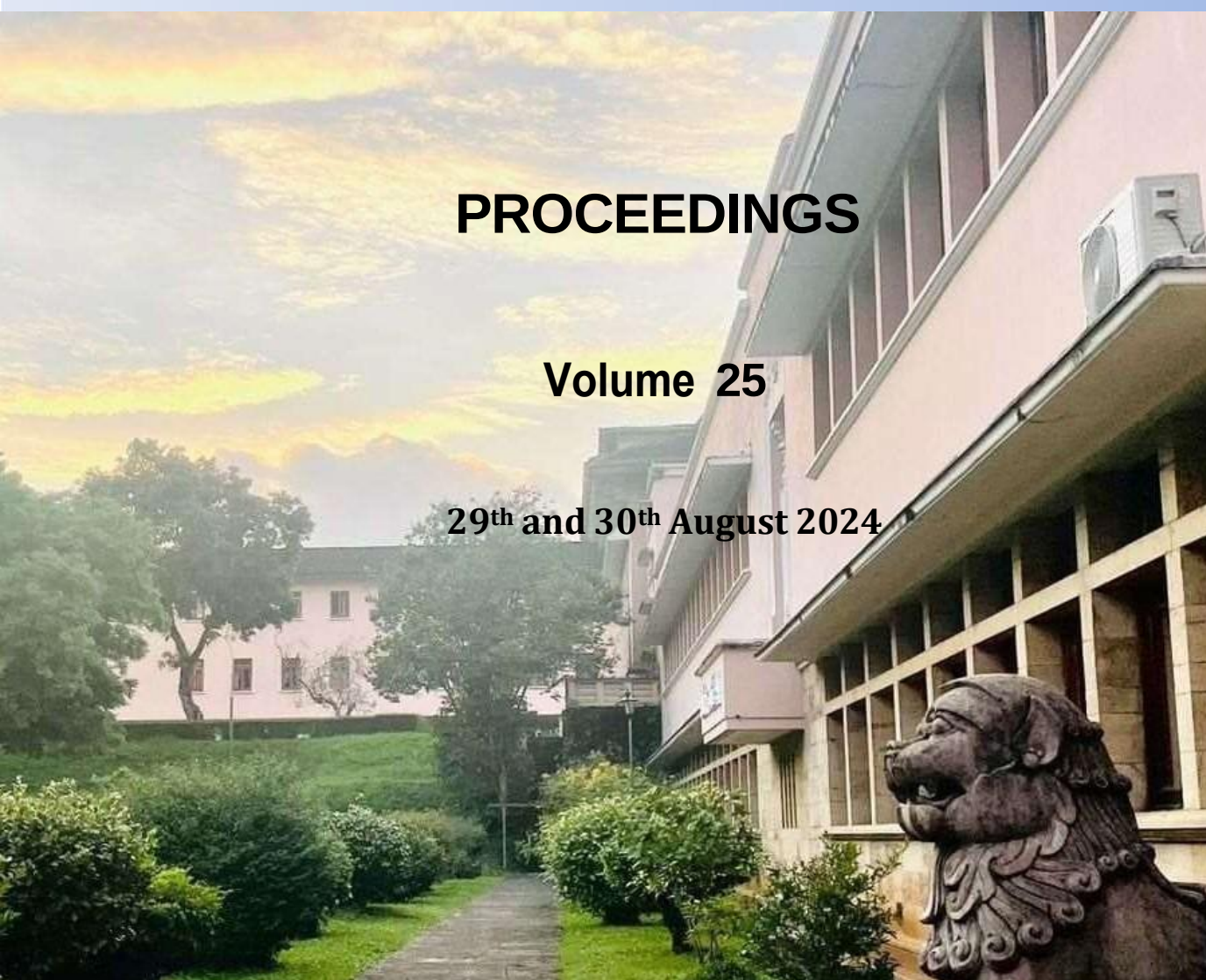
iPURSE 2024

PERADENIYA UNIVERSITY INTERNATIONAL RESEARCH SYMPOSIUM AND EXPOSITION

"A Resilient and Sustainable Sri Lanka: Weaving Together Diverse Threads"



PROCEEDINGS

Volume 25

29th and 30th August 2024

UNIVERSITY OF PERADENIYA

SRI LANKA

"A Resilient and Sustainable Sri Lanka: Weaving Together Diverse Threads"

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PERADENIYA UNIVERSITY INTERNATIONAL RESEARCH SYMPOSIUM AND EXPOSITION (iPURSE) 2024

Volume 25

iPURSE 2024

29th & 30th August 2024

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Message from the Vice Chancellor

It is with immense pleasure that I send this congratulatory note to the Peradeniya University International Research Symposium and Exposition (i-PURSE 2024). This year's conference theme is "*A Resilient and Sustainable Sri Lanka: Weaving Together Diverse Threads*" which underscores the importance of resilience and sustainability which is timely and highly topical since it holds profound significance for our nation and our collective future.

i-PURSE 2024 focuses on four sub-themes: Food Security and Environmental Stewardship, 'Equitable and Inclusive Development', 'Embracing Innovation and Resilience', and 'Weaving Technology for Sustainability and Wellbeing'. Resilience involves adapting and thriving despite challenges, while Sustainability encompasses environmental, social, and economic aspects. The University of Peradeniya promotes sustainable practices through research, university initiatives, and partnerships. Weaving Together Diverse Threads reflects a diverse society, where students and staff collaborate to create positive change and build a future based on shared values.

i-PURSE, our annual flagship research platform that acknowledges the dynamic evolution of the research landscape, is vital for our academic community which nurtures collaboration and drives innovation. This diversified platform provides opportunities for our academia, researchers, practitioners, and policymakers to work together, exchange insights, and motivate change reflecting the richness of research activities at our university.

I encourage all researchers to welcome the opportunities presented by i-PURSE, allowing the university to honor the legacy and promote our university's aims of progressing knowledge, nurturing innovation, and contributing to society through outstanding research.

I would also like to express my gratitude to the keynote speakers for accepting our invitations despite their busy schedules. I am thankful to the organizing committee, led by Prof. Janaka Ekanayake, and all academic and non-academic staff for their tireless efforts in bringing this esteemed event to fruition.

Let us drive progress towards a more resilient and sustainable future, not just for ourselves, but for the future of our nation and generations to come.

I wish you all a productive and inspiring session.

Prof. Terrence Madhujith

VICE-CHANCELLOR

Message from the Chief Guest

Dear Friends and Colleagues,

It is a singular honour and a privilege for me to pen this congratulatory message for the 24th edition of iPURSE - a now hallowed tradition of our esteemed university.

First, I wish to extend my heartfelt gratitude to the iPURSE Organizing Committee, led by Professor Janaka Ekanayake, for bestowing upon me the role of Chief Guest at this significant event. The theme of this year's conference, "*A Resilient and Sustainable Sri Lanka: Weaving Together Diverse Threads,*" resonates profoundly, with me and I am honoured indeed to contribute to its narrative.

Sri Lanka, with its diverse cultures, picturesque landscapes, and deep-rooted traditions, stands as a testament to resilience amidst enduring challenges. Over the decades, this nation has navigated storms and adversities, emerging stronger by interlacing the varied threads of its multicultural fabric into a tapestry of unity and fortitude. This resilience is exemplified in our academic institutions, notably our university, which has played a pivotal role in nurturing generations of graduates and researchers now making an impact locally, regionally and worldwide.

The indispensable role of iPURSE in showcasing interactive threads of research and bridging the gap between science and industry cannot be overstated. The 2024 annual conference, with over 300 presentations, once again serves as a beacon, spotlighting the innovative work of our muti-talented researchers and recognizing the challenges they overcome in a resource-constrained, developing nation. It is a platform that celebrates their dedication and perseverance in the face of adversity, and I am truly delighted to be part of this narrative.

May each and every one of you have an exciting, fruitful and an interactive iPURSE, and above all, a most productive research career ahead!

Sincerely,

Lakshman Samaranayake
Hon DSc (U Pera.) Hon DSc (Armenia) FRCPath DDS FDSRCS FRACDS FDSRCPS FCDSHK
Professor Emeritus and Immediate-Past Dean, Faculty of Dentistry
University of Hong Kong, Hong Kong
Honorary Professor, University of Peradeniya, and the University of Sri jayawardhanepura, Sri Lanka
King James IV Professor, Royal College of Surgeons of Edinburgh, UK

Message from the Guest of Honour

It is with great pleasure that I extend my warm greetings to all the distinguished participants of the Peradeniya University International Research Symposium and Exposition 2024. The theme of this year's symposium, "*A Resilient and Sustainable Sri Lanka: Weaving Together Diverse Threads*," is not only timely but also profoundly significant in light of the challenges and opportunities that Sri Lanka is currently facing.

As we navigate through an era characterized by swift technological progress and environmental uncertainties, the concepts of resilience and sustainability have become paramount. Peradeniya University has consistently been a beacon of academic and research excellence, leading the charge in our collective pursuit of these ideals. This symposium serves as a vital conduit for the dissemination of research and a gathering point for like-minded individuals to exchange knowledge and experiences. I am eagerly looking forward to participating in this conference, to share my thoughts and more importantly to absorb new knowledge and insights.

My highest admiration for the faculty, organizers, and attendees for their unwavering commitment and effort in orchestrating this symposium. Your contributions are instrumental in shaping policies and practices that will undoubtedly enhance our society.

May this symposium serve as a catalyst, inspiring each one of us to contribute towards building a resilient and sustainable Sri Lanka. I wish us all an enlightening and fruitful symposium.

Dr. Sujata Gupta,
Director, Energy Sector Office, Asian Development Bank

About Guest of Honor

Ms. Sujata Gupta is the Director of the South Asia Team, Energy Sector, Sectors Group of the Asian Development Bank (ADB). She joined ADB in 2003 and has worked on the public and private sectors of ADB as well as for resource mobilization from development partners. Sujata has a PhD from the London Business School, University of London and Master's and Bachelor's from the University of Delhi. Before joining ADB, Sujata was Senior Fellow and Director of the Policy Analysis Division, at TERI (then the Tata Energy Research Institute), New Delhi. She has also worked as a visiting researcher at the International Institute of Applied System Analysis in Austria. She was a member of United Nations (UNFCCC) CDM Methodologies for Baselines and Monitoring Panel (2002–2005), and a co-coordinating lead author for the Second, Third, Fourth and Fifth Assessment Reports of the Intergovernmental Panel on Climate Change.

Message from the Chairperson of iPURSE 2024

The University of Peradeniya has a longstanding tradition of disseminating its cutting-edge research through its flagship initiative, the Peradeniya University Research Sessions (PURSE), which was established in 1996. Over the years, PURSE has evolved, and in 2014 PURSE was elevated to the Peradeniya University International Research Sessions (iPURSE), expanding its scope to include international participants. In 2022, as a flagship project of the University Research Council, we introduced the Peradeniya University Research Exhibition Showcase (PURES).

Recognizing the evolving academic landscape with its myriad publication opportunities, we are redefining the purpose and format of our research dissemination and showcase events. This year, we are formally merging iPURSE with PURES. Although the event is still referred to as iPURSE, its full name has been updated to "The Peradeniya University International Research Symposium and Exposition."

The objectives of iPURSE-2024 are:

- To achieve enhanced visibility and branding - A coordinated platform will amplify the university's research output and attract wider participation.
- To promote cross-disciplinary synergies - Bringing diverse research areas together under iPURSE will foster multidisciplinary collaboration and knowledge exchange.
- To showcase the breadth and depth of research - A consolidated exhibition will provide a comprehensive overview of the university's research endeavours.
- To Facilitate public engagement - iPURES can attract the public and potential industry partners, fostering knowledge transfer and showcasing potential applications of research.
- To raise the university profile - A large-scale research exhibition can boost the university's reputation and attract talented researchers and students.

For iPURSE-2024, we received over 400 abstracts and 50 exhibits. Following a rigorous review process, we selected 302 papers for presentation across four sub-themes: 'Food Security and Environmental

Stewardship,' 'Equitable and Inclusive Development,' 'Embracing Innovation and Resilience,' and 'Weaving Technology for Sustainability and Wellbeing.' This is the most genuinely multidisciplinary conference ever held in Sri Lanka, providing a platform that not only fosters multidisciplinary research within the University of Peradeniya but also strengthens collaboration with partner universities, industries, and government agencies.

iPURSE also celebrates researchers who have demonstrated exceptional excellence in their research endeavours. The prestigious Lakshman Samaranayake Award is presented to those researchers with a distinguished record of securing major competitive and external research funding, disseminating research outcomes through high-impact publications, patenting innovative work, successfully supervising and completing research projects, and achieving significant citation impact in their respective fields. Additionally, Tier 4* researchers are recognized for their outstanding contributions during this esteemed event.

This year, the URC has also introduced two new award schemes. The first acknowledges researchers who have produced notable research outputs and outcomes in 2023, while the second honours those who have successfully secured research funding from various national and international funding bodies.

I would like to extend my heartfelt thanks to the academics who have tirelessly served on the Technical Programme, Publication, Exhibition, Marketing and Communications, Awards, and Logistical committees for iPURSE. Their unwavering dedication and hard work have been instrumental in making this event a reality.

I am confident that iPURSE 2023 will be a remarkable technical event and an extraordinary experience for all participants. It is an event that not only showcases the pinnacle of Sri Lankan research but also exemplifies the spirit of collaboration and innovation.

Prof. Janaka Ekanayake
Chairperson, Organizing Committee, iPURSE 2024
BScEng (Hons), PhD, FIEEE (USA), FIET (UK), FNAS (SL), FIESL, CEng
Director, University Research Council
University of Peradeniya, Sri Lanka

EDITORIAL NOTE

It is with great pleasure that I write this editorial note to the Proceedings of the iPURSE 2024 conducted under the theme of "*A Resilient and Sustainable Sri Lanka: Weaving Together Diverse Threads*" paying attention to Sri Lanka's commitment on resilience and inclusive transformation towards a sustainable development where economic development underpinned by the ideas of *going green* and *social inclusivity*. The conference aims to advance knowledge by providing a platform for researchers, scholars, and professionals across diverse fields to engage in meaningful dialogue facilitating interdisciplinary research in *resilience* and *sustainability*. Sustainability research, designated as being '*interdisciplinary*', has become increasingly prominent today as it deals with the increased scale and complexity of the research problems that researchers are tackling. This year conference intends to promote interdisciplinary approach across four subthemes that synergistically integrate different knowledge that transcends disciplinary boundaries resulting *methodological novelty* and *theoretical pluralism* for a specific theme. I am confident that the proceedings will be an added value to interdisciplinary research for the scientific community to inspire further study and research.

The proceedings comprise a total of 302 abstracts organized under four sub-themes: 'Food Security and Environmental Stewardship'- 57 abstracts, 'Equitable and Inclusive Development' - 116 abstracts, 'Embracing Innovation and Resilience'- 75 abstracts, and 'Weaving Technology for Sustainability and Wellbeing'- 54 abstracts. All abstracts received have gone through a double-blind peer review process and only three forth of abstracts were accepted for presentation.

I would take this opportunity to express my gratitude to all expert reviewers of iPURSE 2024 for their constructive feedback and on time completion of their review process. Their dedication helped immensely to uphold the standard of the work presented at iPURSE 2024. I would also like to extend my sincere appreciation to chair, co-chair and all members of technical committee. Their invaluable contributions were essential in making proceedings of iPURSE 2024 a reality. I would like to express my heartfelt gratitude to the conference chairperson, Prof. J.B. Ekanayake and all members of iPURSE 2024 organizing committee; Their unwavering support eased the process of compiling the proceedings.

I wish to extend my special thanks to Dr S. Subasinghe, Dr Samidi Navarathna, Dr N. D Karunaratne, Prof H. N. S. Soysa and Dr N. G. D. A. K. Neelawala of the Publication Committee, iPURSE 2024 and Ms. H R D A Priyantha of the Faculty of Management for their invaluable assistance in compiling and editing the proceedings on time. Last but not least, I extend my well wishes for all presenters of iPURSE 2024.

Dr S Maheswaran

Chairperson, Editorial Board, iPURSE 2024

KEYNOTE ADDRESS - Dr. Nishan De Mel

About the keynote speaker

Dr. Nishan de Mel is the Execute Director and Head of Research of Verité Research, a think tank that provides analytical research and advisory services on economic, political and legal issues in Sri Lanka and Asia. He is an economist with extensive academic, policy, and private sector experience. He has been a Member of the Presidential Task Force on Health Sector Reform, Presidential Committee on Tobacco, Alcohol and Dangerous Drug Regulation, and the National Steering Committee on Social Security. He has also served as the Executive Director of the International Centre for Ethnic Studies (ICES) and on the Board of the Sri Lanka Foundation Institute, among others. Internationally, Nishan has held several governing, teaching, and research positions, including as Lecturer in Economics at the University of Oxford, UK. His undergraduate degree in Economics is from Harvard University, USA. He earned his masters and doctoral degrees in Economics at the University of Oxford where he was a Chevening scholar.

Abstract

The title of this conference aptly incorporates the word "diversity," a theme particularly relevant for universities and our current times. Universities are unique institutions designed to foster methods, values, and a culture that unites individuals with high intellectual ability in the human quest for understanding and meaning through an honest exploration of diverse approaches to axioms, ideas, and reasoning. This mission is profoundly encapsulated in the Sanskrit motto of the University of Peradeniya: “Sarvasya Locanam Sastram,” meaning “knowledge is the eye unto all.” In this address, I will briefly reflect on three interconnected aspects essential for accomplishing this mission, particularly in Sri Lanka: public reasoning, moral formation, and cultural renewal. Sri Lankan state universities, as microcosms of the nation, mirror the social, political, and intellectual diversities and tensions of society.

Given the importance of universities in shaping public life, especially the historically significant University of Peradeniya, it is crucial to examine their role if we are concerned about the nation's state. Amidst an economic crisis, it is essential to remember that our task as a society extends beyond merely growing GDP or repaying debt; it involves fostering societal flourishing through dialogical engagement (public reasoning), exploring shared values (moral imagination), and enabling dynamic societal change that breathes life into these reasons and values (cultural renewal).

