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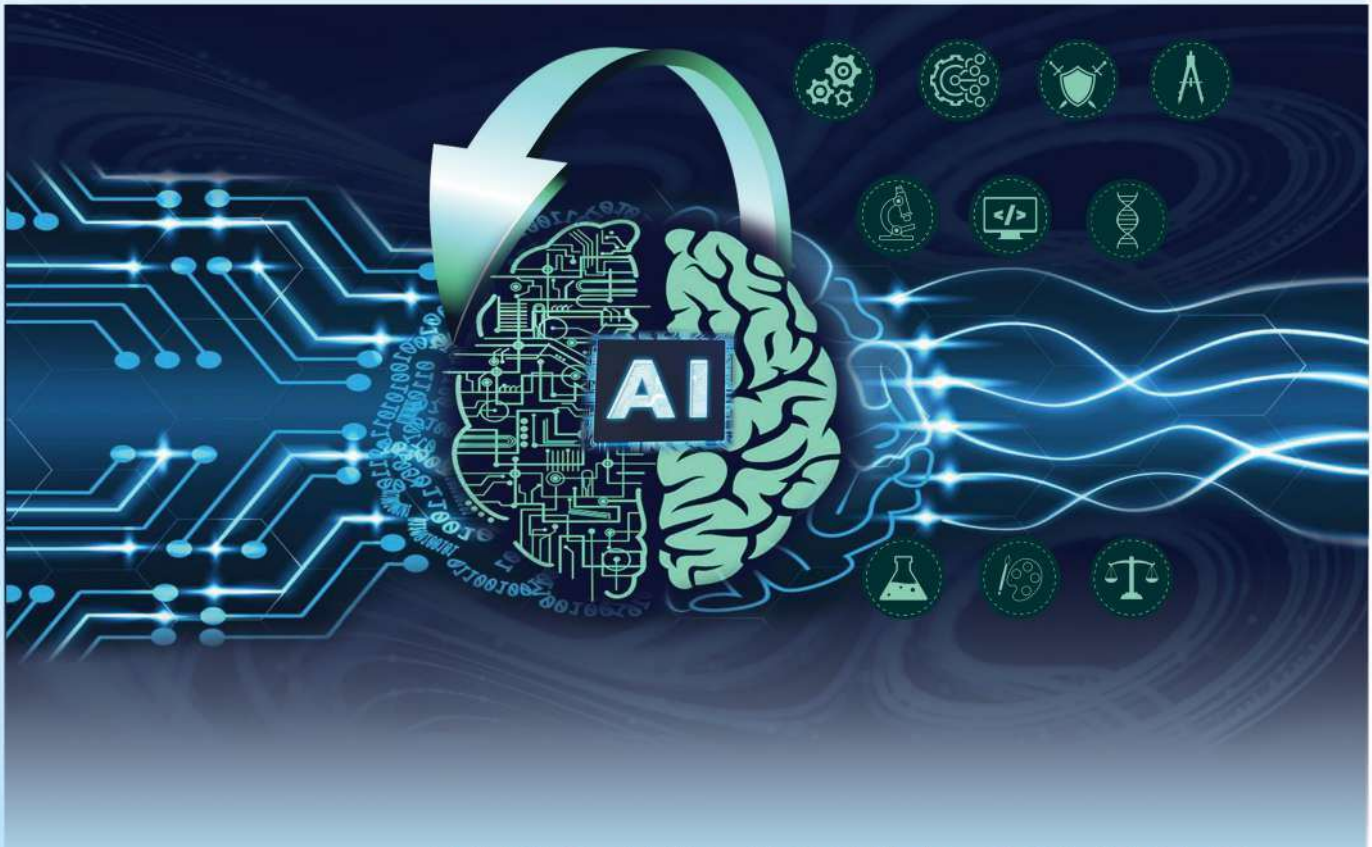
Unravelling the Paradigm Shift: Revolutions in the Era of AI

26TH - 27TH SEPTEMBER 2024



BASIC AND APPLIED SCIENCES

ABSTRACTS

General Sir John Kotelawala Defence University

17th INTERNATIONAL RESEARCH CONFERENCE

UNRAVELLING THE PARADIGM SHIFT: REVOLUTIONS IN THE ERA OF AI

BASIC AND APPLIED SCIENCES

ABSTRACTS

General Sir John Kotelawala Defence University
Ratmalana, Sri Lanka.

KDU PRESS

This book contains the abstracts of papers presented at the **Basic and Applied Sciences** Sessions of the 17th International Research Conference of General Sir John Kotelawala Defence University, Ratmalana, Sri Lanka held on the September 26–27, 2024.

ISBN: 978-624-6427-39-9 (E Copy)

Book is typeset using LaTeX2e.

Published by
General Sir John Kotelawala Defence University,
Ratmalana, Sri Lanka.

Message from the Chief Guest

I am truly honoured to welcome all the distinguished participants to the 17th International Research Conference (IRC) at General Sir John Kotelawala Defence University (KDU). This annually organized conference serves as a unique milestone showcasing the rich research culture deeply embedded within KDU. As a prestigious seat of learning, novelty and innovation remain at the heart of KDU's mission. Therefore, 'Unravelling the Paradigm Shift: Revolutions in the Era of AI' has been chosen as the key theme of IRC 2024.

Moving ahead with the momentum of modern-day research, we are set to uncover the extensive impacts of artificial intelligence, not just in defence but across every facet of national interest. Currently, AI has become a driving force, reforming our defence strategies, transforming healthcare, and restructuring our educational frameworks and infrastructure.

Investing in research is essential for national advancement, promoting innovation, formulating policies, and offering solutions that address our most pressing challenges. Hence, the IRC serves as a vital platform that fosters such great endeavours, contributing significantly to national development. Our responsibility as defenders of national security is profound, extending beyond traditional roles to include the ethical integration of advanced technologies that ensure our nation's safety and prosperity.

KDU stands as a symbol of a rich and diverse research culture across many disciplines. It is also a hub for high-quality research, upholding international standards of academic excellence. This conference represents a critical meeting of minds where leading experts converge to define strategies for our future. Each discussion and presentation at this event is a step toward securing a thriving, prosperous future for our region.

I extend my best wishes to all for a successful and productive conference, eagerly anticipating the innovative ideas and transformative insights that will undoubtedly arise.

GENERAL SHS KOTTEGODA (Retd) WWV RWP RSP VSV USP ndc
Chancellor General Sir John Kotelawala Defence University

Message from the Keynote Speaker

Brain health is a holistic concept encompassing cognitive, sensory, social-emotional, behavioural, and motor functions, enabling individuals to achieve their full potential. With one in three people globally affected by a brain disorder, the urgency for preventive brain health initiatives is evident. Since the inception of World Brain Day in 2014, there has been a renewed global focus on this critical area. The World Federation of Neurology (WFN), in collaboration with key organizations such as the American Academy of Neurology (AAN), the European Academy of Neurology (EAN), and the Asian Regional Consortium of Headaches (ARCH), has led the charge to raise awareness and promote brain health worldwide.

This keynote address will outline the journey of World Brain Day and its impact on the global brain health movement, with a specific focus on prevention. It will explore the evolution of brain health concepts and the alarming prevalence of brain disorders, emphasizing the need for urgent, coordinated action. Central to this effort is the role of artificial intelligence (AI) in enhancing preventive brain health strategies. AI-driven technologies are increasingly being used to predict, diagnose, and monitor brain health conditions, enabling earlier interventions and more personalized approaches to prevention.

The address will highlight the author's pioneering work in community-based programs, public health campaigns, and international collaborations. It will underscore the critical role of prevention, early intervention, and AI-powered tools in improving quality of life and reducing the global burden of brain disorders. The ultimate goal is to advance comprehensive brain health initiatives that leverage cutting-edge technologies to ensure a healthier future for all.

Professor Tissa Wijeratne
DR OAM MD PhD FRACP FRCP(London) FRCP (Edin) FAAN (USA) FEAN (EAN) Professor and Chair, Director, Senior Neurologist, Department of Neurology, Western Health, Victoria, Australia Co-Founder and Co-Chair, World Brain Day, World Federation of Neurology

Message from the Vice-Chancellor

Greetings to all participants, speakers, and guests of the 17th International Research Conference (IRC) at KDU. This year's IRC is centered around a timely theme that has sparked diverse dialogues in the realms of research and innovation. The theme, 'Unravelling the Paradigm Shift: Revolutions in the Era of AI', serves as an eye-opener for both eminent and novice researchers across the globe. It also highlights the critical role that advanced technologies play in shaping our world.

At KDU, we take pride in being at the forefront of defence education in Asia, a distinction affirmed by our high rankings and our pivotal role in shaping global security dialogues. KDU claims to have a unique history of providing high-quality education for both military and civilian students. It also proudly stands as a thriving hub for cutting-edge research that addresses pressing global and national issues. We strongly believe in fostering a rich and diverse research culture among KDU's students and staff, aligned with international standards. Therefore, IRC is recognszed as a key event in KDU's annual calendar, emphasizing its significance in the institution's academic and research endeavours.

This year, we aim to explore the revolutionary impacts of AI across diverse disciplines, reaffirming our commitment to leading these discussions on a global scale. The insights shared here will undoubtedly spark new research initiatives and strategic collaborations, enhancing Sri Lanka's stature as a leader in both academic and strategic domains.

I extend my sincere gratitude to all those whose collective efforts have brought this conference to a reality. Your contributions ensure that KDU plays a prominent role in the international arena, driving discussions that will shape the future of technology and strategy. I look forward to a successful event, characterized by insightful discussions and pioneering ideas.

REAR ADMIRAL HGU DAMMIKA KUMARA, VSV, USP, psc, MMaritimePol, BSc (DS)
Vice Chancellor General Sir John Kotelawala Defence University

Message from the Chairperson

It is my honour, as the Chairperson, to welcome you all to the 17th International Research Conference at KDU. This year, we explore how artificial intelligence has evolved from a technological innovation into a catalyst for transformative change across numerous sectors. With an impressive selection of 441 research papers, drawn from nearly 1000 submissions, our conference spans across 11 distinct tracks covering a wide range of disciplines. Our theme, “Unravelling the Paradigm Shift: Revolutions in the Era of AI," highlights the profound and far-reaching transformations that AI is driving—from reshaping urban infrastructure to revolutionizing healthcare. The conference is designed to promote interdisciplinary dialogue, addressing not only technological advancements but also the ethical, social, and economic implications of these developments. One of our key objectives is to create a platform where researchers, professionals, and thought leaders can come together, exchange ideas, and foster collaborative initiatives that will push the boundaries of innovation. I am deeply grateful to all our keynote speaker and the plenary speakers, other presenters, , participants, and the entire organizing team for their tireless efforts and contributions. Your dedication to advancing knowledge is what brings this conference to life, positioning it as a critical forum in global research. Together, we are charting a path toward a future where technology and society grow hand in hand, reshaping the landscape of not just research but our daily lives. Let’s engage in meaningful discussions that will inspire new perspectives and drive impactful solutions. Here’s to a successful conference, rich in insight and collaboration. Finally, I would like to extend my best wishes to all the presenters, authors, and participants joining the KDU IRC 2024, whether on-site or online. I hope each of you finds this conference not only informative and enjoyable but also an encouraging opportunity to experience the warm hospitality of KDU throughout these two fruitful days.

Dr. Nirosha Wedasinghe
Ph.D(KDU-SL), MIT(CStud-Aus),B.Sc in Comp IS (London Met -UK), SMIEEE(US), MBSC(UK), MCS(SL), FISDS(Japan) Senior Lecturer cum Director -Centre for Gender Equity and Equality General Sir John Kotelawala Defence University Conference Chair-IRC 2024

Message from the Secretary

As we gather for the 17th International Research Conference at KDU, I extend a warm and heartfelt welcome to all participants, researchers, and thought leaders. This year, we proudly present 441 research papers selected from nearly 1,000 submissions, spanning across 11 tracks in diverse fields such as Defence and Strategic Studies, Medicine, Health Sciences, Engineering, Technology and Computing, Basic sciences, Law, Social Sciences and Humanities, and the Built Environment and Spatial Sciences. Our theme, "Unravelling the Paradigm Shift: Revolutions in the Era of AI," reflects the profound ways that AI is transforming our world, becoming integral to our lives and work. The discussions here aim to explore how AI can address global challenges, drive innovation, and foster interdisciplinary collaborations that will shape the future. Looking ahead, the future of IRC lies in broadening its horizons. We aim to increase international participation, diversify the scope of research, and establish global research consortia to tackle real-world problems that extend beyond the borders of Sri Lanka. The insights gained here must lead to actionable outcomes, particularly in formulating policy recommendations in areas such as AI in defence, public health, and education. This conference is more than just a forum for discussion; it is a platform where the brightest minds collaborate to drive change. I extend my heartfelt thanks to all our speakers and participants for their dedication and contributions. Together, we are not only shaping the future of research but also crafting solutions that will impact society on a global scale. Here's to a successful and inspiring conference that drives innovation, shapes policy, and sparks meaningful collaboration.