KEYNOTE ADDRESS
Vidva Jvothi (Prof.) Vaiira H. W. Dissanavake

About the keynote speaker

Professor Vajira H. W. Dissanayake MBBS (Colombo), PhD (Nottingham), FNASSL, FIAHSI, FCMA and FRCP (Lond) is the Dean of the Faculty and Senior Professor (Chair) of the Department of Anatomy, Genetics, and Biomedical Informatics of the Faculty of Medicine, University of Colombo. He has spearheaded numerous pioneering initiatives in the fields of genetics, genomics, biomedical informatics and biotheics in Sri Lanka and globally. With an h-index of 25, i-10 index of 80, and 2845 citations he is the leading researcher in these fields in Sri Lanka. In recognition of his scientific achievements, he was elected a fellow of the National Academy of Sciences of Sri Lanka in 2013 – the youngest fellow of the Academy at that time, a fellow of the International Academy of Health Sciences Informatics in 2020 – the first Sri Lankan fellow of the Academy, and conferred the Sri Lankan national titular honour of *Vidya Jyothi* in 2019 on the recommendation of the Sri Lanka Medical Association.

Abstract

Health and Wellbeing for a Resilient and Sustainable Sri Lanka: Innovation, Genomics, Digital Technologies, and AI

In an era marked by rapid technological advancement and complex global health challenges, Sri Lanka faces the imperative of reimagining its healthcare system to ensure resilience and sustainability. This talk explores the transformative potential of innovation, genomics, digital technologies, and artificial intelligence (AI) in shaping a future where health and well-being are accessible to all. By leveraging these tools, Sri Lanka can address pressing healthcare challenges, improve public health outcomes, and create a system that is both equitable and efficient. This

presentation will set the stage for understanding how these technologies can be harnessed to create a robust healthcare infrastructure that can withstand future crises, adapt to changing needs, and continuously improve the quality of care provided to citizens.

Genomics plays a critical role in the next frontier of healthcare by enabling more precise, personalized approaches to disease prevention, diagnosis, and treatment. With advancements in genomic technologies, Sri Lanka has the opportunity to integrate genomics into its public health strategy, identifying genetic predispositions to diseases and tailoring interventions accordingly. This section will delve into the current state of genomics in Sri Lanka, highlighting initiatives in genetic screening, precision medicine, and population genomics. It will also explore the ethical, legal, and social implications of genomics, emphasizing the need for policies that ensure equitable access to genomic innovations while safeguarding individual privacy and consent. Through the integration of genomics, Sri Lanka can enhance its ability to prevent and manage both communicable and non-communicable diseases, thereby improving health outcomes at a population level.

The role of AI in healthcare is particularly promising, offering opportunities to enhance diagnostics, treatment planning, and personalized care. Through AI-driven predictive analytics, healthcare providers can anticipate disease outbreaks, manage chronic conditions more effectively, and tailor treatments to individual patient needs. Additionally, AI can support decision-making processes in clinical settings, reduce human error, and optimize resource allocation. This talk will delve into specific examples of AI applications in Sri Lankan healthcare, demonstrating how these technologies can elevate the standard of care and make it more responsive to the needs of the population.

Digital technologies are revolutionizing the way healthcare is delivered, making it more accessible, efficient, and patient-centered. From telemedicine and mobile health apps to electronic health records and wearable devices, digital innovations are breaking down barriers to care, particularly in remote and underserved areas. These technologies not only improve access to healthcare services but also empower individuals to take control of their health through self-monitoring and real-time communication with healthcare providers. This discussion will explore

how digital health initiatives in Sri Lanka can be scaled up to create a more connected and informed healthcare ecosystem, ultimately leading to better health outcomes across the nation.

However, the integration of AI, genomics, and digital technologies into healthcare systems raises important ethical considerations. It is crucial to ensure that these innovations are implemented in a way that respects patient privacy, prevents data misuse, and promotes equity in healthcare access. The talk will address the ethical frameworks and governance models that must accompany the adoption of these technologies, ensuring that they are aligned with Sri Lanka's cultural values and socio-economic context. By fostering a collaborative approach among stakeholders, including policymakers, healthcare professionals, technology developers, and the community, Sri Lanka can develop a health system that not only meets current needs but is also prepared for the future.

In conclusion, this talk will provide a comprehensive overview of how Sri Lanka can leverage innovation, genomics, digital technologies, and AI to build a resilient and sustainable healthcare system. By adopting these advancements, Sri Lanka can improve the health and well-being of its citizens, create a more responsive and equitable health system, and position itself as a leader in healthcare innovation in the region. This vision for the future of healthcare in Sri Lanka is one where technology and human-centered care work hand in hand to ensure the best possible outcomes for all.

KEYNOTE ADDRESS
Prof. Lakshman Dissanayake

About the key note speaker

Vidya Nidhi **(Prof.) Malavi Achchi Kankanamge Lakshman DISSANAYAKE** was the first Professor of Solid State Physics and Senior Professor at the University of Peradeniya.

He played a leading role in initiating the solid state ionics research project and M.Sc. level post-graduate courses at Peradeniya during the 1985-1992 period. He, was largely responsible for the receipt of major research equipment and training fellowships for post-graduate students from the International Programmes for Physical Sciences, Uppsala University, Sweden. This long-term research programme on novel technologically important materials supported by the International Programmes in Physical Sciences (IPPS) of Uppsala University, Sweden spanned over a period of nearly 25 years (1984-2009) and a total of about **USD 1.0 million** has been invested in research equipment, consumables, student and staff fellowships, and conferences.

In 1992, the European Economic Community awarded Prof. Dissanayake's group a research grant worth over **Rs. 6.5 million** for a three-year research project to develop new solid-state ionic materials. This project resulted in several novel lithium ion conducting solid and glassy electrolytes suitable for the next generation of lithium batteries.

Prof. Dissanayake was the Editor-in-Chief of "Ceylon Journal of Science" for 5 years 2016-2021. Prof. Dissanayake has supervised or co-supervised 15 Ph.D.s, 18 M.Phil.s and 20 M.Sc.s up to now and still he is mentoring several MPhil and PhD students at NIFS and University of Peradeniya. Prof. Dissanayake's research interests cover several different areas of Solid-State Physics These include solid-state ionic materials and solid-state batteries, optical properties of solids, photovoltaic semiconductors, dye-sensitized and thin film solar cells, high-temperature superconductors and interactive computer-based Physics teaching. At the Institute of Fundamental Studies, Kandy during the 1987-1992 period he developed experimental facilities from scratch for researching **high-temperature superconductors**. Prof. Dissanayake spent his sabbatical years as Visiting

Research Fellow at Chalmers University, Sweden (1984/85 & 2000/2001) and at Oklahoma University, USA(1993/94), as a Visiting Professor at the University of Aberdeen, UK (1992/93) and as Visiting Professor at University of Illinois at Chicago, USA (2008/2009).

Prof. Dissanayake played a key role in the formulation and planning stage of the Postgraduate Institute of Science(PGIS) at Peradeniya in 1996. He was Director of the PGIS for 5 years (2003-2008) and was largely responsible for initiating several nationally important M.Sc. programmes for the firsnt time in Sri Lanka; These are the MSc programmes in GIS and Remote Sensing, Disaster Management, Nanoscience and Nanotechnology and Medical Microbiology. He was a member of the UGC Committee on Postgraduate Education (2003-2008). Prof. Dissanayake was also a Member of the Board of Management of the National Science Foundation, Member of the Biard of Governors of the National Institute of Fundamental Studies, Council Member of the National Research Council.

Prof. Dissanayake is currently (2024) making a pioneering contribution to the development of the solar energy sector in Sri Lanka by being the principal coordinator and researcher in the Muti-university five-year R&D and training project to develop R&D and manufacturing of prototype thin film solar panels during 2017-2023. This was initiated through his collaboration with the University of Illinois at Chicago (UIC)and Sivananthan Laboratories, Inc., USA (Prof. S. Sivananthan). This project has trained the much-needed Solar technicians and R&D level scientists needed for the country.

Keynote Speech

Sri Lanka: A Renewable Energy Island by 2050?

Introduction: “The Blue Planet”: Earth's Uniqueness and the Quest for Life

Earth, often referred to as the "Blue Planet," is the only known place in the universe that sustains life. Its vast oceans, covering approximately 70% of the planet's surface, provide the essential medium—water—for life as we understand it. While humanity has advanced in its exploration of the cosmos, seeking evidence of life beyond our planet, no such discovery has

yet been made. Earth remains unique, not just in its ability to support life but also in its capacity to nurture intelligent beings who can contemplate the universe's vastness. However, this singularity comes with immense responsibility, especially as we face the growing challenges of climate change, driven by our energy consumption and environmental impact.

Global Energy Sources and Their Environmental Impact

The global demand for energy has led to the widespread use of various sources, including petroleum, coal, nuclear power, hydroelectricity, solar, wind, and biofuels. Among these, fossil fuels- petroleum, coal, and natural gas- dominate the energy landscape, accounting for a significant portion of electricity generation and transportation fuel worldwide. As of 2023, fossil fuels generated approximately 61% of the world's electricity. While these energy sources have powered industrialization and economic growth, their environmental cost is substantial.

Burning fossil fuels releases large amounts of carbon dioxide (CO_2) and other greenhouse gases (GHGs) into the atmosphere, contributing to global warming and climate change. The effects of these emissions are evident in the rising global temperatures, more frequent and severe storms, prolonged droughts, and the melting of glaciers, leading to rising sea levels. The consequences are dire: increased flooding, loss of species, reduced agricultural productivity, and heightened health risks. The world's poorest populations are often the most affected, facing food insecurity, displacement, and heightened vulnerability to climate-related disasters.

The Mechanism of Global Warming and Its Consequences

Global warming is primarily driven by the accumulation of greenhouse gases (GHG's) in the atmosphere, which trap heat and cause the planet's surface temperature to rise. Carbon dioxide, methane (CH_4), and nitrous oxide (N_2O) are the most significant contributors. These gases are released through the combustion of fossil fuels, industrial processes, agriculture, and deforestation. Since the beginning of the industrial era, the concentrations of CO_2, CH_4, and N_2O have increased by over 31%, 151%, and 17%, respectively. This sharp rise is overwhelmingly attributed to human activities.

The impacts of global warming are multifaceted. As temperatures rise, so do the frequency and intensity of extreme weather events. Heatwaves become more common and severe, storms grow more destructive, and

droughts extend longer. The melting of polar ice caps and glaciers contributes to rising sea levels, which in turn lead to coastal erosion and increased flooding in low-lying areas. The Intergovernmental Panel on Climate Change (IPCC) warns that if current trends continue, some island nations, such as the Maldives, Tuvalu, and the Marshall Islands, may become uninhabitable by 2100 due to rising sea levels.

The longevity of GHGs in the atmosphere exacerbates the problem. Carbon dioxide, for instance, can remain in the atmosphere for approximately 100 years, while methane lasts about 12 years. These long-lasting effects mean that even if emissions were drastically reduced today, the impacts of past emissions would continue to influence the climate for decades, if not centuries.

The Role of Renewable Energy in Mitigating Climate Change-COP21

Given the severe consequences of climate change, the transition to renewable energy is not just desirable but essential for the survival of life on Earth. Renewable energy sources—such as hydroelectricity, solar power, wind energy, biofuels, and geothermal energy—offer a path to reduce GHG emissions and mitigate the worst effects of climate change. These sources are abundant, sustainable, and, most importantly, have a minimal environmental impact compared to fossil fuels.

The global community recognizes the urgent need to shift towards renewable energy. The Paris Agreement, adopted by 196 parties at the UN Climate Change Conference (COP21) in Paris in 2015, is a legally binding international treaty aimed at combating climate change. Its primary goal is to limit the global average temperature increase to well below 2°C above pre-industrial levels, with efforts to limit the rise to 1.5 °C. Achieving these targets requires significant reductions in GHG emissions, primarily through the widespread adoption of renewable energy and energy efficiency measures.

The Path Forward

The survival of life on Earth, and the preservation of the planet as a habitable environment, depends on our collective ability to address the challenges posed by climate change. This requires a fundamental shift in how we produce and consume energy, moving away from fossil fuels and towards renewable sources. The urgency of this transition cannot be overstated, as the consequences of inaction will be felt for generations to

come. By embracing renewable energy and adhering to international agreements like the Paris Agreement, we can mitigate the impacts of climate change and ensure a sustainable future for all life on Earth.

The Imperative of a Renewables Revolution: Insights from COP-27 and Beyond

The 27th Conference of the Parties (COP27) to the United Nations Framework Convention on Climate Change (UNFCCC), held in November 2022 in Sharm El-Sheikh, Egypt, marked a critical juncture in the global fight against climate change. As climate impacts intensify and the window for action narrows, COP27 highlighted the urgent need for a transition from fossil fuels to renewable energy. UN Secretary-General António Guterres emphasized that the world is at a crossroads, stating, "We need a renewables revolution, not a self-destructive fossil fuel resurgence." This message highlights the importance of the push for renewables, and the broader context of global climate action as the world heads toward the critical year of 2030.

COP27: A Call for Accelerated Climate Action

COP27 underscored the slow pace of progress in reducing greenhouse gas (GHG) emissions and the need for accelerated action. Countries were urged to enhance their climate commitments, particularly by transitioning from fossil fuels to renewable energy sources such as wind and solar power. The urgency of this transition was emphasized by Guterres, who warned that "fossil fuel producers and their enablers are still racing to expand production, knowing full well that this business model is inconsistent with human survival." ***The message was clear: if humanity is to avert climate catastrophe, renewables are the only credible path forward.***

Despite these warnings, the world continues to struggle with the inertia of fossil fuel dependency. The energy sector remains a significant source of GHG emissions, accounting for nearly three-quarters of global CO_2 emissions. To keep the goal of limiting global warming to 1.5 °C within reach, COP27 called on governments to accelerate the transition to renewables in their next round of climate commitments. This includes setting more ambitious targets for renewable energy deployment, improving energy efficiency, and phasing out fossil fuel subsidies.

COP28: A New Era of Climate Action

The momentum from COP27 carried forward to COP28, held in December 2023, where global leaders gathered for the World Climate Action Summit (WCAS) in the United Arab Emirates. COP28 marked a significant milestone as it placed food and farming at the center of climate discussions for the first time, recognizing the crucial role that agriculture plays in both contributing to and mitigating climate change. At the summit, 154 Heads of State and Government, along with 22 international leaders, committed to cutting food system emissions, future-proofing farm yields, and scaling agricultural innovation.

A particularly poignant moment came when Britain's King Charles III addressed the summit, stating, "In 2050, our grandchildren won't be asking what we said, they will be living with the consequences of what we did or didn't do." This statement encapsulated the sense of urgency that pervaded COP28, as leaders reiterated their commitment to transitioning to an energy system that aligns with the 1.5 °C target. The decisions made at COP28 set out a clear to-do list for parties and partners to achieve deep, rapid, and sustained reductions in GHG emissions by 2030, including a first-time explicit reference to the need to reduce emissions by 43%.

The Path to a Renewable Future

The transition to renewable energy is not just a moral imperative but an economic and technological one. The vision of "*One Sun, One World, One Grid*" highlighted at COP-26 Summit in Glasgow encapsulates the global ambition to harness solar energy on an unprecedented scale. While solar photovoltaic (PV) capacity worldwide topped 500 GW in 2020, it still meets less than 3% of global electricity demand. However, the potential for growth in this sector is enormous. By 2030, electricity from renewable sources could provide 65% of the world's total electricity supply, and by 2050, it could decarbonize 90% of the power sector, massively cutting CO_2 emissions and helping to mitigate climate change.

Renewable energy encompasses a diverse mix of sources, each with its unique advantages and challenges. Hydroelectric power, for instance, harnesses the kinetic energy of running water to generate electricity. While more reliable than solar and wind power, hydroelectric dams are expensive to build, and their environmental impact must be carefully managed. Solar energy, based on the photovoltaic effect, offers the benefits of producing no air pollutants or CO_2, and systems installed on

rooftops of buildings have minimal environmental impact. However, solar energy's efficiency is dependent on factors such as location, time of day, and weather conditions.

Wind energy is another crucial component of the renewable energy mix. Wind turbines convert the kinetic energy of wind into electricity, offering a clean, renewable, and cost-effective power source. The industry has seen rapid growth, but challenges remain, including the reliability of wind, its impact on wildlife, and concerns over noise and visual pollution. Geothermal energy, which utilizes steam from underground reservoirs of hot water to produce electricity, and biofuels, derived from organic materials, further expand the renewable energy portfolio. Biofuels, such as ethanol and biodiesel, offer the potential to significantly reduce emissions from transportation, although their production can be resource-intensive.

The global transition to renewable energy is both a necessity and an opportunity. As highlighted at COP27 and COP28, the world must accelerate its efforts to reduce GHG emissions, strengthen resilience to climate impacts, and provide financial and technological support to vulnerable nations. With only six years remaining until 2030, the urgency of the climate crisis demands that all pillars of the Paris Agreement be fully activated and implemented. The decisions made at these conferences signal the beginning of the end for the fossil fuel era and the dawn of a new, renewable energy future.

However, the path ahead is challenging. It requires unprecedented levels of international cooperation, investment, and innovation. As Secretary-General Guterres rightly pointed out, renewables are the only credible path forward if we are to avert climate catastrophe. The transition to a sustainable energy future is not just about reducing emissions; it is about ensuring the survival and prosperity of future generations. The time to act is now, and the world must seize this moment to build a cleaner, safer, and more equitable energy system for all.

Sri Lanka: A Renewable Energy Island: A Global Imperative and Sri Lanka’s Journey

The urgency to transition from fossil fuels to renewable energy sources has never been more critical. Global leaders, environmentalists, and scientists have repeatedly emphasized the need for a rapid shift to renewable energy to combat climate change, reduce greenhouse gas emissions, and ensure a sustainable future. This essay examines the global

call for renewable energy, the pivotal agreements from COP28, and Sri Lanka's efforts to embrace renewable energy, particularly solar, wind, and biofuels.

Renewable Energy in Sri Lanka: Current Status and Future Prospects

Developing countries like Sri Lanka have taken bold steps in this direction. At the COP-26 Summit in Glasgow in 2021, Sri Lanka committed to achieving carbon neutrality by 2050 and pledged to phase out the use of fossil fuels. The country is also working to increase its carbon sequestration capacity by 7% by 2030, an effort that involves expanding forest cover and adopting sustainable land-use practices.

Sri Lanka, like many other nations, is actively working towards increasing its reliance on renewable energy. The country has recognized the immense potential of solar energy, particularly given its favorable geographical location and high solar incidence. The present consumption level of electricity in Sri Lanka is around 12,000 GWh, with an annual increase rate of 6.5% to 9%. To meet this growing demand, the Sri Lankan government has set ambitious targets, aiming to achieve 70% electricity production from renewable sources by 2030 and to reach net carbon zero by 2050.

The current total installed capacity of the national power grid (2023) is 5024 MW, which consists of 58% renewable energy sources including hydro. The total installed capacity of the national power grid in 2023 is 5,024 MW, which consists of 58% renewable energy sources (including hydro) and 42% fossil fuels. Out of the fossil fuel portion, 18% consists with coal and 24% comes from thermal oils. The breakdown is: Solar Roof Top 13%; ORE (Other Renewable Energies, Without Solar Roofs) 17%; Coal 18%; Thermal oil (IPP)12%; Thermal oil (CEB)12%; **Major Hydro 28%.**

The Long-Term Generation Expansion Plan (2018-2037) developed by the Ceylon Electricity Board (CEB) outlines a roadmap for increasing the country’s power generation capacity from the existing 5000 MW to 7000 MW by 2025. This plan includes significant contributions from solar, wind, and other renewable sources. Notably, the plan anticipates adding 1,389 MW of solar, 1,205 MW of wind, and 85 MW of biomass power to the national grid by 2037.

Solar energy plays a pivotal role in Sri Lanka's renewable energy strategy. The country's first 500 kW solar power plant was established in Hambantota in 2011, marking the beginning of large-scale solar energy projects. Since then, several other solar plants have been developed, including the 10 MW solar power plant in Welikande, Pollonnaruwa, which utilizes a solar tracking system to optimize energy yield. Additionally, the first agrivoltaic power plant in Sri Lanka, opened in Vavunativu in 2022, integrates agriculture with solar power generation, showcasing the potential for multi-use land development. These developments align with global trends, where solar energy is rapidly becoming a cornerstone of the renewable energy mix.

Wind energy also holds significant potential in Sri Lanka. The country has nearly 5,000 square kilometers of wind-rich areas, particularly in regions like the West Coast, Mannar, and the North Western Central Highland. With a promising wind resource potential of approximately 25,000 MW, Sri Lanka is poised to expand its wind energy capacity significantly in the coming years. The country has already identified nearly 2,060 MW of exploitable wind potential in aforementioned regions. The Thambapavani Wind Farm, the largest in the country with a capacity of 100 MW, was developed by the CEB with financial assistance from the Asian Development Bank (ADB). This project, located on the southern coast of Mannar Island, is a testament to the significant wind energy potential in Sri Lanka.

In addition to solar and wind, biomass energy is another crucial component of Sri Lanka's renewable energy portfolio. The country's favorable conditions for plant growth make it an ideal location for biomass production. It is estimated that Sri Lanka can generate approximately 40 billion kilograms of biomass by converting marginal land to fuelwood plantations and improving the productivity of existing croplands. The country has the potential to produce large quantities of biomass, particularly from crops like Gliricidia sepium, which thrives due to favorable soil conditions and high solar energy incidence. This potential makes biomass a viable and sustainable energy source for the country's future energy needs. By the end of 2020, the total biomass-based capacity in Sri Lanka was 40 MW, including both dendro (wood-based) and agricultural waste-based power generation.

The transition to renewable energy is not just a necessity; it is an imperative for the survival of our planet. The decisions made at COP27

and COP28 underscore the urgency of this transition and the critical role that renewable energy will play in achieving global climate goals. Sri Lanka's commitment to renewable energy, as evidenced by its ambitious targets and ongoing projects, positions the country as a leader in the region. By continuing to invest in solar, wind, and biomass energy, Sri Lanka can not only meet its growing energy demand but also contribute to the global fight against climate change. As the world moves towards a more sustainable energy future, the lessons and experiences from Sri Lanka's renewable energy journey will undoubtedly serve as valuable examples for other nations to follow.

Strategic Plans for Renewable Energy Expansion

The CEB's base case plan for 2023 to 2042 includes development of a cumulative capacity of 6,925MW from renewable energy consisting of 4,705MW of solar, 1,825MW of wind power, 195MW of mini hydro and 200MW of biomass. The annual total electricity demand is about 14,150 gigawatt hours (GWH). Solar photovoltaic (PV) capacity is expected to hold the largest share of this expansion, followed by wind and major hydro capacity.

Future Prospects and Challenges

As Sri Lanka looks to the future, the development of innovative energy storage solutions will be crucial to ensuring the stability and reliability of its renewable energy grid. Battery energy storage systems and pumped hydro energy storage are two major technologies that are being explored to provide fast frequency response and grid stability. The first floating solar power plant in Sri Lanka, with a capacity of 42 kW, was installed at the University of Jaffna in 2020, demonstrating the potential for floating solar technology to address land constraints.

Additionally, Sri Lanka aims to expand its rooftop solar programme, with the goal of converting at least one million rooftops into micro powerhouses by 2030. This initiative, part of the Soorya Bala Sangramaya scheme, could add up to 3 GW of installed capacity, significantly contributing to the country's renewable energy targets.

However, achieving these ambitious goals will require substantial investment and strong policy support. The global transition to renewables necessitates an annual investment of more than USD 1 trillion until 2030, and Sri Lanka will need to attract both public and private sector

participation to finance its renewable energy projects. Specific policies and measures, such as renewable energy targets, tax incentives, and pricing mechanisms, will be essential to encourage the deployment of renewables and ensure a smooth transition to a sustainable energy future.

Summary and Conclusion

Sri Lanka stands at the cusp of a renewable energy revolution. With its rich natural resources and strategic planning, the country is well-positioned to become a renewable energy leader in Asia. By focusing on expanding its solar, wind, hydro, and biomass capacities, and by investing in innovative energy storage solutions, Sri Lanka can achieve its goal of 100% renewable energy by 2050. This transition will not only meet the country's growing energy demands but also contribute to global efforts to combat climate change, making Sri Lanka a shining example of sustainable development.

Sri Lanka is uniquely positioned to become a global leader in sustainable development by harnessing its abundant renewable energy resources. Blessed with vast hydropower potential, consistent sunshine, and favorable wind conditions, the country has the strategic advantage of transitioning away from fossil fuels to meet its energy needs. This shift is not only environmentally responsible but also economically beneficial, as it reduces dependency on imported fuels, stabilizes energy prices, and promotes energy security.

Hydropower has long been a cornerstone of Sri Lanka's energy infrastructure, providing a reliable and renewable source of electricity. The country's extensive river systems and high annual rainfall offer the potential to further expand hydroelectric capacity. Additionally, with over 200 days of sunshine annually, Sri Lanka has significant solar energy potential. Investments in solar technology, particularly in decentralized and off-grid systems, can bring affordable and clean energy to even the most remote areas of the island.

Wind energy is another area where Sri Lanka can excel. The country's coastal regions and central highlands are ideal for wind farms, which can be integrated into the national grid to complement other renewable sources. By leveraging these natural assets, Sri Lanka can create a diversified energy portfolio that is resilient, sustainable, and capable of supporting the country's development goals.

The transition to renewable energy also aligns with global climate commitments, such as those outlined in the Paris Agreement, and reinforces Sri Lanka's pledge to achieve carbon neutrality by 2050. By phasing out fossil fuels, the country can reduce greenhouse gas emissions, mitigate the impacts of climate change, and protect its rich biodiversity. Moreover, the shift to renewables can drive economic growth by creating green jobs, fostering innovation, and attracting international investment.

In conclusion, Sri Lanka's natural endowments of hydropower, sunshine, and wind present a unique opportunity to lead by example in the global transition to clean energy. By capitalizing on these resources, Sri Lanka can secure a sustainable and prosperous future for its people while contributing to the global fight against climate change.

KEYNOTE ADDRESS – Nandika Bandara (PhD., CFS)

About the keynote speaker

Dr. Nandika Bandara is an Associate Professor and Canada Research Chair in Food Proteins and Bioproducts at the Department of Food and Human Nutritional Sciences, University of Manitoba, Canada. Dr. Bandara's research primarily focuses on value-added applications of protein in nanodelivery, biopolymer applications in packaging and biomedical materials, and protein processing, with particular emphasis on sustainable technologies and non-thermal protein modifications for functionality improvement with an overarching research vision of "creating sustainable solutions for agriculture and food industry-based bioeconomy." Over the past four years of his independent academic career, Dr. Bandara has secured over 3.2 million dollars in research funding as PI and an additional 6.2 million as Co-PI, trained/currently training over 35 HQPs (PDF, PhD, MSc, and BSc) at different career stages, and published over 40 peer-reviewed manuscripts in high impact journals and edited 2 books. In addition to his primary role at the University of Manitoba, Dr. Bandara is currently the Editor of the "Food Chemistry" journal (IF: 8.8) and Associate Editor of the Journal of American Oil Chemist Society (JAOCS). Also, Dr. Bandara has previously served Chair of the Food Chemistry Division of the Institute of Food Technologists (IFT) and is currently serving as the Secretary of the Protein and Co-products division of the American Oil Chemist Society (AOCS).

Abstract

"Advancing Circular Bioeconomy for Sustainability in Agri-Food Industries"

The circular bioeconomy is a concept that integrates the principles of the circular economy with the sustainable use of biological resources, aiming to create a system where resources are reused, recycled, and regenerated in a closed-loop system to minimize waste and reduce environmental impact. This approach contrasts with the traditional linear economy, which typically follows a "take-make-dispose" model. The circular bioeconomy focuses on making the most out of biological materials, such as crops and food by-products in agriculture and food processing. This involves several strategies, including waste minimization, where waste generated during agricultural production and food processing is repurposed into valuable

products, such as converting food scraps and residues into bioenergy, animal feed, or bioplastics. Resource efficiency is enhanced by recycling water, nutrients, and energy within agricultural and food processing systems. Sustainable practices are implemented to maintain or enhance the value chain of agricultural and food processing industries. Additionally, new, high-value products are created from agricultural outputs and by-products, thereby increasing the economic value of the bioresources.

Research on proteins and bioproducts is crucial in advancing the circular bioeconomy, particularly in agriculture and food processing. Protein extraction and valorization are key areas of focus, where agricultural by-products rich in proteins, such as plant residues or animal processing waste, can be extracted and converted into valuable products, like food additives, nutraceuticals, or biopolymers. For example, proteins from plant residues could be used to create sustainable, biodegradable packaging materials. Nanoencapsulation of bioactive compounds is another critical research area, where proteins are used as carriers for bioactive compounds, allowing for the protection and controlled release of nutrients or pharmaceuticals, enhancing their efficacy. Developing biodegradable materials is also critical, as proteins can be engineered to create biodegradable materials that replace conventional plastics, reducing reliance on fossil fuels and decreasing plastic pollution. Furthermore, research on proteins in the context of biomedical materials can lead to innovations such as wound healing products derived from agricultural by-products, offering an eco-friendly alternative to synthetic materials.

Integrating protein research and bioproduct development into the circular bioeconomy framework, particularly within agriculture and food processing, offers significant potential for sustainability. By converting agricultural by-products into valuable proteins and bioproducts, we can reduce waste, enhance resource efficiency, and develop sustainable, high-value materials. This supports the goals of a circular economy and contributes to environmental preservation and economic growth. During the presentation, Dr. Bandara will highlight research from his group that addresses circular bioeconomy concepts in protein processing, value-added applications, and biopolymer-based materials to improve sustainability in agri/food industries.

PROF LAKSHMAN SAMARANAYAKE RESEARCH EXCELLENCE AWARD

"Professor Lakshman Samaranayake Research Excellence Award of the University of Peradeniya" is a prestigious award in order to recognize exceptional achievement in research and discovery as endowed by Prof. L. Samaranayake, an Alumnus of the University of Peradeniya.

To ensure equity and fairness in the distribution of awards across all faculties of the university the following award scheme shall be implemented. Awards shall be annually granted to a single faculty within each Cluster (see below) on a rotational basis (i.e., one award per cluster, and a total of three awards per year. The faculty clusters are as follows: Cluster I: Medicine, Dental Sciences, and Allied Health Science, Cluster II: Agriculture, Veterinary Medicine & Animal Science and Engineering, Cluster III: Arts, Science and Management. This year, Faculties of Management, Veterinary Medicine & Animal Science and Allied Health Science are eligible for the award; accordingly, the following are selected from each faculty on a merit basis.

Profile of Prof. L. Samaranayake Awardees 2024

Prof. Athula Ekanayake (B.Sc. Bus. Adm., MBA, PhD, FCA)

Athula Ekanayake serves at the Department of Business Finance, Faculty of Management as a Professor in Accounting. He received his Ph.D. in Accounting and Finance from Macquarie University in Australia, MBA from PGIA, University of Peradeniya, and B.Sc. (Special) in Business Administration from University of Sri Jayewardenepura. He is also a Fellow Member of the Institute of Chartered Accountants of Sri Lanka. His Google Scholar profile as of 14th August 2024 indicates 392 citations for his publications with a 9 h-index. His primary area of research is corporate governance, with a focus on developing countries. His current research projects focus on financial sustainability and survival ability of MSMEs, and entrepreneurship support in Sri Lanka. He has served in several editorial boards: the Co-editor of Modern Sri Lanka Studies, the Journal of Social Sciences of the Faculty of Arts, Peradeniya Management Review, the Journal of the Faculty of Management, and the Managing Editor of the Journal of Emerging Financial Markets and Policy, the Journal of the Sri

Lanka Finance Association. In addition, Prof. Ekanayake held several positions in professional bodies. He served as the President of the Association of Kandy Chartered Accountants, and the Vice President of the Sri Lanka Finance Association.

Prof. Dilan Amila Satharasinghe (BVSc, MVM, PhD, MSLCVM)

Dr Satharasinghe graduated from the Faculty of Veterinary Medicine and Animal Science, University of Peradeniya, in 2006 and later obtained a Master of Veterinary Medicine degree in Biosecurity from Massey University New Zealand in 2012, and year 2016, he obtained his PhD in Immunology from the University Putra Malaysia, Malaysia. Currently, he serves as a professor in molecular biochemistry at the Department of Basic Veterinary Sciences, Faculty of Veterinary Medicine and Animal Science. His Google Scholar profile as of 13th Aug indicates 555 citations for his publications with a 13 h-index. He also serves as an honourary reviewer in several SCIE-cited Q1 and Q2 virology and molecular biology journals. Despite his academic background, he serves as a local and international poultry health and management expert and has addressed many national and international scientific conferences on poultry. In addition, he served as the 75th president of the Sri Lanka Veterinary Association, the largest professional body representing veterinarians in Sri Lanka. Currently, he is on sabbatical leave and working as a post-doctoral scholar at the University of Florida, attached to the Bronson Animal Disease Diagnostic Laboratory, Florida Department of Agriculture and Consumer Services, USA.

Prof. M. D. M. Lalani Damayanthi Kumari Yatawara (PhD, FSLCVS)

Prof. Lalani Damayanthi Kumari Yatawara is a distinguished academic and researcher specializing in Biochemistry and Molecular Genetics. She currently holds the position of Professor in the Department of Medical Laboratory Science at the Faculty of Allied Health Sciences, University of Peradeniya, Sri Lanka.

Prof Yatawara obtained the Bachelor of Veterinary Medicine and Animal Science from the University of Peradeniya in 1997 and PhD in Medical Sciences from Kochi Medical School, Japan in 2009. Her extensive research experience includes positions such as Post-Doctoral Research Fellow at the Genetic Laboratory, Institute for Research and Development, Teaching and Research Assistant at Kochi Medical School, Japan, and supervision of many posts graduate research students. Prof. Yatawara's research interests are broad, encompassing molecular diagnostics of genetic and biochemical disorders, molecular genetics of cancer, and molecular epidemiology of infectious diseases, biochemical markers of dyslipidemias among others. Prof. Yatawara has published numerous research papers in refereed journals with H-index 13. She has been recognized with various awards, including a Presidential Scholarship, Monbugakusho Japanese government scholarship, WHO Fellowship and NRC merit awards for research. She is actively involved in several academic and professional organizations, contributed significantly to the development of the faculty and the university holding various academic and administrative positions at the University of Peradeniya.