Dr. HM Prasanna Herath
Ph.D. (USJ), RN(SLNC), B.Sc(Nursing) Hons (UPSL), CTHE Senior Lecturer Faculty of Allied Health Sciences Erasmus coordinator General Sir John Kotelawala Defence University Conference Secretary- IRC 2024

Message from the Director

In 2013, General Sir John Kotelawala Defence University (KDU) established the Institute for Combinatorial Advanced Research and Education, known as KDU-CARE. This institute serves as the research arm of KDU, addressing the research needs of the society, the country, and the world with fully-fledged advanced research facilities. The academic and research staff at KDU-CARE implement projects using state-of-the-art scientific technologies that enhance KDU's scientific education and research capabilities.

KDU-CARE conducts multidisciplinary scientific research in health, cell and molecular biology, biotechnology, chemistry, engineering, and technology fields. Many of these research projects are conducted in collaboration with both public and private sector organizations, aiming to build research capabilities and foster innovation within KDU and beyond, thereby advancing national scientific research capabilities in Sri Lanka. Much of this research work is commercialized.

KDU-CARE is comprised of professors, senior lecturers, research scientists, research assistants, and research students who engage in various research activities, addressing national problems and generating international publications or products/services that generate revenue for KDU. A major area of service is conducting bioequivalence studies for state and non-state pharmaceutical companies for various drugs they manufacture. To facilitate such projects, KDU-CARE has established its commercial arm, CARE Technology Lanka (Pvt) Ltd. Additionally, affiliated members, including clinicians from various faculties of KDU, collaborate with KDU-CARE scientists to achieve these goals.

Furthermore, the academic staff of KDU-CARE offers consultancy services across a wide array of disciplines, both nationally and internationally. The KDU-CARE academia also engages in fundamental research by securing research grants for the institute from national and foreign funding bodies. Currently, KDU-CARE has the largest number of research students at the University working towards their postgraduate studies, contributing to KDU's research output through publications in high-impact journals and by securing patents.

Prof. Dr. Ing. Thushara Weerawardane
BSc (Moratuwa), MSc (Germany), PhD (Germany), CEng (UK), MIEEE, MCSSL Dean, Faculty of Engineering General Sir John Kotelawala Defence University

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ORAL PRESENTATIONS

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Identification of Chemical Constituents in "Wathupalu" (*Mikania cordata*) Plant Extracts in Wound Healing Using Scratch Assay

PGKA Bandara[1], CD Wijayarathna[1#], CL Goonasekara[2], and AI Kuruppu[3]

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Mikania cordata (Burm.) Robinson is a fast-growing herbaceous vine that belongs to the family Asteraceae. Traditional medicine uses freshly ground *M. cordata* leaves for cuts and wounds. This study aimed to evaluate the wound healing potential of *M. cordata* leaves and identify the potential chemical constituent/s responsible for this effect. Leaf extracts were prepared separately by sonicating dried and powdered leaves in distilled water, ethanol, methanol, and dichloromethane (DCM). The Vero cell line was used to examine the wound healing potential. Cells were treated with a series of concentrations of different *M. cordata* extracts to determine the toxicity using an MTT assay. More than 70% of viability was found in all extracts within the concentration range of 10 - 1000 µg/mL and cell viability exceeded 100% in some concentrations (Ethanol 500 µg/mL) indicating a cell proliferation effect. Therefore, the scratch assay was performed for 100, 500, and 1000 µg/mL concentrations to examine the wound healing ability of the extracts while monitoring scratch closure for 24 and 48 hours. Aqueous, ethanol, methanol and DCM extracts of M. cordata showed significant ($P \leq 0.05$) wound healing properties at 24 hours and the level of significance decreased at 48 hours for all four concentrations tested. The cells treated with 100 µg/mL of ethanol extract for 24 hours showed the highest percentage of wound closure (82%) compared to the untreated cells ($P \leq 0.001$). This indicated the presence of compound/s responsible for wound healing in all 4 extracts. A Single spot (R_f – 0.27) was observed in thin layer chromatography (TLC) for the aqueous extract dissolved in DCM. Fourier-transform infrared (FT-IR) spectroscopy analysis of this compound showed the possibility of an alcohol group, methyl groups and alkyl stretches. Ultraviolet visible (UV-vis) spectroscopy suggested the compound to be an alkaloid with unsaturated C stretches.

Keywords: *Mikania cordata (Burm.) Robinson, wound healing, MTT assay, scratch assay, UV-Vis spectroscopy, FT-IR spectroscopy, TLC*

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In-silico Structure Based Identification of Potential Human Gamma Secretase Inhibitor Ligands

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Gamma secretase (GSEC) is a multi-subunit transmembrane aspartyl protease complex that cleaves transmembrane (TM) domains of over 150 membrane proteins. GSEC plays a crucial role, at least in part during the pathogenesis and progression of different types of cancer types by downstream proteolitic processing of aberrantly activated NOTCH receptor (NR). Therefore, GSEC is considered as a potential target for anti-cancer drug design. However, there are no clinically approved GSEC inhibitors available to date. The main motive of this study was to identify potential GSEC inhibitors from the compounds of lipids map database. A Python script base pipeline was created for the conversion of the 2D molecular structure of the database to 3D structures followed by geometry optimization using an Amber force field. Molecular docking of 47500 geometry-optimized lipid like molecules and five known GSEC inhibitors (L685, 458, DAPT, Ganoderic Acid, Rutin and Semagastat) was performed against the active site of the GSEC using the Autodock vina program. Molecules that exhibited binding affinity lower than the best binding affinity value of known inhibitors (<-10.2 kcal/mol) were further screened for the drug-like properties. The top 5 most drug-like compounds were selected for further analysis. For these compounds, 100ns molecular dynamic (MD) simulation was performed in their natural membrane environment using Desmond (Schrodinger 2020.1). The stability of the complexes was assessed by evaluating root mean square deviation (RMSD), root mean square fluctuation (RMSF) and protein-ligand contacts during the simulation period. Molecular mechanics with generalized born and surface area solvation (MM/GBSA) calculation was executed for the three most stable complexes using 100 frames of each MD trajectory. Potential off-targets of the selected molecules were predicted by network analysis. Results indicated that Euchrenon a12, Euchrenon a14, and Euchrenon a15 are potential inhibitors of GSEC. However, further wet-lab experiments are needed to validate the results.

Keywords: *gamma-secretase, cancer, lipid-like molecules, mmgbsa*

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Comparative Investigation of Antioxidant Activity of Pectin and Gelatin-based Food Packaging Films Incorporated with Green Tea and TiO_2

DNA Arachchi[1,2], RM De Silva[1#], and KMN De Silva[1]

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This work comparatively investigated the total phenolic content (TPC) and antioxidant properties of Chitosan/Pectin (CS/PC) and Chitosan/Gelatin (CS/GL) blended nanocomposites reinforced with TiO_2 nanoparticles integrated with green tea extract (GTE), for food packaging applications. Four different GTEs were prepared named GTE 1 (in 10% ethanol, at Room Temperature (RT)), GTE 2 (in 10% ethanol, at 40°C), GTE 3 (in 25% ethanol, at RT), and GTE 4 (in 25% ethanol, at 40°C). By separately integrating the aforementioned GTEs, four PC blended films and four GL blended films incorporated with CS and TiO_2 were fabricated using solvent casting technique. These were then compared with neat materials of CS/PC/TiO_2, CS/GL/TiO_2, and CS/PC, CS/GL. Antioxidant properties of fabricated films were evaluated using the DPPH method, while TPC was determined following the Folin-Ciocalteu method. The lowest antioxidant activity was recorded for the CS/PC in PC blends and CS/GL in GL films. The incorporation of TiO_2 nanoparticles slightly raised antioxidant capacity. Integration of GTEs compatibly enhanced the antioxidant activity of the films in both types, emphasizing films with GTE 4 with the highest scavenging activity (for PC blend = 30.70%, for GL blend = 44.44%). This could be attributed to the initial extraction conditions employed for GTE 4. This is also in good agreement with the highest TPC values for the films with GTE 4, 18.63 mg GAE g^{-1}, 13.70 mg GAE g^{-1} for PC and GL blends respectively. This study emphasized the potential of using all the fabricated membranes as antioxidant packaging films, and films with GTE 4 as the best. Results also revealed that GL blends have comparatively more potent antioxidant activity than PC blends.

Keywords: *green tea extract, antioxidant activity, food packaging, pectin, gelatin*

ID 107

Bio-congruent Synthesis and Characterization of Silver Nanoparticles Using Aqueous Extracts of Justicia Genus Leaves: Investigation of Cytotoxicity, Antioxidant Capabilities, Antimicrobial Efficacy, Para-nitrophenol Reduction, and Photocatalytic Properties

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Nanotechnology involves precisely manipulating matter at the nanoscale. This study focused on developing non-toxic and economically sustainable "green" silver nanoparticles (AgNPs) for various versatile applications. The AgNPs in this study were synthesized from leaf extracts of the Justicia genus—specifically *J. adhatoda* (JA), J. paniculata (JPn), and J. procumbens (JPr). Qualitative phytochemical analysis of the water extracts (WE) revealed the presence of phytochemicals such as terpenoids, flavonoids, and cardiac glycosides. AgNPs were then synthesized from these species, and scanning electron microscopic analysis revealed spherical nanoparticles with diameters of 60-70nm. The AgNPs and their corresponding WE were evaluated for antioxidant potential through Total Flavonoid Content, Total Phenolic Content, Total Antioxidant Capacity, and DPPH scavenging activity. Notably, higher antioxidant activity was discovered in the synthesized AgNPs, compared to WE, with AgNPs also demonstrating lower IC_{50} for DPPH, indicating superior scavenging activity. AgNPs displayed antibacterial activity against *Staphylococcus aureus* and *Escherichia coli*. Studying their potential in bioremediation, the photocatalytic activity of AgNPs against Methylene Blue demonstrated the fastest reaction rate in 4000ppm JA-AgNPs under sunlight with NaBH4. Additionally, complete catalytic reduction of para-nitrophenol was observed within 3-11 minutes. These results were confirmed through kinetic studies, validating the catalytic properties of the AgNPs. The lack of cytotoxicity was confirmed by 100% cell viability in the brine-shrimp lethality assay when exposed to AgNPs for 24 hours. This study therefore highlights the potential of Justicia-derived AgNPs in applications ranging from treating free radical-initiated diseases to bioremediation of environmental pollutants, through a cost-effective and environmentally friendly alternative with minimal harm to organic life.

Keywords: *silver nanoparticles, biosynthesis, para-nitrophenol, photocatalytic, antioxidants, cytotoxicity*

ID 122

Kinematic Analysis of the Release Phases in Male Javelin Throwers in Sri Lanka's National Athletic Pool

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This study investigates the kinematic analysis of the Release Phase (RP) in Sri Lankan national javelin throwers to elucidate factors influencing their throwing performance. The primary objective was to analyze seven key kinematic variables during the RP and to explore their relationship with throwing distance. Employing a descriptive research design, 20 athletes from the national pool of JT were selected as the sample. High-speed cameras captured the RP from a sagittal plane, recording variables including Lead Foot/Foul Line Distance, Height of Release, Release Velocity, Release Angle, Attitude Angle, Angle of Attack, and Stride Length. Data analysis was conducted using Kinovea software (version 0.9.3) and SPSS software 22 for the Pearson correlation test. The results indicate a significant positive correlation between throwing distance and release velocity ($r = 0.753$, $P < 0.001$), underscoring the pivotal role of velocity in performance enhancement. Conversely, no significant relationship was found between throwing distance and lead foot/foul line distance, height of release, release angle, attitude angle, angle of attack, or stride length ($P > 0.05$). Javelin throwers exhibited enhanced performance with foul line distances ranging from 0.93 m to 2.97 m, release velocities averaging between 15.91 m/s and 24.05 m/s, release heights spanning 1.05 m to 1.95 m, and stride lengths from 0.45 m to 1.36 m. The Release Angle, Attitude Angle, and Angle of Attack ranged between 0.49 r to 0.67 r, 0.61 r to 0.83 r, and 0.02 r to 0.24 r respectively. Findings emphasize the critical importance of increasing release velocity to maximize throwing distance. The study recommends that SL JT should focus on improving technique to increase release velocity, this should be the key priority in training programs. Coaches should emphasize training methods that enhance release velocity to improve competitive javelin throwing performance.