DETAILS OF TIER 4*, URC RESEARCH AND RECOGNITION AWARD

Tier 4* Research Awardees

Prof. P.C.G. Bandaranayake, Faculty of Agriculture

Prof. N.D.K. Dayawansa, Faculty of Agriculture

Prof. F. Noordeen, Faculty of Medicine

Prof. S. Yatigammana Ekanayake, Faculty of Arts

Prof. R.D. Jayasinghe, Faculty of Dental Sciences

Prof. K.G.N. Nanayakkara, Faculty of Engineering

Dr. M.C.M. Nasvi, Faculty of Engineering

Prof. H.M.V.G. Herath, Faculty of Engineering

Prof. C.N.R.A. Alles, Faculty of Medicine

Prof. I.B. Gawarammana, Faculty of Medicine

Prof. K.M.G. Gehan Jayasuriya, Faculty of Science

URC Research Awards - 2023

Prof. P.C.G. Bandaranayake, Faculty of Agriculture

Prof. W.M.T. Madhujith, Faculty of Agriculture

Prof. B. Marambe, Faculty of Agriculture

Prof. S.P. Nissanka, Faculty of Agriculture

Prof. D.K.N.G. Pushpakumara, Faculty of Agriculture

Prof. G.L.L.P. Silva, Faculty of Agriculture

Prof. B.M.L.D.B. Suriyagoda, Faculty of Agriculture

Prof. J. Weerahewa, Faculty of Agriculture

Dr. S.A. Weerasooriya, Faculty of Agriculture

Dr. Bimali S. Weerakoon, Faculty of Allied Health Sciences

Prof. R.D. Jayasinghe, Faculty of Dental Sciences

Dr. K.G. Thilakarathne, Faculty of Dental Sciences

Prof. A.M.A.C.S. Bandara, Faculty of Engineering

Dr. J.A.S.C. Jayasinghe, Faculty of Engineering

Dr. J.H.A.D. Samith Buddika, Faculty of Engineering

Prof. I.B. Gawarammana, Faculty of Medicine

Prof. F. Noordeen, Faculty of Medicine

Prof. D. Yakandawala, Faculty of Science

Prof. R. Chandrajith, Faculty of Science

Prof. R. Rajakaruna, Faculty of Science

Recognition Awards of Research Grant Recipients - 2023

Dr. W.M.T.P. Ariyaratne, Faculty of Agriculture

Prof. P.C.G. Bandaranayake, Faculty of Agriculture

Prof. S.P. Nissanka, Faculty of Agriculture

Dr. S.A. Weerasooriya, Faculty of Agriculture

Prof. A.M.A.C.S. Bandara, Faculty of Engineering

Prof. I.B. Gawarammana, Faculty of Medicine

Dr. D.S. Thilakarathne, Faculty of Veterinary Medicine & Animal Science

THEME 01: EMBRACING INNOVATION AND RESILIENCE

THEME 02: EQUITABLE AND INCLUSIVE DEVELOPMENT

THEME 03: FOOD SECURITY AND ENVIRONMENTAL STEWARDSHIP

THEME 04: WEAVING TECHNOLOGY FOR SUSTAINABILITY AND WELLBEING

EMBRACING INNOVATIONS AND RESILIENCE

University of Peradeniya

A Case-Control Study on Knee and Lumbar-Spine Characteristics of Individuals with Knee Osteoarthritis

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Individuals with knee osteoarthritis (KOA) often present with lower back pain (LBP). However, the characteristics of knee and lumbar-spine in this cohort are less investigated. The objective of this study is to investigate knee and lumbar-spine characteristics of individuals with KOA compared to healthy individuals, and to examine differences in KOA patients with and without LBP. We assessed common clinical characteristics of knee and back namely pain intensity (measured by visual analogue scale), knee function (measured by Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC)), LBP disability (measured by Oswestry Disability Index (ODI), and knee and back range of motion (measured by goniometer) of KOA and healthy people. We also compared the subgroups of KOA with LBP vs without LBP. Independent t and Mann-Whitney U tests were performed to compare characteristics. Twenty eight individuals (KOA, n=14; healthy, n=14) were analyzed. The mean age of participants was 53.6±10.6 years, and 92.9% were females. Knee pain (mean difference, MD=-7.1), LBP (MD=-3.0), knee functional disability (MD=-51.7) and LBP related disability (MD=-12.1) were significantly higher in individuals with KOA compared to healthy individuals. Further, knee flexion (MD=21.9^0), lumbar side-flexion (MD=7.4cm), lumbar flexion (MD=3.1cm) and lumbar rotation (MD=2.5cm) were significantly lower in individuals with KOA compared to healthy individuals. With regards to KOA subgroups, mean age, back pain and ODI of KOA individuals with LBP were significantly higher (($p<0.05$) than individuals without LBP, however none of other characteristics were statistically significant. A higher degree of disability in relation to both knee and back and a higher degree of knee pain and LBP intensity were observed in individuals with KOA compared to healthy individuals. Knee and lumbar spine movements were decreased in individuals with KOA than healthy individuals. LBP and disability of individuals with KOA were higher when they are presented with LBP to without LBP.

Keywords: Low Back Pain; Knee Osteoarthritis; Knee Pain; Back Pain; LBP

AI-Powered Traffic Violation Detection System for Pedestrian Crossing Violations

G.L.C. Aponsu[1]*, H.M.B.S.B. Herath[1], K.J.A.S.N. Jayawardhana[1], W.M.M.T.S. Weerakoon[1], L.T. Samaranayake[1], W.A.N. Harischandra[1]

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As cities become smarter, public safety is enhanced and traffic is managed more efficiently. One area that needs attention is traffic violations at pedestrian crossings, which are a major cause of urban accidents. This under recognized yet urgent issue is tackled by our project through the creation of a cutting-edge system to detect these violations. It was discovered that not stopping at pedestrian crossings ranks as the second most common traffic offence worldwide, and the number of related accidents is expected to rise. A robust system has been developed using the latest in computer vision technology, leveraging YOLOv8 for detailed identification of pedestrians and vehicles. Then, their movements are monitored by an advanced tracking algorithm called ByteTrack. A custom model using the XGBoost algorithm, known for its precision and durability, was implemented for detecting violations. To ensure reliable detection even if the surveillance camera moves, an automatic correction mechanism for the pedestrian crossing positions is included in our system. In real-world tests, a remarkable 99% accuracy in detecting traffic violations was achieved by our system, which is able to perform the detection run in real-time at 30-35 frames per second, even on low-powered GPUs. For scalability, multiple instances of our system have been containerized, enabling them to run efficiently on a centralized server. This setup allows various urban areas to be monitored simultaneously, ensuring consistent and reliable performance across different locations. The key takeaway from our study is that urban surveillance can be significantly enhanced by computer vision. By automating the detection of traffic violations at pedestrian crossings, constant human oversight is reduced, accident rates are lowered, and better driving habits are enforced. Ultimately, our project is not just about improving immediate traffic safety but also about advancing the broader adoption of smart city technologies.

Keywords: Traffic Violations, Pedestrian Crossing, Computer Vision, Deep Learning, Yolov8, Bytetrack, Xgboost

Acknowledgement: We would like to thank the Hardware Acceleration Programme of the NVIDIA Inc., USA for making the GPU hardware available in the department, which we used in the project.

Air Quality Assessment of Highly Ckdu-Affected Areas of the Anuradhapura District

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North Central Province (NCP) reports the highest number of chronic kidney disease (CKD) patients in SL, with 10% of the adult population affected by this disease. Of them, 27% have been related to unknown causes associated with CKD (CKDu). Although numerous studies have revealed that prolonged exposure to high concentrations of air pollutants, especially $PM_{2.5}$, can cause kidney failure, limited studies have been conducted locally, particularly in the highly CKDu-prone northern part of the Anuradhapura District. This study aimed to monitor and compare the air quality of the highly CKD-prone Medawachchiya area (epidemic) with less CKDu-affected Anuradhapura town (non-epidemic). Then, air quality data is assessed using local and international standards. The air quality monitoring program used AEROQUAL Series 500 portable air quality monitoring devices with sensors to record $PM_{2.5}$, PM_{10}, and Carbon Monoxide (CO). Considering traffic and other human activities, the busiest 4 hours (10 am-2 pm) of the day were conducted after a long dry period. According to the data, the 4_h average PM_{10} levels of Medawachchiya and Anuradhapura are 5.0 $\mu g/m^3$ and 4.3 $\mu g/m^3$, and the average $PM_{2.5}$ levels are 8.3 $\mu g/m^3$ and 7.2 $\mu g/m^3$ respectively. All these results are well below the SLS limits (24_h average) of 50 $\mu g/m^3$ and 100 $\mu g/m^3$ for $PM_{2.5}$ and PM_{10}, respectively. 4_h average CO levels of Medawachchiya and Anuradhapura were 0.89 ppm and 0.77 ppm and well below the SLS limit of 9 ppm (8_h average). However, all the parameters of Medawachchiya are slightly higher than that of Anuradhapura. Based on a considerable number of studies, out of many pollutants, long-term exposure to $PM_{2.5}$ >12 $\mu g/m^3$ significantly increases the risk of CKDu. Though the fine particulate matter was within permissible range, it is recommended that the composition of the particulate matter be investigated further since most of the environmental toxins present are attached to fine particulate matter.

Keywords: Air Quality, CKDu, Particular Matter, $PM_{2.5}$ and PM_{10}

Financial assistance given by the University of Peradeniya (URG/2022/34/E) is acknowledged.

A Machine Learning Based Optimization Approach for Solving Manipulator Robot's Inverse Kinematics Problem

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The inverse kinematics (IK) problem is fundamental in controlling industrial and autonomous mobile robots (AMRs). Among these robots, spider-like AMRs have gained popularity due to their agility, speed, and stability on uneven terrains. Conventional IK solutions pose challenges for the development of various robot types, including complexity derivation, calculation difficulty, multiple solutions, and lack of immediacy. Once the Degree of Freedom (DOF) (or independent "joints" having motors) is increased, the computational complexity is raised exponentially. Although numerous existing algorithms such as the Jacobian inverse technique, Cyclic Coordinate Descent (CCD) attempt to solve these problems, each encounter at least one of the mentioned issues. Consequently, researchers continue to analyze and optimize numerous methods and algorithms to overcome these limitations. This research proposes an optimization methodology for the Gaussian Damped Least Squares (GDLS) method, incorporating machine learning techniques, more specifically the Gaussian Process Regression to enhance the algorithmic efficiency, reduce complexity, and improve precision and faster solution predictions. The complexity index used to evaluate is the time elapsed to perform the computation for a given scenario (i.e., compute IK for 6 DOF). Approximately, 1.98% gain was reported from the perspective of response time, compared to the Jacobian inverse technique. (It is assumed that the computational overhead is also corelated with time incurred). The GDLS method is employed to analyze the IK problem of robot manipulators, ensuring motion stability. Approximately, an accuracy of 96.6% was obtained for the testing and validation. However, obtaining accurate solutions requires more (training) data points and thousands of iterations, impeding high-speed calculations. By leveraging machine learning techniques, the proposed approach attempts to significantly reduce the computational overhead and the unavoidable complexity associated with IK computations. In conclusion, the approach significantly improves the efficiency of solution prediction, enabling faster and more accurate inverse kinematics computations for manipulator robots.

Keywords: Inverse Kinematics, Manipulator Robots, Optimization Algorithms, Degree of Freedom, Machine Learning

Analysis of Short-Term Fluctuations in Soil Moisture during the Dry Season in Gampaha District in Sri Lanka using Satellite Remote Sensing

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Soil moisture, a critical factor for plant growth, denotes the water content within the soil. Its significance in agriculture cannot be overstated, as it directly influences plant development and overall health. According to the Land Use Policy Planning Department, in 2008, the Gampaha District dedicated 86.06% of its land to agriculture. Home gardens made up 55.56%, paddy lands occupied 13.47%, coconut plantations covered 13.44%, and rubber cultivation constituted 3.08%. This study focuses on estimating Near-Surface Soil Moisture (NSSM), specifically within the uppermost 5cm or less of the soil layer. The investigation emphasizes the temporal fluctuations of soil moisture during the dry season in this region, intricately linked to variations in climatic conditions, especially rainfall and temperature. After analyzing monthly average rainfall data, which were obtained from the CHRS website from 2003 to 2023, it was noted that the month of February recorded the driest period in the Gampaha District. Subsequently, the research focused on short-term temporal variations in soil moisture during February in 2018, 2021, and 2024 by analyzing Landsat 8 satellite images with the help of ArcGIS Pro software. The analysis incorporated multiple variables, including the Normalized Difference Vegetation Index (NDVI) and Land Surface Temperature (LST), crucial parameters in optical and thermal infrared remote sensing. The study unveiled that the maximum and minimum land surface temperatures during the study period were 35°C and 16°C, respectively. In 2018 and 2021, the Western part of the district recorded drier characteristics compared to the Eastern part. Conversely, in 2024, this dryness shifted towards the Northeast part of the district. During 2018 and 2021, the Eastern part exhibited wet soil conditions. The Southern part maintained wet soil moisture levels, while the Western part, especially Ja-Ela, Katana, and Wattala near the coast, was drier. By 2024, the driest areas were predominantly in the Northeast of the study area. Hence, these findings will be useful for agricultural practitioners and land managers to efficient water utilization and maintain the health of crops.

Keywords: Soil Moisture, Gampaha District, Dry Season, NDVI, LST

An Integrated Approach for Intruder Detection in Nighttime Surveillance

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In nighttime surveillance, accurate human detection and recognition are crucial yet challenging, especially in low-light environments. This study proposes a comprehensive solution for intruder detection, focusing on three stages: image enhancement, human detection, and human (face) recognition. The primary challenge addressed is the significant drop in surveillance accuracy in low-light conditions, where traditional systems often struggle. Firstly, a hybrid image enhancement approach was employed for images captured at 1280x720 resolution from CCTV video of a domestic environment to improve low-light visibility. Utilizing the Contrast Enhancement Algorithm Based on Gap Adjustment for Histogram Equalization (CegaHE), visibility in low-light images was improved by evenly distributing the lower side of the image histogram. This is followed by contrast-limited adaptive histogram equalization (CLAHE), which adjusts the over-enhanced areas of the improved image, providing a balanced light correction. This integrated approach ensures effective operation under low-light conditions. Secondly, enhanced images are processed using SSD MobileNet V2, a lightweight but effective deep learning model, to detect humans with high precision. This method reduces false positives and guarantees accurate human identification. Finally, to recognize home-dwellers from intruders, the detected human was further processed using a fine-tuned Siamese network with triplet loss, capable of face recognition. This network was trained using a dataset of face images belonging to three home-dwellers, and at deployment, it was able to reliably identify the home-dwellers while enduring changes in lighting and occlusion. The proposed system architecture significantly improves intruder detection in nighttime surveillance, achieving a detection accuracy of 90.625% compared to 89.0% accuracy achieved by the state-of-the-art ARCFace model. In conclusion, this integrated approach highlights the novel contributions of image enhancement, robust human detection, and precise face recognition during nighttime, combining advanced artificial intelligence, machine learning, and computer vision to establish a highly efficient nighttime surveillance system.

Keywords: Nighttime Surveillance, Image Enhancement, Intruder Detection, Human Recognition, Siamese Network, Triplet Loss

A Novel Poly (Vinyl Alcohol) – Boric Acid Gel Electrolyte for Lead Acid Battery Storage

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Lead-acid batteries are essential due to their cost effectiveness and reliability, but the environmental impact and safety concerns of traditional liquid electrolytes necessitate alternative solutions. Gel electrolytes, which enhance stability and safety by encapsulating liquid electrolytes in a solid-like form, are a promising substitute. This study focuses on developing and optimizing a novel polymer gel electrolyte composed of polyvinyl alcohol (PVA) and boric acid (BA). The effects of different gel electrolyte compositions, varying the types and amounts of gelling agents, on the electrochemical performance of lead-acid batteries were investigated. The creation of crosslinking bonds between PVA and BA, highlighting their chemical interactions, was confirmed by structural characterization techniques, including Fourier-Transform Infrared (FTIR) spectroscopy. It was revealed that the combination of PVA and BA in the electrolyte is defined by temperature-dependent hydrogen bonding, which influences the crosslinking within the polymer matrix. Notably, the broad band around 3400 cm^{-1} in the PVA spectrum diminishes in intensity with increasing BA concentration, indicating the formation of covalent crosslinks between polymer segments. Electrochemical analysis, including cyclic voltammetry and electrochemical impedance spectroscopy, was used to evaluate the PVA-BA gel electrolyte's performance. The optimal composition (labeled as PE-2), with 40 wt% BA relative to PVA, exhibited superior anodic peak values, lower resistance (156.4 Ω), and higher conductivity (0.502 S m^{-1}). The increase in conductivity at elevated temperatures is attributed to complex molecular interactions, making the PVA-BA gel electrolyte a promising candidate for practical battery applications.

Keywords: Polymer Gel Electrolyte, Cyclic Voltammetry, Electrochemical Impedance, Fourier-Transform Infrared Spectroscopy

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A Unified Model to Enhance Traffic and Road Sign Detection Under Adverse Weather Conditions

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This study addresses the significant challenge faced by Advanced Driver Assistance Systems (ADAS) in adverse weather conditions such as rain, fog, and low light, which hinder the systems' ability to detect traffic and road signs. Traffic sign detection and recognition systems rely on computer vision, which is affected under poor visibility scenarios. We propose a unified model that effectively mitigates the impact of multiple weather phenomena. Most existing methods address only one weather condition at a time. However, in real driving scenarios, multiple weather impairments may co-occur, and some methods produce artifacts that significantly reduce traffic sign recognition accuracy. To address these issues, we developed an algorithm that simultaneously removes weather degradation from images, enhancing traffic and road sign detection. Our algorithm focuses on conserving computational resources, providing fast processing crucial for real-time traffic sign detection. The methodology involves a feature extraction of various weather conditions using multiple existing machine-learning algorithms. These algorithms are trained to reduce weather-induced image degradation for specific weather conditions. A unified platform is then developed to integrate these trained algorithms, effectively addressing adverse weather conditions, including rain, fog, and low light, within a single framework. The evaluation of the proposed model against existing enhancement methods shows that it achieves the highest average traffic sign recognition confidence score of 0.91. Additionally, the enhanced images from our model exhibit a significantly greater reduction in BRISQUE scores compared to the input weather-degraded images, indicating a substantial improvement in image quality. These results confirm that the proposed model offers a significant advancement over current models, providing superior image quality and more reliable traffic sign detection and recognition under adverse weather conditions. This unified approach for handling various weather conditions presents considerable advantages over existing single-condition methods, thereby enhancing the overall effectiveness of ADAS in poor visibility scenarios.

Keywords: Weather removal, Object detection, Low Light Enhancement, Image Enhancement, Defog, Derain

Coconut Water Electrolyte for Biomass Derived Activated Carbon Supercapacitors

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A supercapacitor is an energy storage device that has a high power density and high charge and discharge rates. Compared to conventional capacitors, supercapacitors possess higher capacitance values. Electrolytes, electrode materials and separating membranes are the major components in a supercapacitor. As the ion conducting medium within the supercapacitor, electrolytes play a crucial role. The widely used aqueous type electrolytes like sulfuric acid (H_2SO_4) and potassium hydroxide (KOH) are expensive and detrimental. As an alternative for these electrolytes, in this work, the possibility of using cost effective, non-toxic coconut water was investigated for the first time. The process of fabricating the supercapacitor began with forming a thin film of activated carbon on a current collector plate using the spray pyrolysis method. The precursor material for the activated carbon was coconut shells. Polyvinylpyrrolidone (PVP) was employed as a binder at a concentration of 10% by mass relative to the mass of activated carbon. The solution was made with isopropanol, and spray pyrolysis was done at 150 °C. Thin film coated plates were heat treated for 20 minutes at 300 °C. To assemble the supercapacitor, filter paper was sandwiched between two activated carbon coated electrodes. Then the filter paper was wetted with coconut water, and the supercapacitor was connected to Autolab PGSTAT302N instrument to run the cyclic voltammetry (CV), galvanostatic charge discharge (GCD), and electrochemical impedance spectroscopy (EIS). It showed the electric double layer supercapacitor behavior and gave the specific capacitance values of 27.0 , 25.3 , 23.7 , 17.6 , 12.9 , 8.3 F g^{-1} for 5 , 10 , 20 , 50 , 100 , 200 m V s^{-1} scan rates, respectively. Series resistance of the cell was observed as 15.0 Ω. This result shows that coconut water can be successfully utilized as an efficient natural electrolyte for supercapacitors.

Keywords: Supercapacitor, Natural Electrolyte, Coconut Water, Activated Carbon

Comparative Study of the Motivation to Learn ICT among Gampaha District School Children: Interactive Whiteboards vs. Traditional Whiteboards in Online Teaching

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This study investigates the impact of interactive whiteboards (IWBs) versus traditional whiteboards on the motivation of 11th-grade students in Gampaha District, Sri Lanka, to learn Information and Communication Technology (ICT). The shift towards digital teaching tools underscores the need to assess how these technologies affect student engagement and learning outcomes. The primary aim is to determine if IWBs can significantly enhance students' motivation towards ICT compared to traditional teaching methods. The objectives include comparing pre and post-intervention motivation levels between students taught with IWBs and those taught with traditional whiteboards, and analyzing specific areas of motivation such as Technology Orientation, Instrumental Orientation, Self-Confidence in ICT, and Self-efficacy beliefs. The study included 180 male and 106 female students from public schools in the Gampaha District. The study divided 286 students into two groups, employing a robust methodology to ensure accurate, reliable findings. Data was collected using a self-administered questionnaire before and after a seven-week intervention. Statistical analysis included Independent Samples t-tests and Levene's test for equality of variances. Before the intervention, motivation levels were comparable between the groups. Post-intervention data revealed that students using IWBs showed significantly higher motivation across all examined dimensions. For example, in Technology Orientation, IWB users scored 4.72 compared to 4.39 for non-users ($p=0.027$), and in Self-Confidence in ICT, IWB users scored 4.86 versus 4.29 for non-users ($p=0.012$). This study aims to provide evidence that integrating IWBs into classrooms can make learning more interactive and engaging, significantly improving student motivation.

Keywords: Interactive Whiteboards (IWBs), Student Motivation, Information and Communication Technology (ICT), Educational Technology, Quantitative Analysis

Daily Intake of Feed and Nutrients by Captive Asian Elephants

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Five privately owned captive elephants brought for the Esala Perahera in Kandy 2023 were studied with regard to their food supply. The nutritional composition of the feed given was compared with the daily average requirements. Feed ingredients examined were Kithul (Caryota urens) trunk and leaves, Jack (Artocarpus heterophyllus) branches and leaves, and sugar cane (Saccharum officinarum L.). Feed items provided irregularly and in small quantities, namely coconut (Cocos nucifera), banana (Musa spp), and watermelon (Citrullus lanatus), were not studied. The quantities of feed provided and left uneaten were weighed to obtain the measurements. Representative feed samples were subjected to proximate analysis at the Veterinary Research Institute. The average nutritional intake was then calculated and compared with published standard nutritional requirements. Body weights of the elephants were estimated by assuming each foot at withers height was 500 lbs. The withers heights of elephants were estimated as twice the circumference of the right forefeet measured in inches, an acceptable approximation. Each elephant consumed 4.48% of its body weight on a fresh matter basis. Their daily diet consisted of 40.4% Kithul trunk (KT), 22% Kithul leaves (KL), 23.25% Jack branches and leaves (JL), and 14.25% sugar cane (SC). According to laboratory findings, an elephant consumes 45.7% Crude Fiber (CFi), 3.5% Crude Protein (CP), and 2.8% Crude Fat (CF). The standard daily nutritional requirements for captive elephants are 33.5% Crude Fiber (CFi), 8-10% Crude Protein (CP), and 1.2-1.8% Crude Fat (CF). The daily crude protein intake (3.5%) of the elephants studied is grossly lower than the requirement. All other nutritional demands are satisfied. Including protein supplements for privately owned captive elephants is recommended. Since commercial feed supplements are unaffordable for elephant owners, locally available protein supplements like coconut poonac and gingelly poonac are recommended to be fed daily.

Keywords: Elephant, Crude Fat, Crude fibre, Metabolizable Energy, Crude Protein.

Damage Detection of Concrete Beams using Artificial Neural Networks

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It is crucial to monitor structures' health to maintain better performance during their service life. Traditional methods like visual inspections and non-destructive testing have limitations, leading to the popularity of vibration-based damage detection. However, data inaccuracies due to noise and environmental factors pose challenges. Various machine-learning techniques have been adopted to overcome these challenges with the advancement of computational power. In this light, vibration-based damage detection of concrete beams incorporating machine learning is proposed. A laboratory-scale reinforced concrete beam was tested under simply supported conditions. Free vibration acceleration responses were recorded using an impact hammer excitation before and after introducing static damage. The beam was numerically simulated using ABAQUS and validated with experimentally identified natural frequencies. Time history analyses were conducted using the validated finite element model to obtain acceleration responses. Different damage scenarios were numerically simulated by dividing the beam into 8 equal segments and altering the elastic modulus of randomly selected segments up to 25% with increments of 5% to create a database of acceleration responses. The frequency response functions of the beam, serving as the inputs to the Artificial Neural Network (ANN), were computed by applying the Fast Fourier Transform (FFT) to the acceleration responses of the damaged beam. Altogether, 8,500 data samples representing multiple damage scenarios were numerically produced. 90% of the produced data was used to train the ANN model and the remaining 10% was used to test it. Five-fold cross-validation and early stopping were used to mitigate overfitting. In this study, a multi-layer perceptron ANN with 3 hidden layers, consisting of softplus activation function, was used. The damage severity of each segment, serving as the target output of the ANN model, was computed as the percentage deviation of the elastic modulus of each damaged beam segment. A genetic algorithm-based approach was used to find the best hyperparameters for the ANN model. The ANN model demonstrated an accuracy of 76% during training and 72% on the testing dataset. Thus, the proposed approach for detecting the location and severity of multiple damage scenarios in concrete beams using ANNs was verified.

Keywords: Damage detection, Artificial neural network, Elastic modulus, Fast Fourier Transform, Multiple damage

Damage Detection of Post-Tensioned Concrete Girder Bridge Using Deep Learning Approach

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Structural health monitoring (SHM) is recognized as crucial for ensuring infrastructure safety and longevity. Structural instability has been attributed to material degradation and crack propagation. Therefore, understanding the combined effects of material degradation and crack propagation across various damage scenarios is essential for early damage detection in concrete structures. This study aimed to develop an effective method for detecting damage in post-tensioned concrete girder bridges using a deep learning approach (for damage of crack propagation and material degradation combinedly). Ambient vibration responses were collected from field measurements and vibration responses generated using finite element models (FEM) of a selected post-tensioned concrete girder bridge. The deep learning (DL) models were developed using numerically generated data, validated through hyperparameter tuning and cross-validation, and used to identify material degradation percentage, crack locations, crack paths, and damage severity within the structure. Initially, ambient vibration data were measured at selected locations on the bridge. A damage parameter was developed using natural frequency and modal curvature shifts from undamaged to damaged scenarios, varying uniquely for crack damage and material degradation. In the FE model, crack and material degradation were implemented by reducing cross-section and elastic modulus, respectively, and data were collected for various damage combinations. The DL models were trained using numerically simulated data and fed with vibration responses from the field to predict damages. The training and validation processes achieved nearly zero, with training accuracy above 95% and validation accuracy of 98%. Mean square error was below 0.0001, and standard deviation was less than 0.005 over K-Fold cross-validation. Fracture mechanics model developed for concrete structures found from the literature was utilized to effectively represent the combined effects of damages, crack orientation, and stress distribution on severity. Finally, damage severity was indicated through a 2D plot for easy on-site accessibility.

Keywords: Damage Detection, Structural Health Monitoring, Post-Tensioned Concrete Girder Bridges, Deep Learning

Damage Detection of Prestressed Concrete Girder Bridges Through Nonlinear Modal Damping Identification

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Recent attention has been drawn to damping-based damage detection techniques due to their superior sensitivity in portraying even small damage. Most studies utilizing damping as a damage indicator rely on the traditional viscous damping model, assuming a constant damping mechanism. However, damage-induced damping demonstrates nonlinear characteristics, where the location of damage notably influences modal damping, particularly when the damage occurs near the antinode of a vibrating mode. Based on this fact, this research proposes a novel methodology for detecting and localizing damage by identifying the nonlinearities in modal damping behavior. Two laboratory-scale experimental setups were used to characterize the damping behavior with and without damage. The first involved simply supported reinforced concrete (RC) beam with varying degrees of flexural cracks at mid-span to study quadratic type of damping. The second setup featured a steel cantilever beam to simulate damage with frictional damping. The challenge of decomposing the measured vibration signal into distinct modal responses was addressed using the Variational Mode Decomposition (VMD) technique. The decaying amplitudes of the decomposed modal responses are then used to extract the instantaneous damping behavior of each mode. Experiments with RC beams showed that at undamaged conditions, modal damping behavior remains constant across all active modes. However, when the damage occurred at mid-span, the damping behavior of the first flexural mode in which the antinode is at midspan becomes nonlinear. In contrast, the second flexural mode in which mid-span is the node point continued to exhibit constant damping. Increasing the degree of flexural damage increased the nonlinearity in damping of the first mode. The experiment of cantilever beam with varying degree of friction damping demonstrated that increasing the degree of friction resistance increased the nonlinearity in damping. Gradual change of location of friction force towards the antinode intensified the nonlinearity in damping of respective mode. These experimental findings indicated that the presence of damage results in nonlinear damping behavior. The location of the damage dictates the presence of nonlinearity in damping of each mode, while the severity of the damage intensifies this nonlinearity in modal damping. Then, the proposed method was used to assess the condition of a single spanned pre-stressed concrete (PC) girder bridge. Free vibration responses extracted from ambient response measurements of the selected bridge were analyzed using the proposed method and revealed that the modal damping behavior is constant for all active modes reflecting no damage as per the laboratory-scaled tested hypothesis.

Keywords: PC Bridges, Vibration-Based Damage Detection, Nonlinear Damping Identification, Variational Mode Decomposition

Dependence of Air Pollutants on Meteorological Parameters in Urban Environments: A Comparative Study of Battaramulla and Kandy

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Urban air quality significantly impacts public health and environmental sustainability amid rapid urbanization. This study delves into the intricate links between air pollutants and meteorological conditions in Battaramulla and Kandy, Sri Lanka, during 2020. Utilizing hourly data from two ambient air quality monitoring stations, it unravels the complex dynamics shaping urban air quality. Examining correlations between multiple air pollutants, including ozone, nitrogen dioxide, carbon monoxide, sulfur dioxide, and particulate matter (PM) with meteorological variables (ambient temperature, relative humidity, solar radiation, precipitation, and wind speed) using Pearson correlation analysis in R software, the research offers valuable insights into these interrelations. In Battaramulla, air pollutants generally showed weak negative associations with temperature and rainfall and moderately negative links to wind speed. O_3 displayed a strong positive relationship with temperature and a weak positive correlation with wind speed. CO, NO_2, and $PM_{2.5}$ showed weak positive correlations with relative humidity, SO_2, PM_{10}, and O_3 exhibited weak negative correlations. Solar radiation had weak negative correlations for CO, NO_2, and both PM types and a weak positive correlation for SO_2. Surprisingly, O_3 showed a moderately positive relationship with solar radiation. In Kandy, a similar pattern emerged, with pollutants generally showing weak positive associations with temperature and solar radiation. O_3 displayed a moderately strong positive relationship with these factors but a moderately strong negative association with humidity. Furthermore O_3, SO_2, and both PM types exhibited weak negative correlations with rainfall. Additionally, O_3, NO_2, SO_2, and PM_{10} displayed weak positive correlations with wind speed, while CO and $PM_{2.5}$ displayed weak negative relationships. Overall, this study unravels the intricate correlations between air pollutants and meteorological parameters in Battaramulla and Kandy, underscoring the complex nature of urban air quality dynamics and providing valuable insights for crafting location-specific strategies to address air quality concerns.

Keywords: Air Pollutants, Correlation Analysis, Location-specific Strategies, Meteorological Parameters, Urban Air Quality

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Development of a Numerical Weather Forecasting Model for Disaster Risk Reduction in Kandy

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Extreme rainfall events, which are frequent and widespread, pose significant hazards in Kandy, leading to potential flooding and landslide risks across various areas. Implementation of a numerical weather forecasting model for the Kandy region could mitigate these risks by enabling early disaster identification. Despite numerous studies on weather forecasting in Sri Lanka, there is a notable lack of research focusing on weather prediction in mountainous terrains like Kandy using numerical models such as the Weather Research and Forecasting (WRF) model. This study aims to fill this research gap by developing a 24-hour weather forecasting model for Kandy, with a particular focus on identifying the optimal microphysics parameterization scheme for the region. The input data for the WRF model was sourced from the National Centers for Environmental Prediction-National Center for Atmospheric Research (NCEP-NCAR) database. Four microphysics schemes which are WSM5, Ferrier, Lin et al., and WSM6 were evaluated against observed data from four rain gauge stations (Katugasthota, Kundasale, Kandy Kings Pavilion, and Madulkelle) at 0300 UTC, using WRF simulations for three rainfall events exceeding 50 mm/day. The optimal microphysics scheme was identified using statistical tests, including the frequency bias index (BIAS), root mean squared error (RMSE), mean absolute error (MAE), and Pearson correlation coefficient. The WRF model, run with the Ferrier microphysics scheme, was found to optimally simulate these rainfall events for the Kandy region, as evidenced by a low Total Model Performance (TMP) in two simulations. An evaluation of the Ferrier microphysics scheme for precipitation forecasting revealed overestimations between 25 mm to 60 mm at the Kandy Kings Pavilion and Kundasale stations, while underestimations between 8 mm to 40 mm were observed at the Madulkelle and Katugasthota stations. The developed model can be effectively used to forecast weather patterns and provide early warnings, thereby contributing to disaster risk reduction in the Kandy region.

Keywords: Extreme rainfall, Numerical Weather Forecasting, Weather Research and Forecasting, Kandy

Development of MATLAB Based User Interface (Med i TexLab) to Manipulate DICOM Images and Extract 93 Different Texture Features

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Studying the texture of biomedical images is an essential aspect of modern biomedical research, image segmentation workflow, and medical diagnostics. This involves the extraction of quantitative insights from complex imaging datasets. With the proliferation of DICOM imaging modalities, the demand for sophisticated software tools that capable of robustly processing, meticulously analyzing, and insightfully interpreting DICOM datasets has become paramount. To satisfy this demand, Med *i* TexLab developed a MATLAB-based graphical user interface (GUI), offering a suite of functionalities meticulously designed for DICOM image manipulation, texture feature extraction, and analysis. Before applying the application in vivo, proceeding with a descriptive scientific evaluation of its functionalities, architecture, and performance is essential. Therefore, this abstract on technical aspect of the software addresses this gap by meticulously exploring the Med *i* TexLab codebase, drawing upon established principles from software engineering, human and computer interaction, image processing, and biomedical informatics. The developed computer application allows the researchers to extract 93 different texture features in several perspectives like Fractal Features, Wavelet Transform, Gray Level Co-occurrence Matrix (GLCM), Local Binary Patterns (LBP), Gray Level Run-length Matrix (GLRM), and Texture Spectrum. Also, it allows to save the extracted texture features in a CSV file for further analysis. However, the Med *i* TexLab has positioned itself as a unique paradigm, allowing the user to access, manipulate, and extract texture features from DICOM images. To demonstrate the functionality of the application, we have loaded five different sequences of magnetic resonance imaging (MRI) brain and breast images (T1, T2, T2*, diffusion and proton density-weighted image), computed tomography (CT) images of brain and abdomen, ultrasound images of abdomen, mammograms as well as clinical X-ray images of chest, shoulder and digital dental X-rays. With each demonstration, the interface provided promising results and was able to collect texture feature details to a CSV file as programmed. Also, the user-friendliness of the application was evaluated by an expert in human and computer interaction (HCI). The evaluation process was based on several components like usability, functionality, accessibility, user experience, and context of use. The result of the as follows: Usability: 85/100, Accessibility: 65/100, and Functionality: 95/100, User Experience (UX): 85/100, Context of Use: 50/100. The robust image processing capabilities of the interface bridge the gap between sophisticated analytical techniques and user-friendly accessibility. Since this is the only available computer application that includes all the aforementioned features and functionalities with a simple four-step process (image loading, zoom in/out, draw region of interest, calculate texture features) the application becomes unique and timely needed tool for researchers who involved in studies based on DICOM images and clinical practice to develop enhancements, and advancements as well as identifying reference texture feature values of specific tissues from healthy /unhealthy individuals.