Keywords: *kinematic variables, performance, releasing phase, techniques*

ID 253

Advanced Formulations of Chitosan/Polyethylene Oxide/Ethyl Cellulose Incorporated Desferrioxamine: A Comparison of Cell Permeability, Loading Efficiency and pH-dependant Release Properties

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Desferrioxamine (DFO) is one of the most potent iron chelators, used for the treatment of iron overload conditions. However, its extreme hydrophilicity results in lower cell permeability and low plasma half-life, rendering DFO non-absorbable orally leading to burdensome subcutaneous infusions decreasing patient compliance. The main objective of this study is to synthesize an orally administrable DFO-incorporated nanocomposite. Three advanced formulations incorporating DFO into chitosan (CTS), polyethylene oxide (PEO) and ethyl cellulose (EC) network were produced by varying chitosan%. The synthesized nanocomposites were characterized using a scanning electron microscope, particle size analyzer and Fourier transform infrared spectrometer. The drug loading capacities (LC) and drug entrapment efficiencies (EE%) were determined using the potentiometric titration method. Both LC and EE% increased proportionally to the CTS%. Nanocomposite DFO_PEP_EC_CTS_TPP_1 with 285.56±0.04 mg/g of LC and 85.67±13.35% of EE% was identified as the best formulation. The drug release kinetics were analysed at physiological and intestinal pH values. The kinetic model, Peppas–Sahlin provided the best correlation for the dissolution of DFO at both pH values (7.4 and 6.8) and it indicates the case II relaxation mechanism for the release of DFO. According to in vitro blood compatibility assays, the nanocomposite was found to be hemocompatible. Cell permeability studies were carried out and results show that a three-fold increase of permeability at the highest CTS (56%) compared to the lowest (18%). These results suggest that the DFO_PEO_EC_CTS_TPP nanocomposites with high CTS% are promising candidates for the formation of pH-responsive, orally administered DFO modularity.

Keywords: *desferrioxamine, controlled release, nanocomposite*

ID 264

In vitro Antioxidant, Anti-inflammatory and Antacid Activities of the Crude Extract of the Marine Algae *Codium sp.*

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Codium sp. is one of the marine algae found in Sri Lankan coastal areas. This study aimed to evaluate the antioxidant, anti-inflammatory, and antacid activities of the chloroform-methanolic crude extract of *Codium sp.* The total phenolic (TPC) and total flavonoid contents (TFC) were measured using Folin-Ciocaltue and aluminium chloride colorimetric methods respectively. The antioxidant activities were determined using 2, 2-diphenyl-1-picryl hydrazyl (DPPH) scavenging assay, ferric reducing power assay (FRAP), and oxygen radical absorbance capacity (ORAC). The TPC, TFC, DPPH, FRAP and ORAC values of chloroform-methanolic crude extract of *Codium sp.* were found to be 24.17 ± 0.00 mg Quercetin equivalent/g of dried extract, 1.94 ± 0.62 mg Gallic acid equivalent/g of dried extract, 73.86 ± 1.38 mg Trolox equivalent/g of dried extract, 20.35 ± 0.55 mg Trolox equivalent/g of dried extract, and 109.42 ± 3.44 mg Trolox equivalent/g of dried extract, respectively. The anti-inflammatory activities of the crude extract based on the egg albumin and the bovine serum albumin denaturation methods were 0.95 ± 0.20 mg Diclofenac equivalent/g of dried extract and 0.84 ± 0.18 mg Diclofenac equivalent/g of dried extract. The antacid activity was determined by preliminary and acid-neutralizing capacity tests. According to the results, the pH and the consumed amount of the H^+ions of the *Codium sp.* were 3.73 ± 0.06 after the addition of HCl and 0.02 ± 0.00 mmol/mL, respectively. The results showed the potential of *Codium sp.* extract as a natural source of substances with anti-inflammatory, antacid, and antioxidant properties for the development of novel dosage forms.

Keywords: *antioxidant, antacid, anti-inflammatory, Codium sp.*

ID 272

The Respiratory Muscle Strength and Pulmonary Functions of Athletes at Sabaragamuwa University: Differences by BMI Classification

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The respiratory system is pivotal for athletic performance. Factors such as Respiratory Muscle Strength (RMS) and Pulmonary Function (PF) are integral components influencing athletes' performance, with diverse Body Mass Index (BMI) profiles and sport-specific characteristics impacting respiratory capabilities. The study aimed to compare RMS and PF according to BMI classification and to compare the RMS and PF among different team sports. A descriptive cross-sectional design was utilized under a quantitative approach. The sample of seventy female athletes, within the age range of 21 to 28 years were divided into four groups according to Asian Pacific BMI ranges (<18.5, 18.5–22.9, 23 – 24.9, $\geq$ 25) and six groups (Hockey, Football, Elle, Kabaddi, Netball, Volleyball) by using a multi-stage sampling technique. Data were collected using the pulmonary function test and the standard formula for calculating RMS. The data were analyzed utilizing ANOVA, employing the Minitab 19 software. According to BMI categories, there were significant differences in Maximum Inspiratory Pressure (MIP) (cmH2O), Maximum Expiratory Pressure (MEP) (cmH2O), Force Vital Capacity (FVC) (L), Force Expiratory Volume in one second (FEV1) (L), and Maximum Voluntary Ventilation (MVV) (L/min) scores ($P < 0.05$). FVC, FEV1, and MVV were highest in the BMI categories of 23–24.9 kg/m^2 and $\geq$ 25 kg/m^2.The category of > 25 kg/m^2 exhibited the highest RMS scores. However, PF and RMS scores did not significantly differ across team sports ($P > 0.05$). In conclusion results suggest athletes achieve optimal PF scores in the BMI categories of 23–24.9 and $\geq$ 25 kg/m^2, while the BMI category of $\geq$ 25 kg/m^2 achieves maximum RMS scores. Results underscore the intricate connection between PF, RMS and BMI in athletes. Further research is needed to better understand the ideal BMI ranges for athletes while considering health outcomes and other determinants as well.

Keywords: *athletes, body mass index, pulmonary function, respiratory muscle strength*

ID 301

Bio-surfactant Production from Waste Coconut Oil by Marine Isolate of *Rhodoccous sp.* RH-01

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Bio-surfactants (BS) production by microorganisms is given attention as a sustainable solution for chemically produced surfactants. Various BS-producing bacteria have been screened and optimized utilizing unconventional substrates. This study focused on the cost-effective production of BS using a marine isolate *Rhodococcus sp.* RH-01. The bacterium was identified using 16S rRNA gene sequencing. BS production was optimized under batch fermentation conditions. Two-liter scale batch fermentations were conducted using Minimal Salt Medium (MSM) with the following optimized conditions; 40% waste coconut oil, pH at 8.0, temperature at 37°C, shaking at 120 rpm. Acid precipitation was done to harvest crude BS and ethyl acetate extraction was used to obtain pure BS. The lipase activity of the culture supernatant was also determined. Surface active properties of BS were determined using oil displacement drop collapse and emulsification index assays. Cost analysis for the BS production at 2- L- scale was evaluated including cost for substrates, manpower, instrument, and overhead charges. NCBI Blast search showed 99% sequence similarity to *Rhodococcus sp.* Maximum BS production under optimum conations was 7691.3±42.25 mg/L. High lipase activity (23.58±2.18) was shown at 72 h fermentation. Scaling up was done to 2-L scale and the reproducibility was checked. Cost analysis showed LKR 22.5±6.12 is required for producing 1mg of BS which should be further optimized under large scale utilizing low-cost substrates in future studies. In conclusion, *Rhodococcus sp.* RH-01R could be an efficient strain to utilize for BS production at an industrial scale using low-cost substrates.

Keywords: *bio-surfactant, Rhodoccous sp., batch fermentation, waste coconut oil, cost analysis*

ID 316

Biofortification of Iron in Hydroponically Grown *Ipomoea aquatica, Lactuca sativa,* and *Alternanthera sessilis* as a Solution to Alleviate Iron Deficiency in Sri Lanka

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Diets high in calories but lacking in essential vitamins and minerals cause micronutrient deficiencies. Iron deficiency is the most common micronutrient deficiency worldwide, mostly affecting developing countries like Sri Lanka. This study aimed to analyse the possibility of increasing the nutritional Fe content of hydroponically grown *Ipomoea aquatica* (Kankun: KK), *Lactuca sativa* (Lollo bionda lettuce: LT), and *Alternanthera sessilis* (Mukunuwenna: MK) as a solution to reduce iron deficiency in Sri Lanka. Six 3-week-old KK, LT and MK plants grown in coconut coir pellets were transferred into a hydroponics system containing AiGrow Private Limited formulated nutrient solution (NS) with added Fe supplementation salts (7.0 ppm and 10.5 ppm). The control group was treated with only the NS which had a Fe concentration of 3.5 ppm. The plants were harvested after 4 weeks of treatment to determine the total Fe concentration using atomic absorption spectroscopy. The effect of Fe concentrations on nutritional and antioxidant parameters was also tested. Compared to controls, LT and MK had the highest Fe concentration in the 10.5 ppm Fe condition, while KK had the highest Fe concentration in the 7.5 ppm Fe condition. The total carbohydrate and protein contents increased with Fe levels. MK recorded the highest total carbohydrate content (22.78 g/100 g in 10.5 ppm) and LT recorded the highest protein content (4.64 g/100 g in 10.5 ppm). MK grown in 3.5 ppm Fe content showed the highest antioxidant activity (71% of DPPH inhibition). Overall, it can be suggested that this method is a viable approach for Fe biofortification in plants. Additional research is necessary to determine the relationship between biochemical patterns and enhanced Fe content in the plants.

Keywords: *biofortification, antioxidants, hydroponics, Ipomoea aquatica, Lactuca sativa, Alternanthera sessilis*

ID 320

Estimation of Pre-practice Hydration Status of National Athletes in Sri Lanka

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In the field of competitive sports, optimal performance is influenced by the physiological well-being of the athletes, where hydration is a key. The study aimed to assess the pre-practice hydration status of national athletes in Sri Lanka. A cross-sectional descriptive research design was employed, with data collected through urine-specific gravity (USG) measurements and a fluid intake questionnaire. Using a multistage sample technique, 89 national athletes (60.67% female and 39.33% male) from both team and individual sports were chosen. Descriptive statistics and Pearson's Chi-square test were used to analyze the data. The results revealed that 51.69% of the athletes were significantly Hypohydrated with a mean USG of 1.036 ± 0.00245, 31.46% appeared Hypohydrated with a mean USG of 1.024 ± 0.001 and 16.85% of the athletes appeared Euhydrated with a mean USG of 1.0125 ± 0.01398. The results indicate that there was no association in the pre-practice hydration status of National Athletes in Sri Lanka with gender differences (x^2 =1.6028, P > 0.05). In women, there was no significant association of menstruation phases (follicular phase and luteal phase) with the pre-practice hydration status (x^2 = 0.41913, P >0.05). The study highlights the importance of tailored hydration strategies to optimize the health and performance of National level athletes in Sri Lanka.

Keywords: *hypohydration, significantly hypohydrated, euhydrated, electrolytes, gender, menstruation phase, urine specific gravity*

ID 425

Evaluating Influence of Solvents in Graphene Synthesis via Electrochemical Exfoliation: Optimal and Suboptimal Performers

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Electrochemical exfoliation is an eco-friendly technique for graphene synthesis, with the major challenge being restacking of graphene layers. This study's novelty lies in optimizing solvents to prevent restacking by considering solvent parameters, including Hansen and Hildebrand solubility parameters, surface tension, graphene dispersibility, and electrostatic and steric parameters, collectively. The optimized electrochemical exfoliation approach was applied to eleven different solvents using two natural graphite materials (KG and BG) and characterized structurally and electrochemically. The gravimetric analysis showed high crystallinity and purity of KG graphite. The peak at 270 nm in Ultraviolet-visible spectroscopy, a broad peak at 2θ=26.45° in X-ray diffraction, sheet-like nanostructures in scanning electron microscopy (SEM), and characteristic graphene peaks in Fourier transform infrared spectroscopy (FT-IR) confirmed the successful synthesis of graphene. The calculated mean lateral size of graphene flakes was ∼0.723±0.259 μm. The Raman analysis confirmed the formation of high-quality graphene with a very low number of defects (I_D/I_G=0.08), and thickness of a few layers (I_{2D}/I_G=0.45). Electrochemical impedance spectroscopy showed the highest ion diffusion behaviour and lowest electron transfer resistance of the BG-graphene-5% acetonitrile (ACN) and KG-graphene-5% N-methyl-2-pyrrolidone (NMP) electrodes. Cyclic voltammetry confirmed the superior electrochemical performances of the KG-Graphene-NMP and BG-Graphene-ACN due to their highest peak currents of 88.04 (860.6%) and 74.16 (343.5%) μA, and lowest peak-to-peak separations of 73.2 and 70.8 mV, respectively. Comparing KG and BG, solvents with compatible surface tension, Hansen, and Hildebrand solubility parameters supported successful graphene synthesis; hence, the best solvent depends on both the compatibility of these parameters and the type of raw material used.