Keywords: Biomedical Image Analysis, DICOM, MATLAB, Graphical User Interface, Software Evaluation, Optimization

Dog and Cat Counts in Sri Lanka, Daththa: An Innovative User-Friendly Digital Approach

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Number of dogs in Sri Lanka is estimated compared to the human population, for various national level programs, while there is no information available on cats. This estimate has proven wrong, at times with regard to various dog mediated lethal human health conditions. A reliable island wide estimate on dog and cat counts, would keep public health professionals and veterinarian at an advantage. We have developed a user-friendly mobile application, *"Daththa"* to be utilized in estimating total number of dogs and cats in any given administrative area. This software categorizes dogs and cats as (a) completely owned, (b) partially, communally, or collectively owned, or (c) completely unowned. An unowned (stray) dog is defined as any dog observed twice, once in the morning and once in the evening on the same day (sight-re sight method). Dogs seen either in the morning or evening, are considered to have some ownership. The software was tested in Udaperadeniya village. Counting started from a designated point, travelled on a predetermined route while using the mobile software and interviewing house owners. After surveying 58 houses, the route and GPS points were forwarded to a second person who counted dogs and cats encountered outside houses while traveling along the same route. The second person conducted counts in morning and evening on the same day, and on the subsequent Sunday. In 58 households, there were 30 owned dogs. There were 3 stray dogs, 14 partially owned/community dogs on the week day and on Sunday, 3 stray dogs and 12 partially owned/community dogs. A total of 13 cats with owners and 8 without owners were reported. Mobile data reception was the most significant logistic problem. Plans have already been made to test the software, after resolving problems, in four different administrative districts and subsequently in the entire country.

Keywords: Digital survey, Dog & Cat count

Enhancing Bamboo Structural Grading under Axial Compressive Load: A Comparative Analysis of Green and Yellow Bamboo

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This study enhanced the structural grading of two Sri Lankan bamboo species subjected to axial compressive loads. It created strength and capacity grading systems for *Dendrocalamus giganteus* (Green bamboo) and *Bambusa vulgaris* (Yellow bamboo). Bamboo exhibits nature's inventiveness by providing a renewable and environmentally beneficial alternative to conventional building materials. Its quick growth and adaptability make it ideal for sustainable buildings, particularly in hot, humid climates and earthquake-prone areas. Despite its strong performance bamboo's full potential in modern building remains largely untapped due to insufficient design guidelines and the material's natural diversity. This work attempts to improve bamboo structural grading under axial compressive load whereas develop standardized testing and design methodologies by looking at the physical and mechanical properties of aforementioned two bamboo species. 60 samples from Green bamboo and 35 samples from Yellow bamboo were obtained to perform mechanical tests. Various diameters and ages were chosen to ensure sample representativeness. Compressive testing was performed adhering to ISO 22157 guidelines. The Universal Testing Machine measured compressive strength parallel to fibers. The maximum compressive loads (F_c) were recorded. Compressive strengths of bamboo samples were calculated by assuming hollow and solid circular sections (σ_{cw} and σ_{cc}, respectively). Linear mass (q) demonstrated a significant correlation with compressive force F_c, with coefficient of determination, R^2=0.78, making it an excellent predictor for bamboo structural grading. The correlation between q and F_c was relatively low (R^2=0.25) for yellow bamboo. Culm density and wall density were identified to be better predictors to estimate σ_{cc} with R^2=0.69 and σ_{cw} with R^2=0.68 in green bamboo. All the predictors indicate low R^2 values (R^2<0.25) when predicting σ_{cc} and σ_{cw} of yellow bamboo. Results show that the compressive capacity of the bamboo can be predicted more accurately than the compressive strength. Hence capacity grading of bamboo is more effective comparing with strength grading.

Keywords: Bamboo, Compressive Strength, Linear Mass, Correlation Values, Sustainable Construction.

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Evaluating Emergency Remote Learning in Physiotherapy Education in Sri Lanka: Preparing for a Technologically Advanced Future

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The evolution of technology has significantly transformed education, with online learning becoming increasingly prevalent. The COVID-19 pandemic accelerated this shift, prompting educators to adopt emergency remote learning (ERL) methods integrating technology. This study evaluated the ERL strategies employed by the State Universities offering Physiotherapy degrees in Sri Lanka, aiming to discern better practices and explore student perceptions of this paradigm shift. A descriptive cross-sectional survey, utilizing a pre-tested online questionnaire, was conducted. The study included participants from all three State Universities, utilizing total population sampling of the 3rd and fourth-year undergraduates. The three institutions were designated as 'A', 'B', and 'C'. The data was collected during 2022, post-pandemic period. A total of 112 responses were received, with 40 responses each from institutions A and C, and the remaining 32 responses from institution B, resulting in a response rate of 67%. Results showed significant inter-institutional disparities ($P<0.05$) in online content delivery and assessment practices. The online content delivery included the provision of lecture notes ($P<0.001$), recordings ($P<0.001$), and video materials ($P=0.002$). Notably, Institution A prioritized content dissemination, while Institution B emphasized student-centered activities. Conversely, Institution C experimented frequent online assessments comparatively. Across all three institutions, lecture note provision was the commonest practice, whereas online assessments were scarcely implemented. However, despite all these variations, students exhibited preference for traditional face-to-face instruction over online delivery for both theoretical (67%) and practical (98.2%) aspects of physiotherapy. Further, the students' overall experience suggested a greater satisfaction with traditional in-person delivery compared to online methods. The study revealed significant differences in the ERL strategies among the three State Universities, indicating substantial opportunities for each institution to enhance its approaches. Nonetheless, addressing negative perceptions of online education warrants further qualitative exploration to optimize the integration of evolving technologies in future educational endeavors in physiotherapy, in Sri Lanka.

Keywords: Online Education, Emergency Remote Learning (ERL), Physiotherapy Education, Student Perception

Evaluation of Effective Radiation Dose to the Male Gonads during High Resolution Chest Computed Tomography Examinations

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Medical radiation imaging carries vital benefits to the mankind along with its inherent inevitable radiation risks. When considering the close proximity of the region of interest to the imaging field, possible radiation exposure to the male gonads during Computed Tomography (CT) chest examinations warrants careful scrutiny of gonadal radiation dose. Hence this study aimed to evaluate the effective radiation dose to the male gonads during CT Chest examinations**.** This quantitative study assessed the gonadal radiation dose in HRCT chest exams with and without lead shielding, while investigating the impact of shielding on image quality. The study was carried out in the National Hospital Kandy, Sri Lanka, from August 2023 to October 2023. Gonadal dose was compared with and without 0.5mm lead shielding of 26 patients who underwent HRCT chest examinations using an electronic dosimeter. Image quality was assessed with RadiAnt DICOM Viewer, and data were analyzed using Minitab software. The study results revealed a substantial reduction in radiation dose to male gonads with lead shielding during HRCT chest examinations. Without shielding, the mean equivalent dose was 0.08104 mSv, which decreased to 0.02838 mSv with shielding. The effective dose dropped from 0.0064832 mSv to 0.0017028 mSv, aligning with ICRP recommendations. Statistical analysis confirmed significant reductions ($p < 0.05$), with a 64.98% decrease in radiation dose with proper lead shielding. Also, it was confirmed that there was no proof of image deterioration caused by the lead shielding. In conclusion, there is significant effective radiation dose to male gonads during HRCT chest examinations which can be evidently reduced with the use of proper lead shielding without degrading the image quality.

Keywords: HRCT Chest, Gonadal Radiation Dose, Shielding, Radiation Protection

Fabrication of Dye-Sensitized Solar Cells Based on Natural Pigments Extracted from the Mixture of Betel, Areca Nut, and Calcium Carbonate

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Dye-sensitized Solar Cells (DSCs) are emerging as promising alternatives to silicon-based solar cells due to their simplicity, efficiency, and cost-effectiveness. DSCs emulate photosynthesis, with the sensitizer converting absorbed solar photons into energetic electrons. Expensive organic dyes like Ruthenium-based N719 and N3 have traditionally been used, but natural pigments like Chlorophyll and Anthocyanin offer cost-effective alternatives. This study explores natural dyes extracted from betel, areca nut, and calcium carbonate ($CaCO_3$) as sensitizers. 2.5 g each of betel, areca nut, and 1 g of $CaCO_3$ were ground together, added to distilled water and ethanol, and filtered. Red tannin dye and green cocktail dye, which containing a combination of Chlorophylls and tannin, were extracted from the distilled water and ethanol, respectively. DSCs were assembled with dye-absorbed TiO_2 photoanode, prepared by drop-casting on FTO glass plates, a Platinum (Pt) counter electrode, a 0.20 cm^2 window mask, and liquid iodine/iodide (I^-/I_3^-) electrolyte. The cells achieved energy conversion efficiencies of 0.15% (Voc of 0.49 V, Jsc of 0.54 mA/cm^2, FF of 0.56) and 0.29% (Voc of 0.52 V, Jsc of 0.84 mA/cm^2, FF of 0.66) for the tannin and cocktail dyes, respectively, under standard AM 1.5 irradiation. The highest IPCE of ~8% was observed at 350 nm for the tannin dye and ~14% at 355 nm for the cocktail dye. The UV-visible absorption spectra revealed peaks at 242.00 nm for the red dye, and 663.50 nm, 434.00 nm, and 229.00 nm for the cocktail dye, indicating the presence of tannin in the red dye and both Chlorophylls and tannin in the cocktail dye. Notably, cocktail dye showed higher efficiency, while tannin dye showed lower efficiency in DSCs. This study highlights the potential of natural dyes from sustainable materials like betel and areca nut to improve DSC performance, aiming for efficient and eco-friendly solar cell technologies.

Keywords: Betel, Dye-Sensitized Solar Cells, Natural Dye, Photoanode, Platinum

Face perception- Facial Age and Anger Expression

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Different facial features affect the perception of human faces. For example, gender, age, and visual identity of a human can be promptly extracted from cranial and facial features of the face. Older faces are processed differently than younger ones and faces expressing diverse emotions are processed differently. Research shows that angry faces are more attended to compared to neutral or other expressive faces, which is known as the 'threat advantage'. The literature has indicated that older faces can be perceived as more threatening than young angry faces. The current experiment investigated subjective ratings in response to neutral and angry faces of young and old individuals, to examine how facial age influences the perception of anger. Participants who were free of neurological or psychiatric disorders and dyslexia were presented with facial stimuli consisting of eight different male facial images, with all possible combinations of neutral versus angry faces and young versus old faces. A questionnaire was given to test the participants' subjective interpretation of the eight faces. It presented each facial stimulus in a pseudo-randomized order, asking the participant to rate each one on a nine-point rating scale about threat rate (1 = least threatening, 9 = most threatening). The results showed that both young and old angry faces were rated as threatening, while old neutral faces were indicated to be more threatening than young neutral faces. This data, in combination, suggests a higher emotional salience of old angry faces compared to young either angry or (young or old) neutral faces.

Keywords: Facial Age, Anger, Perception, Threatening Face

Hybrid Genetic Algorithm for the Hybrid Electric Vehicle Routing Problem with Mode Selection

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Hybrid electric vehicles (HEVs) are becoming increasingly popular due to stringent carbon emission regulations. However, their limited battery capacity necessitates stopping at recharging stations during transport. This study introduces the Hybrid Electric Vehicle Routing Problem (HEVRP) with mode selection, incorporating recharging or refilling at power or gasoline stations. The modes include battery-based mode (primarily operated by the Electric Engines), gasoline-based mode (primarily operated by the Internal Combustion Engines (ICE)), balance mode (operated by both of the above methods in balance), and only gasoline mode (only operated by the ICE). Efficient route planning is crucial for minimizing energy consumption and maximizing fuel efficiency through optimal mode selection according to road conditions. We propose a Hybrid Genetic Algorithm (HGA) to address the HEVRP with mode selection. The HGA combines Local Search (LS) techniques with Genetic Algorithm (GA) techniques, formulated as a mixed integer linear programming model. Using Solomon's benchmark data, categorized into small (5, 8, 10 customers), medium (15, 20, 25 customers), and large-scale (between 30-100 customers) datasets, we conducted numerical experiments. The results demonstrate that the proposed HGA outperforms the traditional GA method in efficiency and effectiveness, not only for small-scale scenarios (for HGA average value is 84.14 and time is 33.46s, for GA average value is 95.48 and time is 99.79s) but also produces better results for medium (for HGA average value is 155.19 and time is 364.46s, for GA average value is 184.42 and time is 702.19s) and large-scale (for HGA average value is 570.33 and time is 2292.43s, for GA average value is 679.25 and time is 2593.48s) situations. This research contributes to sustainable transportation by enhancing HEV efficiency through advanced route planning. Our findings highlight the positive impact of integrating GA and LS algorithms, offering a robust solution to the HEVRP with mode selection.

Keyword: Hybrid Vehicle; Vehicle Routing Problem; Mode Selection; Hybrid Genetic Algorithm

Identification of Forage Ensiling Lactic Acid Bacteria from Silage

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Lactic acid bacteria (LAB) inoculants used to accelerate forage ensiling are not currently produced in Sri Lanka. This study aims to extract genomic DNA from LAB present in silage to precisely identify the species with the goal of producing silage inoculants locally. Silage samples were collected from the Central, North Central and Northern provinces and stored at -4° C. Each sample (10 g) was aseptically homogenized with sterile distill water (90 mL) in plastic bag using a stomacher (3 min, high speed). Supernatants were serially diluted with peptone water, surface-plated on MRS agar, and incubated (37º C, 48 h). The colonies presenting typical LAB morphology (white, round, entire margins) were streaked on MRS agar. Further, Gram staining, mobility, and catalase activity of the pure-cultures were assessed. All the isolates were Gram positive, non-mobile, and negative for catalase, confirming them as LAB. The isolates were frozen (-20° C) in 20% (v/v) MRS glycerol broth. Genomic DNA of the isolates was extracted using the Presto TM Mini gDNA Bacteria Kit. The quality of genomic DNA was determined using 1% agarose gel electrophoresis and a NanoDrop spectrophotometer. The DNA concentration of the extracts ranged between 12.20 and 34.60 ng/µL with a mean value of 20.80±2.20 ng/µL. Additionally, the ratio of absorbance at 260/280 nm ranged between 1.31 and 1.99 with a mean value of 1.70±0.08. The PCR success rate was 100%. The PCR products representing forage species and province were selected for the DNA sequence analysis. The 16S rRNA gene was performed using the 27f (forward) and 1492r (reverse) universal primers. The NCBI database and BLAST search were used to identify the species of the isolates. The DNA sequencing analysis resulted identification of *Lactobacillus plantarum*, *Lactobacillus rhamnosus*, and *Lactobacillus paracasei* with 100% query cover and percentage identity. Meanwhile, the query cover and percentage identity for *Lactobacillus oris* were 99% and 94.81%, respectively. The identified LAB species can be used to produce inoculants for forage ensiling.

Keywords: Concentration, DNA Extraction, Gel electrophoresis, NanoDrop Spectrophotometer

This study was supported by University Research Council (URC), University of Peradeniya (URC MD Grant 381).

Identification of Implementation Barriers of House Lifting Construction Technology by Using Hydraulic Jack Lifting in the Sri Lankan Context

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Adopting house-lifting construction techniques promotes environmental sustainability by reducing the environmental impact of demolition and new construction. Elevating structures reduces vulnerability to flooding, hence safeguarding life and property during severe weather occurrences. This approach improves resilience, lowers rebuilding costs, and promotes sustainable development by overcoming implementation challenges including resource scarcity and ecological impact. Even though there have been significant advancements in construction technologies worldwide, innovative techniques like house-lifting construction using hydraulic jacks have not been widely utilized in Sri Lanka. Therefore, this paper aims to identify the implementation barriers of house lifting technology by using hydraulic jacks in the Sri Lankan context. Interviews and an extensive questionnaire survey were used to assess this study. The gathered data was analyzed using the frequency index approach and content analysis. The results highlighted that one of the main barriers is this hydraulic jack lifting technology incurs the highest implementation cost and the equipment associated with this technology is costly. The shortage of experts in the area of hydraulic jack lifting technology in the Sri Lankan construction industry was identified as another main barrier in this research study. To address this issue this study recommends that there should be the involvement of the government and related authorities by providing the initial investments and guidance to the construction industry practitioners.

Keywords: Implementation Barriers, House Lifting Construction, Hydraulic Jacks, Sri Lanka

Impact of Air Quality due to Traffic Congestion on Human Health

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Escalating concerns about air pollution in Sri Lanka, especially affecting respiratory health, require urgent attention. Rapid urbanization is exacerbating the problem with emissions from transport, industry, agriculture, smoking and deforestation. This study investigates the effects of traffic congestion on air quality, focusing on Kandy, a vulnerable city due to its unique geographical location. The study uses a multidisciplinary approach, combining atmospheric data collection with surveys targeting residents' respiratory health. Field measurements of atmospheric particulate matter were collected using a $PM_{2.5}$ and PM_{10} counter (AEROQUAL Series 500 portable air quality monitoring device), at three targeted locations in Kandy. Further a questionnaire survey was conducted focusing on respiratory disorders among residents, where 150 questionnaires were gathered. This interdisciplinary approach allowed for a comprehensive analysis of air quality and its impact on public health. The results indicated higher particulate fraction in the sites with longer dry periods and elevated traffic intensity. Further, the questionnaire survey indicated that in the high exposure category, exceeding 6 hours of exposure significantly correlated with an increased incidence of respiratory issues. Overall, these findings contribute to a nuanced understanding of the complex interactions between particulate matter and traffic intensity, and health outcomes in a few hotspots close to Kandy. The findings underscore a correlation between traffic-related emissions and respiratory disorders. Effective interventions with air-born particulate matter pollution contributors CO_2, NO_2, SO_2, mineral dust, carbon particles, and heavy metals are essential. The insights gathered provide a basis for policies and initiatives aimed at reducing the adverse effects of air pollution in Kandy and similar areas.

Keywords: Air Pollution, Respiratory Disorders, Traffic Congestion, $PM_{2.5}$ Monitoring, Public Health

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Impact of Synthesis Methods on the Size and Shape of Zinc Oxide Nanostructures

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Zinc oxide (ZnO) has gained a lot of research interest in the present owing to its possibility of usage in various applications such as in solar cells, sensors, photodetectors, photo-catalysts, supercapacitors, and many others. In many of these applications, the size and the shape of the ZnO particles play an important role. This research focuses on facile low-cost synthesis methods of ZnO particles, and how these methods affect the size and shape of the produced particles. The ZnO synthesis was carried out using the chemical precipitation method, followed separately by microwave irradiation, usage of capping agents, and thermal decomposition. The sizes and morphologies of the synthesized samples were assessed using scanning electron microscopy. The microwave irradiation method produced ZnO rods showing a variation in rod size with the length of microwaved time intervals (15 s, 30 s, and 60 s). A relative decrease in the size of the ZnO rods with larger cycle time intervals was observed, the smallest width (~177 nm) being observed for the rods microwaved in 60 s cycle time intervals. The usage of capping agents resulted in ZnO rods, showing a dependence on the capping agent used. The rods synthesized by the usage of Starch and Polyvinyl alcohol (PVA) as capping agents showed axial capping, while those synthesized using Polyethylene glycol (PEG) as the capping agent showed lateral capping. The ZnO particles synthesized using the thermal decomposition method showed a granular shape. The sample synthesized by using Na_2CO_3 as the base showed a noticeably smaller mean particle size of ~75 nm, than those synthesized using NaOH as the base, which showed a mean particle size of ~222 nm. The XRD analysis confirmed that the synthesized particles were ZnO existing in its Wurzite phase. The results show how the size and shape of ZnO nanoparticles can be controlled by manipulating the synthesis conditions.

Keywords: ZnO Particles, Microwave Irradiation, Capping Agents, Thermal Decomposition.

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Improvement Drought Tolerance Properties in Rice through Soil Incorporation of a Superabsorbent Polymer with or without Compost

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Superabsorbent polymer (SAP) application can be used as an effective soil amendment method for relieving drought impacts on crops. Combining SAPs and Compost (COM) may boost soil available water, thereby dehydration tolerance (DT) capacity of rice. Therefore, Study was conducted under microcosmos conditions in two experiments: (E1) explore the effects of SAPs on DT strategies of Bg314 (a designated DT variety) and Bg352 (a general cultivar) and (E2) examine the cumulative impact of both SAP (50 $kgha^{-1}$) and COM (COM: Soil=1.5:2.5) on the DT adaptations of Bg314. In both experiments, similar physiological drought cycles were imposed (i.e. 70-40% field capacity; FC) while control plants were kept above FC, saturated conditions. Continuous growth measurements and two sets of morpho-physiological measurements including photosynthetic gas exchange (GE), chlorophyll fluorescence (CF), electrolyte leakage (EL), relative water content (RWC), and chlorophyll content (Chl) were taken between maximum tillering and panicle initiation (M1) and then, between grain filling and maturity (M2). Yield, thousand grain weight (TGW), plant dry weight (PDW), water-use efficiency (WUE), soil moisture content (SMC), and root dry weight at two depths (RDWt; 0-40 cm, RDWd; 40-75 cm) were recorded at harvest. In both experiments, SAP effect was significant ($p<0.05$) for most traits at M2 irrespective of the variety or COM. In E1, SAP significantly ($p<0.05$) increased RWC, SMC, RDWt, and WUE and decreased EL in both varieties under drought. Similar effects were seen in E2 with a noticeable increase in RWC and decrease in EL. In E2, SAP had a significant ($p<0.05$) positive effect on GE parameters of Bg314 under drought. However, SAP effect was not significant for CF, Chl, PDW, growth, and yield or TGW in both experiments ($p>0.05$). Current results demonstrate that SAP stimulates rice DT while SAP and COM together improve DT, WUE, and GE in rice under drought.

Keywords: Dehydration Tolerance, Drought, Compost, Superabsorbent Polymer, Water Use Efficiency

Influence of Sintering Temperature of RGO based Counter Electrodes on Efficiency of Cds Quantum Dot-Sensitized Solar Cells (Qdsscs)

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Quantum dot-sensitized solar cells (QDSSCs) have emerged as a promising technology for next-generation photovoltaic devices due to their high efficiency, tunable optical properties, and potential for low-cost production. For QDSSCs to operate at a higher efficiency, the counter electrode (CE) needs to meet a number of requirements. CE should not photo-decompose, compatibility with the polysulfide electrolyte, be highly electro-catalytic and should not dissolve in the electrolyte. For CEs, reduced graphene oxide (RGO) that satisfies all of these criteria is a wise option. The purpose of this work was to determine how the efficiency of QDSSCs is affected by the sintering temperature of RGO-based CEs. Photo-anodes were prepared using CdS QDs deposited using SILAR method. Graphene oxide (GO) was prepared using Modified Hummers method was reduced at 850 ^{o}C in a furnace. XRD and Raman spectrum indicated that GO was reduced to RGO. CEs fabricated by spraying RGO on to FTO substrate were subsequently sintered at various temperatures from 150 ^{o}C to 250 ^{o}C in steps of 50 ^{o}C, keeping the sample for 20 min at each sintering temperature. The solar cell efficiency gradually increased up to 250 ^{o}C sintering temperature. Beyond 250 ^{o}C, the efficiency decreased. This could be due to the structural changes of RGO. The highest PCE of 0.845% was recorded for the CE sintered at 250 ^{o}C. The electro-catalytic activity and conductivity of CEs were further elucidated by smaller semicircle in the higher frequency region of electrochemical impedance spectroscopy (EIS) and higher limiting current density of Tafel plot at 250 ^{o}C. The morphology of CEs was revealed by scanning electron microscopy images. It was determined that the sintering temperature of RGO based CEs have a significant impact on the performance of the QDSSCs. Further studies are needed to understand the structural changes of RGO with sintering temperature.

Keywords: Reduced Grapheme Oxide, Counter Electrode, Quantum Dot Sensitized Solar Cells.

Interaction between Climatic Extremes and Vegetable Supply Chain Performance: Conceptualizing a Pre-Preparedness Mechanism

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Developing a comprehensive understanding of the direct impacts of climate change and the cascading impacts of climate variability is essential for examining the influence on vegetable supply chain performances. However, there is a lack of well-established methodology for capturing the complex interaction between climate extremes and vegetable supply chain performances in Sri Lanka. Hence the objective of this study was to develop a conceptualized model to capture this complex interaction in the vegetable supply chain. The field data collection was designed as a focus group discussion that consisted of 65 vegetable farmers and 10 wholesalers in Nuwara Eliya which was conducted in November 2023. This conceptualized approach had three main phases; including (1) Developing a graphical interpretation between climatic extremes and vegetable supply chain performances (Cognitive mapping), (2) A field data collection to identify variables involved in climatic extremes and vegetable supply chain performances, (3) Assessing the conceptualized dynamic model using multiple case scenario technique. It was observed that temperature and rainfall extremes directly affected different performance dimensions of the vegetable supply chain, especially production, and logistics. More than 90% of the sampled vegetable farmers and 83 % of wholesalers stated that climate change was a significant risk for their supply chain nodes. The findings showed a significant decline in the availability of raw materials, which increased the risk of stock-outs. The common scientific basis of these three methods is the systematic identification, analysis, and modeling of the relationships and impacts of climatic extremes on vegetable supply chain performances to understand and predict system behaviors. Hence this suggested model mainly disclosed two different cost categories influenced by climate change: production costs due to resource scarcity and logistic costs. This conceptualized interaction between climate extremes and supply chain performances can be utilized as a baseline study to develop a pre-preparedness mechanism in the vegetable sector.

Keywords: Climatic extremes, Cognitive mapping, Dynamic model, Supply chain

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Ionic Liquid Treated Non-Polymer Gel Electrolyte for Magnesium-ion Battery Application

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This study focuses on the design and synthesis of a novel, cost-effective non-polymer gel electrolyte incorporating magnesium borohydride ($Mg(BH_4)_2$), ionic liquid (IL) (1-butyl-1-methylpyrrolidinium bis (trifluoromethanesulfonyl) imide ($PYR_{14}TFSI$)), ethylene glycol (EG), and fumed silica (SiO_2) to address the problem of low ionic conductivity in electrolytes for rechargeable magnesium batteries. Under this project, a liquid electrolyte sample series was prepared by varying the molar ratio of EG to $Mg(BH_4)_2$ ([200:1], 200:2], [200:2.5], [200:3], and [200:4]) at room temperature (27 ^oC). Their conductivity measurements were taken for the sample series at room temperature. The highest conductivity achieved was 4.628×10^{-4} S/cm, and the molar ratio of EG to $Mg(BH_4)_2$ for the corresponding sample was (200:2.5). Ionic liquid was added to the best conducting sample ($Mg(BH_4)_2$ / EG) by varying the volume of the ionic liquid (30.0, 50.0, 70.0, 80.0, and 100.0 µl), and another liquid electrolyte sample series was prepared. Their conductivity measurements were taken for the sample series at room temperature. The highest conductivity achieved was 1.0728×10^{-3} S/cm, and the corresponding sample consisted of a volume of ionic liquid of 70.0 µl. Finally, fumed silica (SiO_2) was added to the best conducting sample ($Mg(BH_4)_2$ / EG / ionic liquid) by varying the weight of fumed silica (20.0, 40.0, 60.0, and 80.0 mg) and the final gel electrolyte sample was prepared at room temperature. The gel electrolyte sample was optimized ($Mg(BH_4)_2$ / EG / ionic liquid / SiO_2), and the corresponding sample consisted of the mass of fumed silica (80.0 mg). Their conductivity measurement was taken for the gel electrolyte sample at room temperature. The conductivity of the gel-electrolyte was 5.5701×10^{-3} S/cm. The ionic conductivity of this gel electrolyte can be improved further, and it can be used to check performance with magnesium-ion batteries.

Keywords: Ionic Liquid, Fumed Silica, Magnesium Borohydride, Ethylene Glycol, Gel-Electrolyte

Investigating the Effect of Concrete Confinement Towards the Lateral Performance of Concrete Filled Steel Box Columns

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Elevated highways and bridges have become a major part of modern transportation networks. In such structures, piers play a major role in transferring loads into the substructures and foundations. These structures should be able to withstand both vertical and horizontal loads such as earthquakes. Several materials and design criteria have been practiced and structural steel has been identified as the most suitable and economically viable material for the seismic performance of the piers. In steel piers, it can be identified that there are several practices to improve the lateral performance such as positioning stiffeners and diaphragms to prevent local buckling of side plates, using high strength materials, double column arrangements and concrete filling. In both numerical and experimental studies, it has been identified that the Concrete Filled Steel Tubular (CFST) columns have comparatively better performance than steel hollow piers. Lateral restraint of concrete increases its ductility, strength, and energy absorption capacity, which is known as the confinement effect. The focus of this study is to numerically investigate the effect of confinement of concrete towards the overall performance of the pier and to propose methods to increase the confinement of concrete in CFST columns by altering the stiffener arrangement and the dimensions of the stiffeners. First, A comprehensive finite element model has been developed and validated against previous experimental data under lateral cyclic loads. Next, by adopting the same modelling procedure, a parametric study was conducted by using ten numerical models of stiffened CFST columns with different cross sections where the stiffener arrangement is varied. Results revealed that the "T" arrangement gives the most effective stiffener arrangement towards the confinement effect. Then, the flange to web ratio of the T-shape stiffeners varied and the section with width to flange ratio of 2.0 was identified as the best performing section for the strength and energy dissipation capacity.

Keywords: Steel Piers, Concrete Confinement, Cyclic Loads, Finite Element Modelling

Investigation and Optimization of Thermoelectric Properties of Hydrochloric Acid Doped Polyaniline

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Global warming and the depletion of fossil fuels have driven the demand for novel energy conversion technologies. Thermoelectricity is a phenomenon that can convert waste heat into electricity. A thermoelectric module is an array of two dissimilar (p-type material and an n-type material) thermoelectric materials (TEMs), arranged electrically in series and thermally in parallel. Since conventional TEMs like Bi_2Te_3 and Sb_2Te_3 are toxic and rare, there exists a high demand for non-toxic TEMs. The p-type organic semiconductor/conductive polymer: polyaniline (PANI), has been widely used in thermoelectric power generation due to its low cost, non-toxicity and easily tunable thermoelectric properties through doping. An attempt has been made to optimize the thermoelectric properties of PANI through doping with hydrochloric acid (HCl). The chemical oxidative polymerization method was used to synthesize HCl doped PANI (HCl-PANI). The synthesized powder was pressed into pellets to measure the electrical conductivity at room temperature and temperature dependent Seebeck coefficient for 8 different HCl concentrations, 1.0 M, 1.25 M, 1.5 M, 1.75 M, 2.0 M, 2.5 M, 3.0 M and 4.0 M. The successful synthesis of HCl-PANI was confirmed by Fourier Transform Infrared Spectroscopy (FTIR). Characteristic peaks (1364, 1217, and 1088 cm^{-1}) were consistent with PANI. Thermogravimetric Analysis (TGA) revealed that HCl-PANI is stable in the temperature range from room temperature to 350 °C. The highest electrical conductivity values of 3.5 and 3.4 S m^{-1} were observed for 1.50 M HCl-PANI and 1.25 M HCl-PANI respectively. The highest Seebeck coefficient value of 1.4 $\times 10^{-3}$ V K^{-1} was observed for 1.25 M HCl doped PANI at 303 K. 1.25 M HCl-PANI provided the best thermoelectric properties among the HCl concentrations studied, with a power factor of 6.66 x 10^{-6} W m^{-1} K^{-2} at 303 K.

Keywords: Thermoelectricity, Polyaniline, Chemical oxidative Polymerization, Electrical Conductivity, Seebeck Coefficient

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Knowledge, Attitude and Practice of Emergency Management of Tooth Avulsion among School Dentaltherapists and Trainee School Dental Therapists in Sri Lanka

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Tooth avulsion is one of the most severe forms of dental trauma with multifaceted consequences impacting dental and overall development of thechild. The prognosis of avulsed teeth hinges upon prompt and appropriate emergency management. School dental therapists play a pivotal role as initial responders, given that most of these incidents occur within school premises. Understanding the knowledge, attitude, and practice regarding emergency management of avulsed teeth among the school dental therapists and trainee school dental therapists is essential for favorable treatment outcomes. Aim of this research is to assess the knowledge, attitude, and practice of emergency management of tooth avulsion among school dental therapists and their trainees in Sri Lanka. A descriptive cross-sectional survey was conducted among trainee school dental therapists who were following the school dental therapists training program in 1st and 2nd years at dental therapists training school, Maharagama and island- wide school dental therapists with the aid of pre-tested, self-administered questionnaires.Two hundred and thirty-seven (65.83%) SDTs and 47(87.03%) trainee SDTs had responded to this survey. The majority of SDTs (86.5%) had high knowledge regarding emergency management of tooth avulsion. Only a few (7.6%) of SDTs and 25.5% of trainee SDTs knew the best storage mediumfor avulsed teeth. Only 79.3% of trainee SDTs and 85% SDTs knew the replantation should be carried out within 60 minutes for a better prognosis. One hundred and fifty-two of SDTs came across avulsion cases, but only 7of them had tried for replantation. The study revealed that school dental therapists have a high level of knowledge while trainees have average knowledge about emergency management of tooth avulsion. Both groups need reinforcement in weak areas such as storage media, extra oral dry time for avulsed teeth and clinical practice of SDTs regarding replantation of avulsed tooth.

Keywords: Avulsion, Dental trauma, Emergency management, School dental therapists, KAP Study

Larvicidal Effect of Pseudomonas Mosselii Against Larvae of Dengue Vector Mosquito Aedes Aegypti

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Due to limitations and drawbacks associated with current mosquito control strategies, there is a growing demand for innovative methods, such as the utilization of entomopathogenic microorganisms. In this study, we investigated the larvicidal properties of toxins produced by the bacterium *Pseudomonas mosselii*. The bacterium was isolated from the egg surface of *Aedes* mosquitoes and cultured in Luria Broth medium for five days at 30 °C. The bacterium culture with an optical density (OD) of 1.7 was used to assess larvicidal activity against *Ae. aegypti*, the primary vector of dengue disease. Third instar larvae (n=15 per concentration with four replicates) were utilized for all assays. Initially, the larvae were exposed to supernatants of the bacteria culture ranging from 0.170 to 0.068 OD. Freeze-dried cell-free supernatant and freeze-dried bacterial culture were also evaluated for toxicity. Larval mortalities were recorded at 24, 48, and 72 hours, and the percentage mortality data were subjected to log probit analysis to estimate the Lethal Concentrations required to kill 50% and 90% of larvae (LC_{50} and LC_{90}). Respective LC_{50} values of 0.093, 0.092, and 0.089 OD were obtained for 24-, 48-, and 72-hour exposures to the supernatant of bacterium culture, with corresponding LC_{90} values of 0.157, 0.152, and 0.146 OD. LC_{50} values of 2729 ppm, 2644 ppm, and 2632 ppm with LC_{90} values of 2991 ppm, 2990 ppm, and 2968 ppm were obtained for freeze-dried supernatant for the respective time intervals of 24, 48, and 72 hours. Freeze-dried bacterial culture showed relatively high toxicity with LC_{50} values of 2572 ppm, 2511 ppm, 2440 ppm, and LC_{90} values of 3131 ppm, 3018 ppm, and 2948 ppm. A significant positive correlation was observed between treatment concentrations and percentage mortalities ($r=0.9$, $p<0.05$). Overall, the results indicate strong larvicidal activity of *P. mosselii* bacterial metabolites, suggesting its entomopathogenic activity against *Aedes aegypti* larvae.

Keywords: Biological Control, Dengue Vectors, Entomopathogenic Microbes, Larvicides

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Motion Artifact Removal in MRI Using U-NET Neural Network

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Magnetic Resonance Imaging (MRI) is one of the most useful tools available today for medical diagnosis. One major drawback of MRI is that due to their relatively long scan acquisition time they are very sensitive to in-scanner patient movements. These movements could result in motion artifacts in the final scan. These artifacts primarily manifest in two forms: blurring or smearing, resulting in an unfocused appearance on the scan, and ghosting, which introduces extraneous elements and compromises important structural components within the scan. Both these artifacts could lead to a significant degradation in the quality of the MRI. This could affect the overall accuracy of the clinical diagnosis as well as making automated diagnosis challenging. In this paper, we propose a U-NET type neural network architecture that requires less computational resources to train and is able to remove motion artifacts from head MRI to improve the accuracy of the images. The model was trained to minimize the Mean Squared Error. One of the main bottlenecks faced in this research is the scarcity of task-specific datasets. Hence, to ensure robust training, accurately simulated motion artifacts were introduced into the non-corrupted MR-ART dataset to generate training pairs. Subsequently, the model's efficacy was tested using clinically captured MRIs with motions**.** Motion corrected MRIs were rated by medical professionals for the quality of the output. The assessment conducted by professionals demonstrated that the model is effective in accurately removing motion artifacts.