Keywords: *graphite, graphene, electrochemical exfoliation, solvent parameters*

ID 477

Bio-surfactant-mediated Surface Conditioning Enhances the Microbial Colonization on Polyethylene Terephthalate (PET) Surface: Implication for the Development of Microbial Enhanced Biodegradation of PET

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Microbial degradation of Polyethylene Terephthalate (PET) holds promise for bioremediation efforts. The process can be slow, yet sustainable and have long-term implications for environmental health and stability. This study focused on the bio-surfactant-mediated PET colonization and degradation by the indigenous microbial species. PET debris from marine coastal waste and the open environment were collected. Then plastic debris was first washed with running water and then washed with sterile distilled water. Minimal salt medium (MSM) supplemented with 0.05% crude oil and plastic debris were used as potential carbon sources. The incubation period for cultures extended up to 3 months and microbial colonizers on the PET surface were recovered and grown on the Luria Brentani broth (LB). Mix microbial cultures were further evaluated for PET degradation on standard PET granules (Sigma Aldrich, Germany). Weight losses were measured after specific incubation periods (2-3 months). Bio-surfactant production was determined by drop collapse, oil displacement, emulsification index, and interfacial tension assays. Microbial strains colonized on PET were identified using nucleotide sequences of 16S rDNA and ITS1-ITS2 region. Nucleotide sequences were compared using BLAST search and 99% sequence similarities were found with *Pseudomonas alkaligenes, Rodococcus sp. Shewenella sp., Acromobacter sp* and *Candida sp.* to the GenBank. SEM images showed dense microbial colonization on PET particles and about 30% weight losses were observed. The microbial degradation of PET and heavy colonization of PET highlight the importance of bio-surfactant production leading to surface conditioning of the PET surface. Further studies are currently underway to determine PET metabolites in the supernatant.

Keywords: *bio-surfactant, PET, microbial degradation, Pseudomonas alkaligenes, Rodococcus sp., Shewenella sp., Acromobacter sp,, and Candida sp.*

ID 500

Fitting Column Study Data of Commercial Activated Charcoal for Cu (II) Adsorption in Different Kinetic Models

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The presence of heavy metals (HMs) in the environment is of major concern and to address this issue, the adsorption process using activated charcoal (AC) stands out as one of the most efficient and economical methods. Among HMs, Cu pollution in water resources poses a serious threat and effective removal of Cu is of prime importance. This study aimed to evaluate the effectiveness of commercially available AC under various experimental conditions for removing Cu (II) from aqueous solutions using a column study. The breakthrough curves and associated parameters were detected by altering the bed depths (2, 4, and 6 cm), maintaining an initial metal concentration of 100 mg/L, and using a flow rate of 2.5 mL/min. During the process of Cu (II) removal using AC, the breakthrough points for bed depths of 2, 4, and 6 cm were achieved at 15, 25, and 40 min, and the exhaustion points at 210, 330, and 840 min, respectively. Three kinetics models were utilized to analyze the adsorption kinetics. Only the first part of breakthrough curves was described by the Adams–Bohart model. The adsorption process is represented by the Yoon-Nelson and Thomas models, which have coefficients of determination (R^2) that range from 0.92 to 0.95. The good fit of two models, implies that the rate-controlling mechanisms are well captured by these models. Maximum Thomas uptake capacity was achieved up to 951.4, 386.9, and 480.4 mg/g, for bed depths of 2, 4, and 6 cm, respectively. This study demonstrated that using AC contributes to achieving the objectives of sustainable development. The good fit can be used to optimize the design and operation of adsorption columns. Future work could focus on extending the current study by preparing activated charcoal from low-cost, environmentally friendly materials, thereby contributing to sustainable environmental practices.

Keywords: *heavy metals, copper, activated charcoal, adsorption, kinetic models*

ID 510

Total Phenolic Content, Total Flavonoid Content and Antioxidant Activity in Whole Fruits of Ceylon Gooseberry (*Dovyalis hebecarpa*) at Different Maturity Stages

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Ceylon gooseberry (*Dovyalis Hebecarpa*) or Ketambilla is an under-utilized fruit plant in Sri Lanka with untapped potential. It bears small, deep purple berries that are packed with antioxidants, pigments, and vitamins, making them suitable for various medicinal and commercial uses. Antioxidants are increasingly valued for their ability to combat oxidative stress-induced health issues in the body. This study aimed to address the absence of a comparative study on the contents of phenols, flavonoids and antioxidant activity of three maturity stages of Ketambilla; raw, near-ripe and ripe. Freeze-dried whole fruit samples were extracted in methanol (100%) by maceration for 72 hours. Total phenolic content (TPC) was assessed by Folin-Ciocalteu method. Total flavonoid content (TFC) was evaluated by aluminium chloride method. A concentration gradient of the extracts (0.03125, 0.0625, 0.125, 0.25, 0.5, 1.0 mg/ml) was assessed for antioxidant activity by 2,2-diphenyl-1-picrylhydrazyl (DPPH) and 2, 2′-azino-bis-(3-ethylbenzothiazoline-6-sulfonic) acid (ABTS) assays with ascorbic acid as the positive control. Out of all three extracts, the highest TPC was demonstrated by the near-ripe as 16.8228±1.6060 mg GAE/g. The maximum TFC value was also depicted by near-ripe as 0.5001±0.0582 mg QE/g. From DPPH assay, the 50% Inhibition concentration (IC_{50}) values were obtained as 0.3449±0.0342, 0.2442±0.0222 and 0.2225±0.0421 mg/ml respectively by near-ripe, raw and ripe extracts. The IC_{50} values recorded from ABTS assay, were greater than 1 mg/ml in all extracts. The study suggests that Ketambilla fruit has a notable phytochemical content and antioxidant capacity. In terms of phytochemical content, it is best to consume in the near-ripe stage.

Keywords: *antioxidant activity, maturity stages of fruit, under-utilized, Dovyalis hebecarpa*

ID 558

Formulation of an Antioxidant Nutraceutical through the Optimization of Mixing Ratio of Antioxidant-Rich Underutilized Fruit Based on Experimental Mixture Design

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Sri Lanka, a tropical nation, boasts a diverse array of fruit varieties. Beyond commonly consumed fruits, several underutilized fruit are traditionally used, especially in rural areas. Those little-known fruit are often incorporated into traditional indigenous medicine. The antioxidants present in these fruit can prevent and mitigate the oxidative damage caused by reactive oxygen species and non-radicals to lipids, proteins, and nucleic acids. This study optimized the mixing ratio of *Manilkara zapota* L. (Sin: Sapodilla), *Cynometra cauliflora* L. (Sin: Naminan), *Elaeocarpus serratus* L. (Sin: Veralu), and *Flacourtia indica* L. (Sin: Ugurassa)dried fruit powders to select best combination for the formulation of nutraceutical containing high total phenolic content (TPC), total flavonoid content (TFC) and high antioxidant activities using a Design of Experiment-mixture design. Methanolic extracts of nineteen fruit powder blends were tested for TPC, TFC, Ferric Reducing Antioxidant Power (FRAP), and DPPH. Results showed significant differences ($P < 0.05$) between blends. The reference blend, where each component was 0.25 of the totals. Reducing E. serratus can improve Total Phenolic Content. Reducing M. *zapota* and increasing C. *cauliflora* can improve DPPH. Reducing C. *cauliflora* and increasing M. *zapota* and F. *indica* can improve FRAP. However, the FRAP value increased with a higher *Flacourtia indica* L. proportion and a lower Nami Nam proportion. The optimal mixing ratio was 53.20% *Flacourtia indica* L., 18.28% *Cynometra cauliflora* L., 17.52% *Manilkara zapota* L. and 11% *Elaeocarpus serratus* L. At this ratio, the predicted response values of Total Phenolic Content, Total Flavonoid Content, DPPH (IC_{50}), and FRAP activity, were 19.66 mg GAE/g dry extract, 7.83 mgQE/g,15.17 mgTE/g, 23.28 mgTE/g respectively. The mixture design approach proved to be an effective method for optimizing a bioactive formulation and can be successfully applied to other food mixture systems.

Keywords: *underutilized fruits, antioxidant properties, experimental mixture design*

ID 624

In vitro Bioactivity of *Curcuma longa*

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Sri Lanka's traditional medicine "(Deshiya Chikithsa)," has been practiced for millennia, making it the earliest documented medical system in the country. *Curcuma longa* (CL) has been used to treat viral infections by traditional healers. For this study, a hot water extract of the rhizome of CL was prepared. The total phenolic content (TPC) and total flavonoid content (TFC) were quantified. Antioxidant activity was evaluated using 1,1-diphenyl-2-picrylhydrazyl (DPPH) and 2-2′-azino-bis (3-ethylbenzothiazoline-6-sulfonic acid) (ABTS) assays. Anti-inflammatory activity was determined through human red blood cell (HRBC) membrane stabilization and protein denaturation assays. Cytotoxicity was assessed by 3-(4,5-dimethylthiazolyl-2)-2,5-diphenyltetrazolium bromide (MTT) assay at 24 and 120 hours, using Vero cells cultured in DMEM complete media at 37 37°C and 5% CO_2. TPC was recorded as 40.8 mg/g GAE. TFC was 48.6 mg/g QE. For the DPPH assay, IC_{50} was <0.0625 mg/mL for both CL and standard Ascorbic acid. For the ABTS assay, IC_{50} of CL was 0.37 mg/mL while Ascorbic acid showed an IC_{50} <0.0625 mg/mL. For the protein denaturation assay, IC_{50} was >1 mg/mL for CL while standard Ibuprofen showed IC_{50} of <0.0625 mg/mL. HRBC depicted an IC_{50} of < 0.0625 mg/mL for both CL and Ibuprofen. Cytotoxicity was recorded for CL as CC_{50} 0.81mg/mL for 24 h and >1 mg/mL for 120 h. CL showed remarkably higher TFC and TPC values with moderate antioxidant activity, which can help mitigate the detrimental effects of infection by reducing oxidative stress and protecting host cells. Additionally, CL demonstrated high CC_{50} values by the MTT assay, suggesting that it would be an interesting candidate for further investigations as a possible anti-viral treatment.

Keywords: *Curcuma longa, traditional medicine, antioxidant activity, anti-inflammatory activity, cytotoxicity, potential antiviral treatment*

ID 635

Development of a Low-cost Paper-based Electroanalytical Device for the Detection of Caffeine

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Paper-based electroanalytical devices are more attractive than any other analytical techniques for determining the caffeine (CAF) content in different applications to assess the quality of food and pharmaceuticals due to the simplicity, portability, sensitivity, stability, and low-cost nature of the devices. This research employed a paper based and commercially available polyurethane varnish to develop the hydrophobic pattern to generate the hydrophilic detection zone in which the sample is spiked. The electrode system having three electrodes, was fabricated on the detection zone for the electrochemical detection of caffeine using cyclic voltammetry (CV). The working electrode was modified with anthraquinone and showed electrocatalytic activity towards the oxidation reaction of caffeine. Throughout the study, unmodified carbon paste electrodes (UMCPEs) and silver plates served as counter and pseudo-reference electrodes respectively. The pH, scan rate, and modifier concentration were optimized to improve the analytical performance. Under optimum conditions, the calibration plot that was obtained between peak current and the caffeine concentration showed a good correlation with a correlation coefficient as high as 0.99, over the concentration range from 0.1 mM to 1.0 mM, having a detection limit (LoD), quantification limit (LoQ) and sensitivity (S) of 4 µM, 0.4 mM and 5.0 x 10^{-4} A mM^{-1} respectively. The electrochemical analysis demonstrated the applicability and reliability of this method since the calculated precision, accuracy, detection, and quantification limits (LoD and LoQ) fall within the acceptable range for monitoring caffeine levels in various samples. The low-cost nature, high sensitivity, and good linearity further support its potential as an effective analytical method for caffeine determination.

Keywords: *anthraquinone, caffeine, cyclic voltammetry, paper-based, polyurethane varnish*

ID 657

Optimizing Bioactive Properties of *Garcinia queasita* and *Moringa oleifera* Combinations: Phytochemical, Antioxidant, and Anti-inflammatory Insights

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Garcinia and Moringa are widely recognized for their medicinal properties. The objective of this study was to determine the optimal combination of the two plant species to maximize their *in vitro* bioactivity. Air-dried, mechanically-powdered, and sieved *Garcinia queasita* fruit and *Moringa oleifera* mature leaves were mixed in nine different ratios (G90:M10, G80:M20, G70:M30, G60:M40, G50:M50, G40:M60, G30:M70, G20:M80, and G10:M90). All the combinations and the unmixed plant samples were analysed through *in vitro* bioassays. The radical scavenging activity was analysed by the 2, 2-diphenyl-1-picrylhydrazyl (DPPH) assay. The radical scavenging ability of G70:M30 combination demonstrated the most potent IC_{50} of 0.202 mg/mL while unmixed *G. quaesita* and *M. oleifera* exhibited IC_{50} values of 0.331 mg/mL and 0.770 mg/mL, respectively. The standard ascorbic acid showed an IC_{50} of 0.399 mg/mL. The G70:M30 combination demonstrated the most potent IC_{50} of 0.120 mg/mL in the *in-vitro* anti-inflammatory experiment, which was carried out using the human red blood cell (HRBC) membrane stabilization assay. *G. quaesita* and *M. oleifera* alone showed IC_{50} values of 0.124 mg/mL and 0.674 mg/mL, respectively, while standard ibuprofen recorded an IC_{50} of 0.141 mg/mL. The total phenolic content (TPC) was analysed by the Folin-Ciocalteu assay. The highest TPC was observed in the G30:M70 of all combinations, with a value of 261.80 mg GAE/g ± 22.62 . *M. oleifera* and *G. quaesita* demonstrated 226.08 mg GAE/g ± 66.93 and 276.45 mg GAE/g ± 38.31, respectively. The aluminum chloride colorimetric assay determined total flavonoid content (TFC). For the TFC assay, the G10:M90 combination showed the highest value of 87.82 mg QE/g±0.22 while *M. oleifera* and *G. quaesita* exhibited values of 85.99 mg QE/g±0.96 and 50.67mg QE/g±0.11, respectively. These findings suggest that specific combinations of the plants can significantly enhance bioactive properties, highlighting their potential in therapeutic research.

Keywords: *bioactive synergies, garcinia, moringa, radical scavenging activity, anti-inflammatory activity, optimal combinations*

ID 750

The Field Evaluation of the Efficacy of Bio-herbicide Formulations and Recommending the Effective Dosage for Rice

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Weeds are a major threat in rice (Oryza sativa L.) cultivation that affects the yield on a significant scale. Three bio-herbicides that were derived from the plants belonging to families Apocynaceae, Araceae, and Sapindaceae showed a significant effect on controlling weeds in rice. The effects of these plant extracts were tested for the weed species including the indicator weeds; Gojaravala (Ischaemum rugosum L.), Bajiri (Echinochloa crus-galli L.), and Bolathunessa (Cyperus difformis L.). Rice and weeds were cultivated in the field laid out according to RCBD. There were five treatments; bio-herbicide formulations (C1, C2, and C3), manually weeded (W) and synthetic herbicide (H) sprayed plots, and the control. Each plot consisted of five rice varieties grown in strips. Plots were sprayed with bioherbicides in one-week intervals from the pre-emergent period until the sixth week. Manual weeding was done when weeds appeared and H was sprayed once. The growth response of both rice cultivars and weeds was evaluated to ascertain the efficacy of bio-herbicide formulations. Analysis showed a significant effect on the yield of rice ($P < 0.05$). However, there were no significant effects of treatment on flowering time. The highest yield was recorded in the plots sprayed with H and the lowest yield by control. C1 and C2 bio-herbicide-treated plots showed a higher yield and weed reduction compared to the control plot. The improved variety at 378 showed the highest yield and Kalu-heenati showed the lowest yield in response to treatments.

Keywords: *bio-herbicide, weeds, yield, rice, apocynaceae, araceae, sapindaceae, field testing*

ID 782

The Relationship between Breathing Pattern and Shooting Performance of Elite School-Level Air Pistol Shooters in Sri Lanka

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There is a significant gap in understanding how breathing patterns directly influence shooting performance metrics in the context of shooting sports. This study aimed to explore the relationship between breathing patterns and shooting performance metrics such as precision and accuracy among national air pistol shooters in Sri Lankan schools using pre-charged pneumatics pistols (PCP). The data were analyzed using R statistical software (version 3.5.0). A specialized breathing guide was given to ensure a consistent breathing rate as a pattern. The structured testing procedures included preparation shots, test shots, and random breathing patterns to evaluate athletes' adaptability. The data were collected using standard score measuring cards. The findings indicated no significant relationship between breathing patterns with shooting accuracy ($p=0.397$) and precision ($p=0.549$). In conclusion, this study highlights that breathing patterns do not significantly affect the shooting performance of national air pistol shooters in Sri Lankan schools.

Keywords: *breathing rate, shooting performance, shooting accuracy, shooting precision*

ID 806

Potential of African Butter (*Pentadesma butyracea*) Fruit Pulp in Selected Food Product Development

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This study investigates the potential of the African butter (*Pentadesma butyracea*) fruit pulp for food product development. The best maturity stage of fruit among the four maturity stages was selected based on the physicochemical properties. Three formulations of toffee with African butter fruit juice (10%, 20%, and 30%) were developed and analyzed for preference of colour, aroma, texture, taste and overall acceptability using a ranking test. The proximate composition of the most preferred toffee was analyzed. Jam was developed using 40% of the pulp with other ingredients and adjusting the TSS to 68%. It was compared with a commercially available wood apple jam using the hedonic test for preference. Pulp of the mature fruit was selected as the best maturity stage and it contained 0.19±0.02 g/100 g of ascorbic acid (AC), 28.17±0.17 mg/ mL of phenolic compounds, 13.07±0.07 of total soluble solids (TSS), 0.97±0.04% of titratable acidity (TA) and 3.22±0.07 of pH. The toffee made with 20% fruit juice was the most preferred formulation and its pH, TA, TSS, total sugar content, and AC content were 3.9±0.03, 0.51±0.02%, 74.6±0.44%, 74.54±0.84% and 0.08±0.01 (g/100 g) respectively. pH, TA, AC and TSS of the jam were 3.2±0.02, 0.51±0.01%, 0.10±0.01(g/100 g) and 68.2±0.11%, respectively. The proximate composition of the jam was determined as 68.56±0.05% carbohydrates, 2.19±0.07% proteins, 2.14±0.27% fiber, and 0.32±0.03% minerals. The developed jam was significantly preferred ($P < 0.05$) over the commercial jam for colour, texture and overall acceptability. The total phenolic content, total flavonoid content and DPPH scavenging activity of the jam were 223.45±1.02 (mg Gallic Acid Equivalent (GAE)/g dry weight (dw), 41.64±0.98 (mg Quercetin Equivalent (QE)/g dw) and 65.23±0.31% respectively while the values were 112.34±0.61 (mg GAE/g dw), 31.98±0.18 (mg QE/g dw) and 49.32±0.2% respectively for the toffee. Results indicated that the pulp has the potential to be developed into different food products.

Keywords: *African butter fruit, jam, toffee, physicochemical properties, antioxidants*

POSTER PRESENTATIONS

ID 40

Association between the Sleep Quality and Physical Fitness of Undergraduates of the University of Colombo, Sri Lanka

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Sleep and physical fitness are important for undergraduates' performance and daily activity. However, these associations were not assessed adequately in the Sri Lankan context. The objective of the study was to determine the association between sleep quality and physical fitness of undergraduates of the University of Colombo, Sri Lanka. A cross-sectional study was conducted among undergraduates (n=150) of the University of Colombo recruited by random sampling. Their sleep quality was assessed using Munich Chronotype Questionnaire and physical fitness was evaluated using standard fitness tests. Data analysis was done using SPSS version 22.0 and $P < 0.05$ was considered significant. Out of 150 participants, 60% were females with a mean± SD of age of 22.76 ±0.99 years. Their mean ±SD sleep duration was 6.33 ±1.26 hours, and sleep onset latency was 17.8 ±27.46 min. On regular days, a majority (65.3%, n=98) had a normal sleep onset latency and a poor sleep duration (80.7%, n=121). Despite poor sleep duration, the majority (82.7%, n=124) showed normal sleep efficiency. These parameters had no significant difference between males and females ($P > 0.05$). In univariate analysis, undergraduates with normal sleep duration showed significantly better cardiovascular endurance (483.24 ± 53.69 sec vs 561.78 ± 19.69 sec), muscular endurance (45.93 ± 1.69 sec vs 41.49 ± 8.03 sec), and muscular strength (20.17±1.75 vs 15.99±3.80) than those who have abnormal sleep duration ($P < 0.05$). Further, those with normal sleep efficiency showed better cardiovascular endurance (536.14 ± 53.18 sec vs 596.46 ± 54.77 sec) than those with poor sleep efficiency ($P < 0.05$). The logistic regression analysis showed that sleep duration was associated with muscular strength (OR=1.29; 95% CI 1.03-1.60) and cardiovascular endurance (OR= 0.95; 95% CI 0.93 to 0.97). In conclusion, sleep deprivation is a concern among undergraduates which showed a significant association with their physical fitness thus, affecting their daily lives.

Keywords: *sleep quality, physical activity, physical fitness, undergraduates*

ID 142

Investigation of Antioxidant Activity of Selected Sri Lankan Marine Algal Extracts

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In recent years, there has been significant interest in isolating the bioactive molecules from marine algae for antioxidant activity. Sri Lankan marine algae have received very little attention as a source of secondary metabolites. This study aimed to analyse the content of bioactive compounds and determine their antioxidant activity using 1,1-diphenyl-2-picrylhydrazyl (DPPH) as free radicals. In this study two species of red algae (*Chondeophycus sp., Gracilaria sp.*), two species of brown algae (*Sargassum sp., Padina sp.*), and one species of green algae (*Halimeda sp.*) were collected from Barberine reef, Beruwala and Aluthgama beach. These marine algae samples were subjected to chemical extraction to obtained the crude extracts which were tested for antioxidant activity and subjected to TLC studies. The DPPH assay was used to determine antioxidant properties by measuring the decrease in absorbance at 518 nm. The extracts of *Sargassum sp., Gracilaria sp., Halimeda sp., Padina sp.,* and *Chondrophycus sp.* which were collected have some antioxidant activity and red algae and brown algae were more active than green algae. The *Chondrophycus sp., Padina sp.* and *Gracilaria sp.*, showed the highest total antioxidant activity compared with other species with a IC_{50} value of 138.4 µg mL^{-1}, 143.7 µg mL^{-1} and 149.3 µg mL^{-1} respectively. Based on these results and TLC studies, *Padina sp.* was selected for bioassay-guided fractionation by using reversed-phase column chromatography yielded fractions with significant antioxidant activity.

Keywords: *marine algae, antioxidant activity, DPPH*

ID 161

A Study of the Influence of Geographical Location on Usually Pathogenic Targeted Bacteria in the Gut of *Nemipterus virgatus* (Golden Threadfin Bream) in Different Marine Locations in the Western Province of Sri Lanka

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Fish, comprising nearly half of all vertebrates, have diverse physiological and ecological traits. Their gut microbiome is crucial for health and development, influenced by geography, diet, and lifestyle. While fish gut microbiome research is extensive, the impact of geography on pathogens in *Nemipterus virgatus* remains underexplored. This study examined how geographical location affects gut pathogens in this key species, vital to local fisheries and the economy. Stratified random sampling was used to collect fish from Negombo, Muthuwella, and Beruwala and analyzed for pathogenic bacteria in the gut using microbiological methods, including biochemical tests, selective and differential media culturing, disc diffusion methods, and PCR targeting *Enteropathogenic Escherichia coli* (EPEC) to distinguish between typical and atypical strains, while traditional methods sufficed for *Salmonella* and *Shigella* detection. Findings showed that 29.3% (17 out of 58) of the samples harbored targeted pathogens (*Salmonella, Shigella,* and *Escherichia coli*). Statistical analysis using a chi-squared test (p-value < 0.05) confirmed a significant correlation between pathogen presence and geographical location. Antibiotic susceptibility tests revealed 100% resistance to ampicillin and erythromycin, with 47% sensitivity to chloramphenicol. PCR analysis identified an atypical EPEC strain, with 2 out of 6 samples showing a band for targeted eaeA primers and no bands for bfpA primers. This study provides insights into how geographic location influences pathogenic bacteria in fish guts and its potential impact on antibiotic resistance. Future work using sequencing, q-PCR, and optimized multiplex PCR could enhance the identification of additional pathogenic strains and improve health outcomes for both humans and fish.

Keywords: *fish gut microbiome, geographical and marine locations, targeted pathogens, EPEC, atypical EPEC, bfpA, eaeA*

ID 201

The Evaluation of In-vitro Anti-inflammatory Effect of a Given Methanolic Extract of *A. flavus* MM1

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The primary drawbacks of currently available NSAIDs are their toxicity and the recurrence of symptoms once the medication is discontinued. As a result, many individuals seek safer alternatives, such as natural sources. The main objective of this study was to evaluate the in-vitro anti-inflammatory activity of 5 different concentrations of *Aspergillus flavus* (*A. flavus*) MM1 methanolic extracts. The *A. flavus* extracts were subjected to an in-vitro anti-inflammatory activity study using two different methods: an egg albumin denaturation assay and the Human Red Blood Cell (HRBC) membrane stabilization method, which involves heat-induced haemolysis. The methanolic extracts of *A. flavus* MM1 exhibited promising concentration-dependent in-vitro anti-inflammatory activity when calculated using the equation. The anti-inflammatory activity was assessed in comparison to that of the standard drug, Diclofenac Sodium (DS). Higher concentrations were observed to have a more potent anti-inflammatory effect, with the methanolic extracts (156.25-1250 µg/mL) showing inhibition of protein denaturation between 27.6% and 67%. The protein denaturation method demonstrated that the methanolic extract of *A. flavus* (1250 µg/mL) and DS (1000 µg/mL) inhibited egg albumin denaturation by 67% and 63.4%, respectively. The results indicated that the methanolic extracts (312.5-2500 µg/mL)) exhibited a percentage inhibition of haemolysis that fell between 15% and 75.9%. According to the heat-induced haemolysis method, the methanolic extracts of *A. flavus* (2500 µg/mL) and the positive control DS (1000 µg/mL) showed 75.9% and 75.6% inhibition of RBC haemolysis, respectively. The t-test and the above findings revealed the methanolic extracts of the Aspergillus fungus *A. flavus* MM1 exhibited notable anti-inflammatory characteristics ($p < 0.05$).

Keywords: *A. flavus MM1 extract, anti-inflammatory, protein denaturation, heat-induced haemolysis, hrbc membrane stabilization*

ID 204

Addressing Glamour Attached to Violent Behaviour among Youth in a Sri Lankan Technical College through a Health Promotion Intervention

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Glamourization of violence among youth is a determinant of youth violence and the media plays a key role in it. There is a gap in studies that address this issue among youth in Sri Lanka. This study aimed to address the glamour attached to violence among youth in a Sri Lankan technical college through a health promotion intervention. The participatory action research approach was employed. A purposive sample of 74 students (26 male and 48 female) aged 20-27 years participated in a twelve-month-long health promotion intervention and implemented actions; identifying violence promotions in media, conducting informal discussions, displaying posters, and sharing social media posts to de-glamourize violence. Data was collected until data saturation was reached. Four focus group discussions (FGDs) with students and seven interviews with staff members were conducted at the pre-and-post-intervention phases and analysed using thematic analysis. Under the theme 'change', the sub-theme, 'glamourization of violence' emerged. Participants changed their views and attitudes of glamourizing violence following the intervention. The attractive image created around the perpetrators and identifying violence as a *"heroic"* act seemed to be reduced. Female students of two FGDs appeared not to appreciate the perpetrators' strength, courage, or appearance, and the number of students gathering around perpetrators and adding value to their behaviours appeared to be reduced. Students attached a stigma to violence, and considered violence as *"foolish behaviour"*, and *"a disgusting and shaming act"*. This aroused *"fear"* among students to behave violently, making them *"self-disciplined"*. The intervention was successful in de-glamourizing violence among study participants.

Keywords: *glamour, health promotion, violence, youth*

ID 273

Identification and Quantification of the Biodegradation Potential of Polycyclic Aromatic Hydrocarbon-Degrading Soil Bacteria from Fuel Stations: Implications for Effective Bioremediation

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Polycyclic aromatic hydrocarbons (PAHs) are a class of organic compounds containing two or more fused aromatic rings paired with hydrogen and carbon atoms. These compounds primarily result from the incomplete combustion of organic materials, also considered as environmental pollutants due to their carcinogenic, and genotoxic properties towards humans. Bioremediation is an eco-friendly application which utilizes bacteria to degrade or detoxify environmental pollutants including PAHs. This leverages the natural metabolic pathways of bacteria to break down hazardous substances into less harmful or non-toxic compounds. This study focused on naphthalene and phenanthrene by isolating bacteria that can break down these compounds, identifying the best bacteria with effective degradation, and studying their degradation percentages to utilize as a bioremediation solution. Initially, soil samples were collected from selected polluted fuel stations which were randomly selected. To assess the environmental pollution, environmental analysis was done using High-Performance Liquid Chromatography. From the collected samples, morphologically different bacterial strains were isolated. A primary screening plate assay technique was used and in the confirmatory step, spectrophotometric analysis was conducted using methylene blue (609 nm) to identify each strain's ability to degrade specific PAH. According to the results, *Staphylococcus hominis* strain SS2-U3 was identified as the optimum PAH degrader with 50.68% naphthalene degradation and 48.78% phenanthrene degradation percentage. In conclusion, *Staphylococcus hominis* strain SS2-U3 can be used as a potential biological agent to degrade naphthalene and phenanthrene-like PAHs, integrating this into real-world applications including porous bed-medium could further enhance the efficiency and reliability of bioremediation of PAH contamination.

Keywords: *bacteria, bioremediation, degradation, naphthalene, phenanthrene, PAHs, soil*

ID 385

Non-invasive Thermal Sensor Using Zero Heat Flux Method

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Core body temperature is a vital parameter in diagnosing various diseases. it is important to monitor core body temperature during activities that cause hyperthermia or hypothermia, such as surgeries or sports. The zero heat flux method is a promising solution to monitor core body temperature. Two arrays of thermal sensors detect the heat flux coming through tissues and calculate the temperature deep in the body. This approach is non-invasive, reliable, fast response, and simple. Thermocouples are arranged in an array, sandwiched with an insulating layer to measure the heat flux temperature. The processing unit calculates core body temperature from temperature measurements obtained from thermocouple arrays. In this study; a specially designed and built experimental setup was used as an experimental setup. The device was compatible with a Wi-Fi facility to share temperature data with a medical platform. Results show that the developed zero heat flux sensor module gives accurate and reliable measurements in hot and stable ambient conditions. As a wearable medical device, the proposed sensors could be used in hospitals, sports fields, military-grade operations, and day-to-day life.

Keywords: *core body temperature, zero heat flux method, thermocouples*

ID 426

Maximizing Organic Waste Management through Vermicomposting: A Comparative Study of Red Wigglers and Black Soldier Fly Larvae

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Vermicomposting, a process of composting done by using Red Wigglers and black soldier fly larvae (BSFL) offers a sustainable solution for organic waste management. This study aimed to compare the performance of Red Wigglers and BSFL in vermicomposting and evaluate their suitability for different waste types which were yard, kitchen, and food waste. Each waste type was mixed with the compost filling (cow dung, hay, sand, banana cuttings) in separate 9 pots (3 pots per each waste type). Red wigglers and BSFL were added to each waste type, separately and the remaining 3 setups were maintained as controls. pH and temperature measurements were monitored throughout the vermicomposting process, revealing optimal conditions for both organisms, and counting the Red Wigglers and BSFL every week. Results indicate that BSFL exhibits higher efficiency in breaking down organic matter under specific temperature conditions, at a range of 27-30 °C and pH conditions at a range of 6-7. The mean rate of growth/decline per week in food, kitchen and yard waste respected to Red Wigglers were 1.00, 0.72 and -1.00 and respected to BSFL 1.86, 11.86 and 18.00. A significant difference between the rate of growth/decline of Red Wigglers and BSFL was proved statistically (ANOVA test). The compost piles which contribute to an increase in the population of decomposers lead to an increase in the efficiency of composting. Food waste undergoes the highest rate of fermentation, increasing acidity which promotes rapid growth of BSFL that thrive in acidic conditions. Also, BSFL can stabilize in the acidic pH than Red Wigglers. It can be concluded that food waste is preferred to BSFL than yard waste and kitchen waste and yard waste is preferred to Red Wigglers.

Keywords: *red wigglers, black soldier fly larvae, BSFL, vermicomposting, waste management, organic*

ID 532

Comparative Analysis of *Annona muricata* and *Annona reticulata* Crude Seed Extracts; Phytochemical Analysis, Antioxidant Activity and Fatty Acid Composition

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Annona muricata (Soursop) and *Annona reticulata* (Custard apple) belong to the Annonaceae family and are known fruit plants from a medicinal perspective. The study was conducted to find out the differences in terms of phytochemical and fatty acid compositions of these two species. The crude seed extracts of these *Annona sp.* were subjected to phytochemical analysis and FRAP (Ferric reducing antioxidant power assay) and ORAC (Oxygen radical absorbance capacity) assays. The fatty acid composition was conducted using Gas chromatography and mass spectrometry (GC-MS). Phytochemical screening revealed the presence of alkaloids, saponins, tannins, steroids, terpenoids, and flavonoids in the crude seed extracts. The statistical analysis was done using the t-test Minitab 17 software package. The seed of Custard apple exhibited the highest total phenolic content (TPC) at 18.326 ± 0.416 mg GAE/g Dry weight (DW), and the Soursop seed at 12.67 ± 3.9 mg GAE/g DW ($P > 0.05$). The total alkaloid content of custard apple was recorded as 1.05 ± 0.04 g/DW and 1.22 ± 0.02 mg/g for soursop ($P > 0.05$). The terpenoid content was 0.16 ± 0.003 g/DW and 0.11 ± 0.01g/DW ($P > 0.05$) for Custard apple and Soursop seed extracts, respectively. ORAC values for Custard apple seed extract was 32.27 ± 7.08 mg TE/g, and for Soursop seed extract was 76.3 ± 2.58 mg TE/g ($P < 0.05$). The FRAP values were 70.84 ± 5.62 mg TE/g for Custard apple to 107.38 ± 8.27 mg TE/g for Soursop extract ($P < 0.05$). A. *muricata* and A. *reticulata* include (47.26%-45.93%)9-Octadecenoic acid (Z)-methyl ester (oleic acid), (33.02-27.38%) 9,12-Octadecenoic acid hexadecanoic acid methyl ester (palmitic acid) and (18.98%-17.41%) 9,12,15-Octadecatrienoic acid, methyl ester (linolenic acid methyl ester) at (2.4%-1.6%).The Alkaloids content of these two species has shown remarkable enhancement that due to their inherent character. This species all alone isolated 83 alkaloid compounds so far. The findings suggest that the soursop seed extracts demonstrate a high level of antioxidant activity, possibly attributed to the presence of compounds such as alkaloids content (1.22± 0.02) g/DW, terpenoids, and fatty acid content for soursop seed extract compared to the custard apple seed extract.

Keywords: *Annona sp., antioxidant, fatty acid composition, secondary metabolites*

ID 552

Electrochemical Synthesis of Polyaniline-Graphene Nanocomposite for Advanced Supercapacitor Application

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Polyaniline (PANI) is a promising conducting polymer with exceptional properties such as high conductivity, redox activity, and environmental stability. Therefore, it is widely used in energy storage devices such as supercapacitors. However, the surface area of PANI is relatively low and limits the charge storage capability. The synthesis of PANI-graphene nanocomposite by facile electrochemical method is proposed to address this drawback. Graphene is a 2-D advanced carbon material with a large surface area and provides significantly improved charge storage. Therefore, the synthesis of the nanocomposite significantly enhances the capacitance of the supercapacitor. This method involves the electrochemical polymerization of aniline by cyclic voltammetry (CV) in the presence of electrochemically synthesized graphene. PANI and graphene were deposited on a stainless-steel substrate in a single step, minimizing the synthesis steps. The synthesized material was structurally characterized using UV-visible and Fourier transform infrared spectroscopy (FTIR). UV-visible data showed a characteristic peak for graphene at ∼265 nm indicating the presence of graphene and FTIR analysis showed a characteristic peak at ∼3400 cm^{-1} indicating the presence of PANI. The electrochemical characterization of materials was carried out in 0.5 M H_2SO_4. CV data illustrated an enhancement in the capacitance of PANI-graphene composite to 31.5 mF cm^{-2} at the 5 mV s^{-1} scan rate compared to the capacitance of PANI of 7.6 mF cm^{-2}. This is a significant 314.47% improvement. Galvanostatic charge-discharge and electrochemical impedance spectroscopy data showed improved electrochemical performance. These findings demonstrated the successful synthesis of PANI-graphene nanocomposite with enhanced charge storage capability by the facile method.

Keywords: *polyaniline, graphene, nanocomposite, electrochemical polymerization, supercapacitor*

ID 598

Phytochemical Screening, Antioxidant and Antidiabetic Activities of Different Solvent Extracts of *Elaeocarpus serratus* (Veralu) and *Elaeocarpus angustifolius* (Nilveralu) Grown in Sri Lanka

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The novel bioactive compounds derived from plants have shown more efficacy on management of type II diabetes. The dried fruit pericarp of *Elaeocarpus serratus* and *Elaeocarpus angustifolius* were extracted with methanol, hexane, ethyl acetate, and aqueous using sonication extraction. The antioxidant activities were determined through the DPPH and ABTS radical scavenging assays, ferric reducing power (FRAP), and oxygen radical absorbance capacity (ORAC) methods. The anti-diabetic activities were assessed using anti-amylase and anti-glucosidase assays. The crude extract of E. serratus had the highest total phenolic content (561.47 ± 28.35 mg GAE/g of dried extract), while the ethyl acetate fraction of *E. angustifolius* had the highest total flavonoid content (0.19 ± 0.00 mg QE/g of dried extract). The highest ORAC, FRAP, DPPH and ABTS values were in the aqueous fraction of *E. serratus* (83.35 ± 5.20 mg TE/g of dried extract), crude of *E. serratus* (668.75 ± 7.7 mg TE/g of dried extract), aqueous fraction of *E. serratus* (89.23 ± 2.92 mg TE/g of dried extract), and hexane fraction of *E. serratus* (570.305 ± 7.067 mg TE/g of dried extract), respectively. The results showed that all four extracts of *E. serratus* had significantly ($P < 0.05$) high amounts of antioxidants. Aqueous and crude extracts of *E. angustifolius* showed the highest anti-glucosidase activities (IC_{50}= 44.58 ± 0.17 µg/mL, 248.50 ± 0.18 µg/mL, respectively) compared to Acarbose (IC_{50}= 262.32 ± 0.69 µg/mL). None of the extracts showed anti-amylase activities. These findings conclude the potential of these fruits to enhance and promote their commercial value.

Keywords: *antioxidant, anti-diabetic, Elaeocarpus sp.*

ID 601

Comparison of N-based and P-based Additives in the Synthesis of Porous Graphene Material for Supercapacitors

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Supercapacitors are viable substitutes due to their high-power density. However, their performance can be further enhanced to be utilized more effectively. Graphene is the most well-performed advanced carbon and electrode material for supercapacitors. The majority of graphene manufacturing techniques are complex, costly, and require hazardous chemicals and graphene easily tends to be aggregate, hence reducing its electrochemical performance. Therefore, this study aimed to produce porous graphene (PG) with enhanced charge-storing capacity, reduced π-π restacking, and strong van der Waals interactions from the basal planes of graphene sheets using both economically and eco-friendly novel electrochemical pathways and compare the effect of additives. PG was synthesized via electrochemical exfoliation while having nitrogen-based compounds (PG-N1 and PG-N2), and phosphorus-based compounds (PG-P1 and PG-P2) as the additives to facilitate the PG synthesis. Synthesized PG was characterized structurally and electrochemically. Raman spectroscopic analysis data gave I_D/I_G ratios for PG-N1 and PG-P1 as 1.14 and 0.67 respectively. UV-visible data showed absorbance peaks around 270 nm. The cyclic voltammetry data illustrated the electric double-layer capacitive behaviour of synthesized PG by having rectangular shapes even at higher scan rates such as 100 mV/s. The specific capacitances of PG-N1, PG-N2, PG-P1 and PG-P2 are 23.7 F g^{-1}, 20.2 F g^{-1}, 21.1 F g^{-1}, and 19.2 F g^{-1} respectively at a scan rate of 5 mV/s. This enhancement of specific capacitance is 59.04%, 36.12%, 42.2%, and 29.04% compared to the graphene. The electrochemical impedance spectroscopy showed improved capacitive behaviour. In general, PG synthesized in the presence of an N-based less sterically hindered molecule, PG-N1 demonstrated the highest performance among all additive materials. These characterization results validate the successful synthesis of PG with enhanced electrochemical performance due to better pore formation in the presence of additives.

Keywords: *electrochemical exfoliation, graphene, supercapacitors*

ID 636

Comparative Analysis of Sri Lankan Cricketers' Performances in the Lanka Premier League and International T20 Matches

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The performance of Sri Lankan cricket players in international Twenty20 (T20) matches and the Lanka Premier League (LPL) was compared in this study. The goal was to use important performance indicators, including runs scored, wickets taken, strike rates, and economy rates, to find trends and differences in player effectiveness at the national and international levels. The study demonstrated notable distinctions between player performances in domestic and international forms using statistical analysis and data visualisation tools. Some players performed consistently in both formats, but others exhibited variances, especially in their strike and economy rates. The study concludes that although excellent LPL results can frequently forecast success abroad, performance differences are also influenced by other factors including the increased pressure and level of competition in international matches. These results provide important insights to Sri Lankan cricket strategy formulation, squad selection, and player development since they offer information on which players may make a successful transition from the local to the international levels.

Keywords: *Lanka Premier League (LPL), International Twenty20 (T20), player performance, squad selection, Sri Lankan Cricket*

ID 637

Bridging Digital Divide by Boosting IT Skills for Soragune Village Sri Lanka for Socio-Economic Growth

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This study focused on how improving IT skills may help Soragune Village, which is in Badulla District of Sri Lanka, to grow socioeconomically. Even though IT skills are essential for modern growth, rural regions still face issues including poor infrastructure and restricted access to technology. The goal of this research was to provide a sustainable model for ongoing IT education by evaluating the impact of IT training programmes on residents' socioeconomic position, identifying critical IT skills that are in demand, and assessing the existing level of IT literacy. A mixed-method approach was used, combining quantitative information from structured surveys measuring socioeconomic circumstances, infrastructural access, and IT literacy levels with qualitative information from stakeholder interviews in the community. The results of the study show that Soragune Village has poor IT literacy, significant gaps in critical IT skills, and inadequate infrastructure. The study pinpoints crucial areas that require intervention, including the development of customized educational curricula, the acquisition of IT infrastructure, and the active participation of the community in the planning process to guarantee programme efficacy and relevance. This study provides a repeatable model for other comparable situations by emphasizing the potential of IT education to foster socio-economic progress in rural areas. The suggested approach places a strong emphasis on collaborations with non-governmental organizations and educational institutions, ongoing programme effect assessments, and long-term sustainability measures. This study emphasizes how IT skills may significantly improve employment, entrepreneurship, and the general socioeconomic growth of rural regions.

Keywords: *IT skills development, socio-economic growth, rural education, digital divide*

ID 640

Detection of Fake News Using Machine Learning and Natural Language Processing: Addressing the Modern Information Crisis

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Fake news is spreading exponentially due to increased social media use, which is causing serious problems for society worldwide. Although a lot of studies have been done on the topic of identifying fake news, real-time detection of dynamic and quickly changing information environments has not received as much attention. This work attempted to close this crucial gap by creating a machine-learning model that employs cutting-edge natural language processing (NLP) methods to identify and categorize bogus news in real-time. Deep learning models like LSTM and BERT as well as more conventional machine learning models like logistic regression, support vector machines, and decision trees were used. This was done utilizing Python's sci-kit-learn module for text tokenization and feature extraction. The models were enhanced for real-time performance by including streaming data processing capabilities after being trained on a sizable and varied dataset. The outcomes show that, in real-time detection settings, the BERT-based NLP model achieves up to 98% accuracy, outperforming other models in terms of accuracy. To evaluate the models' performance in real-world settings, they were also evaluated using measures like recall, precision, and latency. This model is an essential resource for news organizations and social media platforms because it not only improves the timeliness and accuracy of fake news identification, but also offers a proactive way to stop the spread of false information as soon as it starts.

Keywords: *fake news, social media, machine learning, natural language processing, Python, feature extraction, accuracy metrics*

ID 643

Identifying Trends in Blockbuster Films Using K-Means Clustering

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This study used K-means clustering to analyze patterns in blockbuster movie releases over a 40-year period, from 1975 to 2014. The dataset consisted of the top 10 movies produced each year. Finding trends in box office performance, audience response, and critical praise was the main goal. The study focused on important elements including the duration of the film, its rating on Rotten Tomatoes, its rating on IMDb, and its global gross profits. K-means clustering was used to identify discrete groups of films with different attributes, offering insights into the factors that influence a film's cultural effect and appeal. The research reveals certain patterns that have changed over time, with important ramifications for producers, distributors, and other business partners. Cluster analysis, for instance, showed how audience tastes have changed, how critical acclaim correlates with economic success, and what elements routinely affect box office results. This study advances knowledge about the film business by pointing out patterns that might be used to forecast viewer behavior in the future and direct advertising campaigns. As a result of the organized method of comprehending the dynamics of successful movies, K-means clustering appears to be a useful instrument for evaluating intricate datasets in the entertainment sector. Stakeholders may influence the future of cinema by identifying these patterns and making well-informed decisions that increase a film's chances of success.

Keywords: *blockbuster movies, box office performance, film industry analysis, cultural impact, cinema dynamics*

ID 644

Evaluation of Climate-Related Difficulties and Development of Resilience in Soragune Village, Sri Lanka

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Rural communities are greatly impacted by climate change, and Soragune Village in Sri Lanka's Badulla District is no different. This study examined the unique difficulties that Soragune, a community that is primarily agricultural, faces and suggests ways to make it more resilient to changes brought on by climate change. Due to its varied ecosystems and heavy reliance on agriculture, Soragune is susceptible to water scarcity, irregular rainfall, deteriorating infrastructure, and waterborne illnesses. To analyse the implications of climate change, data were gathered using a mixed-methods strategy that combined quantitative surveys with qualitative interviews. To find out how the community felt about road conditions, water quality, rainfall unpredictability, and economic stability, a representative sample of homes was polled. Structured interviews and field observations yielded qualitative data that highlighted the regional effects of climate dynamics. The findings indicate that 46.15% of families experienced major disruptions because of erratic rainfall, which has a negative impact on water supplies and crop productivity. Two of the main issues associated with climate events were found to be economic instability and an increase in the prevalence of waterborne infections. The analysis suggests adopting water-saving measures, enhancing infrastructure, teaching the public about climate adaptation, and creating efficient emergency response strategies to handle these issues. Fostering a resilient Soragune requires collaborating with local authorities and implementing technical solutions. The results offer significant perspectives for policymakers to formulate focused policies that enhance resilience in rural communities with comparable climate-related hazards.

Keywords: *climate change, agricultural vulnerability, water scarcity, resilience strategies*

ID 646

Evaluation of Phytochemicals, *In-vitro* Antioxidant, and Anti-inflammatory Properties of an Arishta Formula under Three Aging Conditions

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Traditional literature suggests that Arishta can be stored at room temperature for up to two years while maintaining its potency. Arishta has been widely used as a fermented Ayurvedic formulation to treat various illnesses. However, the impact of different aging conditions on its phytochemical composition, antioxidant, and anti-inflammatory properties remains underexplored, highlighting a key research gap. This study aimed to investigate the bioactivity of three samples of one Arishta formula given for tumors: freshly prepared (A), prepared >1 year ago and kept at room temperature (B), and prepared >1 year ago and kept in the refrigerator at 4^0C (C). Comparing these three samples, we aimed to understand the influence of aging and storage conditions on anti-oxidant and anti-inflammatory activities. Oxidative stress and inflammation are linked to tumour formation. Total phenolic content (TPC) was assessed by the Folin Ciocalteu method, and it was highest in A (34.77±2.82mg GAE/g), followed by B (20.92±0.91mg GAE/g), and lowest in C (17.05±0.41mg GAE/g). Total flavonoid content (TFC) was measured by the aluminium chloride method where the values were 3.23±0.40mg QE/g in A, 3.17±0.48mg QE/g in B, and 3.46±0.18mg QE/g in C. The 2,2-diphenyl-1-picrylhydrazyl (DPPH) assay showed similar radical scavenging activity (RSA) ($p>0.05$) for all samples: 25.63±0.31% for A, 22.52±0.53% for B, and 23.20±0.72% for C. The 2,2-azino-bis(3-ethylbenzothiazoline-6-sulfonic acid) (ABTS) assay ($p>0.05$) showed RSA percentages of 48.11±1.02% for A, 45.52±0.23% for B, and 21.84±0.82% for C. The anti-inflammatory percentages of human red blood cell membrane stabilization assays ($p>0.05$) for the samples are 44.93±0.75% for A, 50.98±0.96% for B, and 40.72±1.23% for C. The protein denaturation percentages are 75.51±0.23% for A, 73.60±1.6% for B, and 72.437±0.67% for C. Room temperature storage appears to preserve Arishta's therapeutic benefits, though proper preparation and storage are essential for efficacy. Further research may identify optimal conditions for herbal medicine storage.

Keywords: *arishta formula, in-vitro, storage temperature, antioxidant, anti-inflammatory*

ID 654

Cytotoxic Effects of Green Jackfruit (*Artocarpus heterophyllus*) and Ceylon Olives (*Elaeocarpus serratus*) Fruit Extracts on Cancer Cells

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The present study explores the *in-vitro* cytotoxic properties of Ceylon olives (*Elaeocarpus serratus*) and green jackfruit (*Artocarpus heterophyllus*) extracts due to their therapeutic and nutritional benefits. Several extracts were prepared with dried matured fruit; a hot water extract, a macerated water, and a macerated methanol extract. Cytotoxicity was assessed by 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) assay against two human cancer cell lines; MCF-7 (breast cancer), HepG2 (liver cancer). The findings demonstrated that both extracts had prominent cytotoxic effects in a dose-dependent manner. Green jackfruit showed more activity against the MCF-7 breast cell line and displayed the lowest IC_{50} values as compared to Ceylon olives. Green jackfruit showed the most potent IC_{50} of 0.13 µg/mL, for the hot water extract. The Ceylon olive extract demonstrated higher IC_{50} values for all extracts tested. Out of which it showed the lowest IC_{50} of 30.67 µg/mL, for the macerated water extract against the MCF-7 cell line. Both fruit extracts also showed potent activity against the HepG2 cell line. Green jackfruit (6.19 µg/mL) and Ceylon olives (16.62 µg/mL) macerated water extracts exhibited the highest IC_{50} values. One-way ANOVA analysis was conducted and the MTT assay results showed a significant difference ($p < 0.0001$) when considering the fruit type. Moreover, macerated water extract of Green jackfruit showed the highest anti-inflammatory activity with an IC_{50} of 47.59 µg/mL in the Human Red Blood Membrane Stabilization method, while the Ibuprofen standard showed an IC_{50} of 4.92 µg/mL. Ceylon olives hot water extract exhibited an IC_{50} of 0.03 µg/mL in the ABTS assay (2,2′-azino-bis-(3-ethylbenzothiazoline-6-sulfonic acid)) while Ascorbic acid standard showed an IC_{50} of 0.30 µg/mL This study promotes the investigation of these fruits as sources of novel anticancer drugs and adds to the increasing body of evidence in cancer treatment.

Keywords: *anticancer activity, Artocarpus heterophyllus, Elaeocarpus serratus, HepG2, MCF-7*

ID 746

In-vitro Anti-Cancer Activity of *Cinnamomum* verum Barks and Leaves

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True cinnamon is one of the most sought-after spices in the world and Sri Lanka is its largest provider. Ceylon cinnamon has great potential to be the main ingredient of a nutraceutical, food supplement or adjuvant, especially with its anti-cancer activity. To create such a value-added product, it is important to identify which part of cinnamon is more potent against cancer cells. The objective of this study was to compare the in-vitro anti-cancer activity of Ceylon cinnamon barks against Ceylon cinnamon leaves. The aqueous extracts of three cinnamon leaves and bark samples from three geographical locations of Sri Lanka were subjected to MTT assay (3-(4,5-Dimethylthiazol-2-yl)-2,5-Diphenyltetrazolium Bromide) to determine its cytotoxic effects against RD (Sarcoma) and HepG2 (Liver cancer) cell lines. The lowest IC_{50} value of 0.4894±0.32 mg/mL for bark (B2) and 0.2711±0.25 mg/mL for leaves extract (L3) were recorded for the RD cells, and the lowest IC_{50} value of 0.0884±1.043 mg/mL (B3) for bark and 0.3002±0.5853 mg/mL (L3) for leaf was recorded for the HepG2 cells in the MTT assay. Data were expressed as means and standard deviation, and analysed with GraphPad Prism Version 9.00 and Microsoft Excel 2021. Based on the MTT results, a clonogenic assay was performed with samples B2 and L3 to determine the ability to prevent the formation of cancer cell colonies. The observations showed that Ceylon cinnamon bark was more potent than leaves against cancer cells and prevented the growth of cancer cell colonies. The bark (B2) completely prevented cell colony formation in RD cells where the survival fraction of cell formation was 0%. According to the above study, true cinnamon barks demonstrated higher potency against cancer cells RD and HepG2. Due to its higher anti-cancer activity, barks are economically advantageous to be used in the formation of a nutraceutical. Further studies with more cancer cell lines can be performed to solidify this conclusion.

Keywords: *anti-cancer, RD cells, HepG2 cells, Ceylon cinnamon*

ID 758

In vitro Screening of Antioxidant, Anti-inflammatory, and Cytotoxic Activities of Medicinal Herbal Extracts

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Cancer affects multiple cell types of the body characterized by excessive cell proliferation. Inflammation and oxidative stress from reactive oxygen/nitrogen species contribute to tumour growth. Plants have varying degrees of antioxidant properties. A traditional recipe in the Deshiya Chikithsa was tested for its bioactivity. The individual herbs and the recipe were extracted by hexane and chloroform. All assays were conducted in triplicate. *Zingiber officinale* out of all extracts exhibited the highest total phenolic content at 1mg/mL, with values of 0.515±0.008 mg GAE/g and 0.382±0.002 mg GAE/g for hexane and chloroform extracts, respectively. The recipe showed the highest flavonoid content at 1mg/mL; 0.028±0.008 mg QE/g for its chloroform extract. For antioxidant assays, the chloroform extract of the recipe exhibited the highest IC_{50} values of 0.092±0.001 mg/mL (DPPH assay) and 0.054±0.012 mg/mL (ABTS assay). The chloroform extract of the recipe demonstrated the most potent activity with IC_{50} values of 0.054±0.003 mg/mL in the human red blood cell stabilization assay and 0.054±0.002 mg/mL in the protein denaturation assay. The hexane extract of *P. alatum* exhibited an IC_{50} value of 0.072±0.004 mg/mL, while the chloroform extract of *C. zeylanicum* showed an IC_{50} value of 0.099±0.003 mg/mL against Hela cells in the MTT assay. An inhibitory activity with IC_{50} value of 0.079±0.014 mg/mL was observed in the hexane-extracted recipe. Among all the individual extracts, the hexane extract of *Z. officinale* demonstrated a survival fraction (SF) of 74.29%, in the clonogenic assay for colony formation. The hexane extract of the recipe achieved a SF of 55.58%. The chloroform extract of *Z. officinale* exhibited an SF value of 71.69%, while the chloroform extract of the recipe showed an SF value of 71.17%. It is evident from this investigation that the recipe, and *Z. officinale, P. alatum,* and *C. zeylanicum* extracts have anti-inflammatory, antioxidant, and cytotoxic potential, providing a basis for the development of anticancer drug leads.

Keywords: *Deshiya Chikthsa, traditional recipe, TPC, TFC, DPPH, ABTS, HRBC, protein denaturation, MTT, clonogenic assays*

ID 784

Evaluating Selected Pharmacognostic Properties and Bioactivities of *Careya arborea*

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Careya arborea (wild guava), is native to South and Southeast Asia. It has been traditionally used for its medicinal properties. Fruit, leaf, and stem parts of *Careya arborea* plant were subjected to methanol extraction. In vitro bioassays were conducted to determine the medicinal properties of this plant. The total phenolic content (TPC) was measured by the Folin–Ciocalteu assay. The results showed that the leaf extract had the highest TPC of 1.23 GAE/g. Total flavonoid results were measured by the Aluminum Chloride colorimetric assay which showed that the leaf extract had the best TFC of 0.06 QE/g. The antioxidant activity was determined by the 2,2-diphenyl-1-picrylhydrazyl (DPPH) assay where a maximum radical scavenging value of 61.81% at 1mg/ml (maximum concentration tested) was found for the fruit extract while both the leaf and stem showed a value of 51%. The standard ascorbic acid showed a value of 71.42%. However, the 2,2′-azino-bis-(3-ethylbenzothiazoline-6-sulfonic (ABTS) assay showed that the leaf extract had the highest radical scavenging ability with a value of 86.14% while the fruit and leaf showed 62.60% and 66.54% respectively (standard ascorbic acid 92.50%). The anti-inflammatory activity was determined by the Human Red Blood Cell Membrane Stabilization assay (HRBC) and the Protein Denaturing assay. The HRBC results depicted 75.52%, 70.73%, and 62.89% for the stem, leaf, and fruit respectively at 1mg/ml. The standard Ibuprofen showed 79.35%. The protein denaturing results demonstrated 77.81%, 71.92%, 69.65%, and 73.68% for leaf, stem, fruit, and Ibuprofen respectively. Finally, the cytotoxicity was determined by the 3-(4, 5-dimethylthiazolyl-2)-2, 5-diphenyltetrazolium bromide (MTT) assay against the MCF7 breast cancer cells. The fruit extract showed the maximum cancer cell inhibitory value of 54.69% at 1mg/ml out of all extracts. These findings underscore the therapeutic potential of the plant extracts and warrant further investigations.

Keywords: *fruit sample of careya arborea, stem sample of careya arborea, leaf sample of careya arborea, TFC, TPC, DPPH, ABTS, HRBC, protein denaturation, MTT assays*

ID 814

Simultaneous Detection of Bovine and Porcine DNA in Gelatine-based Products Using Species-Specific Duplex PCR

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Gelatine is a frequently utilized ingredient in many industries and is commonly sourced from bovine and porcine tissues. Authenticating gelatine is of utmost importance to ensure it meets religious and cultural requirements, ensuring consumer well-being, addressing ethical concerns, and upholding transparency in the process. This paper outlines the simultaneous detection of the bovine or porcine origin of gelatine-based matrices like pharmaceutical capsule shells, gelatine powder, jelly cups, and pudding. available in the local market. Gelatine, a highly processed material contains a trace amount of fragmented DNA. Hence, DNA extraction was performed using the 200mg small fragment protocol of DNeasymericon food kit (50), Qiagen (REF 69514) which is designed to extract DNA from highly processed materials. Amplification of extracted DNA was done using conventional duplex PCR with the aid of bovine (251bp) and porcine (289bp) species-specific oligonucleotide primers. The PCR products were analyzed on a 2% Agarose gel. The electrophoresis results showed that out of seven samples tested, four gelatine-based products showed positive bands for both bovine and porcine, while the remaining samples showed bands only for porcine. This study demonstrates the effectiveness of the duplex PCR method in rapidly and accurately determining the source of gelatine in gelatine-based matrices due to their higher sensitivity, cost-effectiveness, and specificity, providing a reliable solution for ensuring transparency and consumer confidence. Thus, further studies will be conducted with an increased sample number to ensure the repeatability of the data.

Keywords: *gelatine, DNA extraction, duplex PCR, bovine, porcine*

ID 823

Development of a Pressure Sensor Matrix Insole utilizing Velostat for Gait Analysis

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This is an introduction of a new technique to analyze the gait cycle of human walking with the support of a pressure sensor material known as Velostat, a pressure-sensitive conductive material. The assessment of the movement of human beings is one of the main cornerstone requirements for diagnosing diseases and setting the stage for a journey towards healing and well-being. There are some traditional methods that are expensive and limited due to widespread accessibility. To overcome this problem, constructing a sensor matrix by using a pressure-sensitive conductive material Velostat is suggested. The matrix consists of an arrangement of Velostat-based pressure sensors which are spread evenly over a confined area over a sheet. The change in the pressure exerted during the gait cycle is detected by each sensor accessing various foot sizes and walking patterns. Signal processing techniques are used in interpreting the collected data accurately, which includes calibration techniques to match up pressure readings with gait parameters such as footfalls, foot pressure distribution and symmetry of gait. Preliminary findings demonstrate the sensor matrix's ability to detect pressure deviations with an accuracy of ±10% and a sensitivity of 0.1 in the range of 0 to 3 N, confirming its efficacy while maintaining affordability and versatility. Potential applications spread from clinical rehabilitation to biomechanics research. Future developments include optimizing the sensor matrix design, integrating it with portable technology for real-time monitoring, and validating its accuracy through widespread clinical trials.

Keywords: *velostat, pressure-sensitive conductive sheet, force-sensitive resistor sensors, insole, gait analysis*

ID 839

Comparison between Two Sampling Methods of Airborne Microplastic Particles

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Sampling methods of airborne microplastics (MPs) affect studies of MPs in the air. Primarily, two methods are used for sampling airborne MPs: passive (diffusive) atmospheric deposition and active pumped samplers. This study aimed to identify the most appropriate airborne microplastic sampling method by comparing these two techniques. A laboratory which is situated in the University of Kelaniya, Sri Lanka was selected as the sampling site for this study. For the passive sampling method, a dry deposition was implemented over a 14-days. This method involves allowing microplastic particles to settle naturally over time. The active sampling method involved operating an active pumped sampler for five hours on a single day, selected from the 14-day period during which the passive sampling was conducted. This method actively draws air through a filter, capturing microplastic particles rapidly. MPs collected from both methods were counted using a stereomicroscope coupled with advanced micro imaging. Results indicated that the passive sampling method achieved an average deposition rate of 1.37 x 10^1 number m^{-2} h^{-1}, while the active sampling method achieved a collection rate of 9.22 x 10^2 number m^{-2} h^{-1}. This significant difference in collection rates suggests that the active sampling method is more effective in capturing MPs in a shorter duration. When analyzing samples, it was found that the active sampling method facilitates easier analysis due to the reduced accumulation of contaminants, attributed to the shorter sampling duration. This study underscores the importance of selecting appropriate sampling methods to accurately assess MP pollution in various environments. The findings highlight the advantages of active sampling for detailed temporal studies and suggest that passive sampling can be useful for long-term deposition trends. Future research should consider these methodological differences when designing studies to monitor and assess airborne microplastic pollution.

Keywords: *active sampling, airborne microplastics, passive sampling*

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