Keywords: MRI, Motion Artifact Removal, U-NET, Motion Artifact Simulation, Clinical Validation

Novel Fly Ash based One-part Geopolymer for Stabilization of Expansive Road Subgrade

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Expansive soils present significant challenges in road construction on account of their volumetric changes and low unconfined compressive strength (UCS). The conventional technique for soil stabilization entails the use of a chemical stabilizer like ordinary Portland cement (OPC), which is the most commonly used binder. However, the sustainability of OPC is hindered by greenhouse gas emissions. Alkali-activated geopolymers have emerged as sustainable alternatives. Geopolymers, which are formed by activating aluminosilicate precursors in an alkaline environment, come in one-part (OP-G) and two-part (TP-G) forms, with OP-Gs offering convenience and lower costs for transportation over TP-Gs. This study aims to evaluate the strength and swell characteristics of an expansive road subgrade material stabilized with OP-G. First, a comprehensive experimental program was undertaken for the mix optimization of OP-G stabilized soil based on UCS and cost. Altogether 16 UCS tests were conducted by varying binder/dry soil and solid NaOH/Fly ash (FA) ratios. Based on the findings, the optimal OP-G mix was determined at binder/dry soil = 0.2 and solid NaOH/FA = 0.1. In the second part of the study, the strength and swell characteristics of the optimum OP-G were compared with the optimum TP-G and OPC mixes. Laboratory tests, including the Atterberg limits, swell pressure, UCS, and California bearing ratio (CBR), were conducted on all three stabilized mixtures. The UCS values of the OP-G, TP-G, and OPC-treated samples were 1.23, 0.98, and 2.77 MPa, while the CBR values were 24%, 16%, and 81% respectively. All three stabilizers satisfied the ICTAD requirements for subgrade materials (UCS from 0.75 MPa to 1.5 MPa and CBR ≥ 15%). Despite the superior UCS and CBR of OPC, the OP-G can be a viable alternative, surpassing OPC in swell control and environmental impact. The outcomes reflect the effectiveness of OP-G in stabilizing expansive road subgrades.

Keywords: Expansive Soil, Fly Ash, One-Part Geopolymer, Soil Stabilization, Strength

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Peer Feedback in ESL Writing: A Boon or a Bane?

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Peer feedback is widely recognized as an effective strategy in producing a piece of writing. Though peer feedback plays a pivotal role in the writing process, students from secondary and tertiary level educational institutions in Sri Lanka rarely use/ have been trained to use peer feedback in ESL Writing. In such a context, the purpose of conducting this research study was to uncover student and teacher perceptions of using peer feedback in the writing process. Approximately one hundred students enrolled in an English as a Second Language (ESL) Program offered by a Sri Lankan state university and four ELT professionals responsible for teaching these students participated in the research project. As part of the study, the students completed a collaborative writing activity and revised their pieces of writing based on peer feedback. A questionnaire survey was then administered to explore student perspectives regarding the use of peer feedback whereas a focus-group interview was conducted to uncover teacher perceptions of peer feedback. Classroom observations and pieces of writing revised by randomly selected groups of students based on peer feedback forms were also employed as part of the data collection procedure. According to the findings, most of the student respondents believe that peer feedback is beneficial for writers in accomplishing what they wish to accomplish as writers. An analysis of the revised pieces of writing associated with the said peer feedback forms also testifies to the crucial role played by peer feedback in the writing process. Additionally, the teachers who participated in the focus-group interview unanimously agreed on the positive aspects of using peer feedback in teaching ESL Writing. Classroom observations further helped strengthen the beliefs of the research participants regarding peer feedback. The results provide implications for ELT professionals involved in administering ESL Programs, designing curricula, & preparing lesson material.

Keywords: ESL Writing, Peer Feedback, ESL Students, ELT Professionals

PEDOT: PSS/GO based Three Electrode Photo Supercapacitor to Harness Light Energy and Storage

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The potential use of photo-powered energy storage devices in smart electronics has attracted a lot of attention due to the emerging power crisis in the world. Therefore, a device capable of simultaneous energy harvesting and storage is crucial. This effort involved the fabrication of a photo-supercapacitor comprising three electrodes. A dye-sensitized photoanode and two graphite electrodes coated with poly(3,4-ethylenedioxythiophene) polystyrene sulfonate and graphene oxide (PEDOT: PSS/GO) were utilized as the three electrodes. In the fabrication process of the device, a gel polymer electrolyte was integrated between a five-layer TiO_2-based photoanode and the middle electrode, as the dye-sensitized solar cell (DSSC). The middle and counter electrodes of the supercapacitor were separated by a filter paper soaked with KOH. The bifunctional middle electrode, which serves as both an electrode for the supercapacitor and a counter electrode for the DSSC to allow electrolyte regeneration, was a double-sided coated electrode based on PEDOT: PSS/GO. Also, a comparison was conducted between PEDOT: PSS/GO and PEDOT: PSS/GO/Ascorbic acid-based photo supercapacitors. Ascorbic acid was added as a dispersing as well as GO-reducing agent. Before the assembly of the hybrid device, the DSSC, and the supercapacitor were analyzed separately. The performance of the fabricated photo supercapacitor was then evaluated under a light intensity of 1000 W m^{-2}. The photo supercapacitor utilizing PEDOT: PSS/GO-based middle and counter electrode was able to achieve a power conversion efficiency of 1.14%, open circuit voltage (V_{oc}) of 0.66 mV, current density (J_{sc}) of 4.35 mA cm^{-2}, a fill factor (*FF*) of 0.40 and a specific capacitance of 3.22 F g^{-1}. The PEDOT: PSS/GO nanocomposite optimized the electrical double layer capacitance provided by individual GO sheets and the photo capacitive contribution of redox-active PEDOT: PSS. The results show that the photo convertibility, *FF*, and V_{oc} are higher in PEDOT: PSS/GO system compared to the ascorbic acid-based system.

Keywords: Photo-Supercapacitor, Dye-Sensitized Solar Cells, Symmetric Supercapacitor, PEDOT: PSS/GO Nanocomposite

Performance of Maximum Likelihood and Bayesian Estimators for the Poisson Distribution

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The Poisson distribution is the standard distribution to model count data having only one parameter, λ. To estimate λ, several point estimators are available in the literature and their performance could be varied under various situations. Among the several available estimators, the commonly used estimator is the maximum likelihood estimator (MLE). This work compares the performance of Bayesian estimators, based on gamma prior squared error loss (SEL) and quadratic loss (QL) functions, with MLE in various situations with respect to the mean square error (MSE) sense by formulating a simulation study. The gamma distribution is a more flexible lifetime distribution having shape and scale parameters and it is an informative conjugate prior for λ. Here various situations were formulated by varying the gamma distribution parameters, sample size and λ. Further, two real-world applications (i) the number of horse-kick deaths of Prussian military personnel and (ii) customers' arrival at an ice cream stand to buy ice cream, were considered in order to verify the simulation study results. From the simulation study and real-world application results, we could conclude that the simulation study results are consistent with the real-world application results and performance of different estimators are affected by various gamma distribution parameters, sample size and λ. Further, for a higher sample-sized data set ($n > 50$), the performance of all given estimators are the same. When we have smaller sample-sized data set, MLE is the best option for a data set with a considerably higher mean and otherwise, the Bayesian estimator is the best option.

Keywords: Poisson Distribution, Bayesian Estimation, Prior Distribution, Squared Error Loss, Quadratic Loss, Mean Square Error

Potential for Producing Leaf Meal Pellets for Ruminant Rations from Wasted Gliricidea (Gliricidia sepium) Leaves

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The conventional protein supplements for ruminant feeding in Sri Lanka are expensive. Being a tree legume, Gliricidia (*Gliricidia sepium*) leaves are rich in crude proteins (CP, 15.4% - 28.8%). A substantial amount of Gliricidia leaves is wasted from Gliricidia plantations managed for Dendro power generation. The objective of this study was to investigate the potential for the production of Gliricidia leaf meal pellets (LMP) as a protein supplement for ruminant rations. Tender Gliricidia leaves harvested, dried, ground, and the proximate composition of the leaf powder (LP) was determined. Using the *in-vitro* gas fermentation assay, the organic matter digestibility (OMD) and metabolizable energy (ME) of LP were determined. Additionally, the *in-vitro* tannic bio-assay was employed to determine the biological effect of tannins in LP. The highest level of LP that could be incorporated into LMP was determined by conducting an experiment with six mixtures containing different percentages of LP, molasses and wheat flour. The mixtures were pelletized, and dried pellets were analyzed for proximate composition, hardness, OMD and ME. The experiment was conducted as a complete randomized design. Gliricidia LP recorded 25.09% CP, 62.36% OMD and 9.06 MJ/kg ME. The tannic bio-assay confirmed that there was no significant ($P>0.05$) biological effect of tannins in LP. The highest level of LP that could be incorporate in LMP was 89%. Despite a lower CP level (20.62% vs. 23.93%), the LMP, which included 77% LP, exhibited significantly ($P<0.05$) greater OMD (80.69% vs. 69.20%) and ME (11.96 MJ/kg vs. 10.15 MJ/kg) compared to those that included 89% LP. The study suggested the potential inclusion of 77% Gliricidia LP in the production of Gliricidia LMP with greater nutritive value as a protein supplement in ruminant rations.

Keywords: Crude Protein, Leaf Powder, Metabolizable Energy, Organic Matter Digestibility

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Seismic Performance of Steel Hollow Box Column under Combined Effect of Fire and Cyclic loading: Thermo-Mechanical Numerical Approach

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Steel structural elements are becoming more common in modern structures due to their multiple benefits. These steel structures may be damaged by the combined impact of fires, earthquakes, and other dynamic loads during their service life. The deformation and bucking of steel structures are more complicated when multiple disasters are coupled, causing more damage to steel structures than single disaster. This study investigated the seismic performance of steel hollow box column exposed to simultaneously combined lateral seismic loading and non-uniform temperature distributions using a unidirectional coupling methodology. In this study, the fire scenarios were simulated using a CFD based Fire Dynamics Simulator (FDS), and the FE analyses were performed using ABAQUS software. Initially, a numerical model for fire simulation and FE analysis was developed for steel hollow box column and validated using relevant experimental data. Subsequently, a parametric analysis was carried out to assess the seismic performance of steel hollow building columns with different slenderness ratios and constant width-to-thickness ratios. In this scenario, cyclic load analysis was conducted to determine the lateral load-lateral displacement variation of the steel hollow building column in order to assess seismic performance. The effect of column slenderness ratio on seismic parameters such as, ultimate strength, ductility and energy absorption capacity under fire condition and room temperature condition (25^{o}C) was evaluated in this study. It was observed that when the slenderness ratio varies within 0.25 – 0.45 range, maximum strength represents noteworthy reduction around 45% to 60% and energy absorption capacity represents around 50% to 65% under fire condition compared to the room temperature condition (25^{o}C). Furthermore, ductility under fire conditions remains relatively unchanged when using columns with a slenderness ratio below 0.35. However, once the slenderness ratio exceeds 0.35, a noticeable reduction in ductility occurs.

Keywords: Finite element simulation, Fluid dynamic simulation, Seismic performance, Steel hollow box column, Thermo-mechanical modeling

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SYNTHESIS AND CHARACTERISATION OF COCONUT SHELL-BASED ACTIVATED CARBON BLACK THROUGH KOH ACTIVATION

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Coconut shells (CS) are considered a promising renewable precursor for the synthesis of carbon black (CB). This study explores the potential of utilising coconut shell-based activated carbon black (ACB) as a sustainable solution for black colourant in printing applications, by optimising carbonisation parameters for CB synthesis and introducing a low-temperature chemical activation method using KOH. Thirty-six CB samples were prepared as combinations of three variables; particle size of CSs (0.1 mm, 1.0 mm, 2.0 mm, and 5.0 mm), carbonisation temperature (450 °C, 500 °C and 550 °C), and duration of carbonisation (2 h, 3 h, and 4 h) to analyse and identify the most effective synthesis parameters. The best CB sample (0.1 mm CS particles carbonised at 550 °C for 4 h) was identified based on the results of Fourier-transformed infrared (FT-IR) analysis and was activated using different weight ratios of KOH (the CB to KOH ratio 1:2, 1:4, 1:6 [w/w]) at 120 °C. FT-IR analysis reveals that reducing particle size, elevating carbonisation temperature, and duration enhance the removal of unstable volatiles as CO_2 in CB samples. Furthermore, the resulted FT-IR spectra confirm the presence of carbonyl groups, carboxylic groups, and C-H bonds as predominant functional groups in ACB, indicating successful activation. Powder X-ray diffraction analysis shows that activation with KOH induces the formation of both amorphous and crystalline phases within CB samples, with an increasing graphitic crystalline nature observed as KOH concentration rises; however, excessive concentrations lead to amorphous carbon formation. Scanning electron microscopy (SEM) images demonstrate that higher concentrations of KOH result in the formation of well-defined spherical micropores with larger sizes (0.656 μm). However, excessive concentrations (CB to KOH weight ratio 1: 6) lead to smaller or closed pores, due to the potential carbon collapse, suggesting that lower KOH concentrations enhance the surface area while maintaining overall performance. Future research will explore the eligibility of these ACBs as a potential black colourant in printing applications.

Keywords: Activated carbon black, Chemical activation, Coconut shells, KOH

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Synthesis of Acrylic based Polycarboxylate Ether High Performance Superplasticizer with Hydroxy Terminated Poly (Ethylene Glycol) Side Chains and its Effects on Cement Hydration

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The challenges we face in the industry on a daily basis include achieving the required high workability and the ability to maintaining concrete in a workable state for a long period with a minimal amount of water. This study focused on the synthesis and characterization of high-performance superplasticizer for concrete admixtures, classified as high slump, longer retention type of polycarboxylate superplasticizers (PCEs) and investigates its effects on cement hydration. The synthesis process involves grafting poly (ethylene glycol) side chains onto the main backbone to enhance dispersibility and water reducing property. The superplasticizers were synthesized through free radical co-polymerization of acrylic acid, hydroxyl ethyl acrylate, and isopentenyl polyoxyethylene glycol ether (TPEG) monomer using Fenton's reagents as the catalyst. The molecular structure of the resulting product was characterized using proton nuclear magnetic resonance spectroscopy (^{1}H NMR), Fourier-transform infrared spectroscopy (FTIR), Gel Permeation Chromatography (GPC) and confirmed the occurrences of polymerization. The comb-type polymer structure provides high fluidity and notable retention properties for cement slurry. The characteristics of this superplasticizer vary in relation to the length of the main chain and side chains. The performance of the novel superplasticizer was evaluated systematically, demonstrating excellent dispersing effects and excellent slump performance. The assessment of hydration heat and setting time indicated that the synthesized polycarboxylate superplasticizer has the capability to delay the hydration process of cement. Subsequent strength tests conducted at 3, 7, and 28 days demonstrated an enhancement in the compressive strength of the concrete.

Keywords: Admixtures, Polycarboxylate Superplasticizers, Co-Polymerization, Dispersibility, Fluidity Retention

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Synthesis of O-Alkylated Garcinol Derivatives as α-amylase and α-glucosidase Inhibitors

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Natural products and their semi-synthetic derivatives have become safer alternatives in treatment of Diabetic Mellitus. Garcinol, a polyisoprenylated benzophenone exhibits remarkable *in-vitro* anti-hyperglycemic activity with potent α-amylase and α-glucosidase enzyme inhibitory potential, which can be further enhanced through functional modifications. However, there aren't any studies on its analogues on antidiabetic properties. Hence, the present study was aimed to synthesize the structural analogs of garcinol via *O*-alkylation and evaluate their *in-vitro* anti-hyperglycemic activity. Dried and ground fruits of *Garcinia quaesita* were extracted into acetone: water (9: 1) using reciprocating shaker (24x3 hours). Garcinol was isolated from the crude extract and structure was confirmed by mass spectroscopy, NMR spectroscopy, FTIR and melting point data. Four novel derivatives of garcinol were synthesized by *O*-alkylation using RX (C_2H_5I (product 1), CCl_3Br (Product 2), $C_6H_5CH_2Br$ (product 3), $C_7H_6BrNO_2$ (product 4)) with a mild base and the products were characterized by mass spectroscopy, NMR spectroscopy and FTIR. The *in-vitro* anti-hyperglycemic activity was assessed by α-amylase and α-glucosidase enzyme inhibition assays. The product 1 (IC_{50} 28.45 ±1.17 mg L^{-1}) and product 2 (IC_{50} 34.90 ± 1.09 mg L^{-1}) showed no significance difference ($p>0.05$) while product 3 (IC_{50} 71.94 ± 6.36 mg L^{-1}) and product 4 (IC_{50} 55.27 ± 10.5 mg L^{-1}) showed significantly lower($p<0.05$) α-amylase enzyme inhibitory potential compared to garcinol (IC_{50} 37.81 ± 1.48 mg L^{-1}). The product 1 (IC_{50} 12.48 ± 0.28 mg L^{-1}) and product 4 (IC_{50} 13.92 ± 1.04 mg L^{-1}) showed no significance difference ($p>0.05$) while product 2 (IC_{50} 7.01 ± 1.61 mg L^{-1}) and product 3 (IC_{50} 47.39 ± 2.77 mg L^{-1}) showed significant difference($p<0.05$) compared to garcinol (IC_{50} 17.18 ± 1.53 mg L^{-1}) in terms of α-glucosidase enzyme inhibitory activity. These data showed that product 2 showed enhanced α-amylase and α-glucosidase enzyme inhibitory potential and it warrants further studies on *in-vivo* anti-hyperglycemic properties.

Keywords: Garcinol, *O*-Alkylation, α-amylase, α-glucosidase

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The Entrepreneurial Decision-Making Approaches of Undergraduate Business Operators: A Study Conducted at University of Peradeniya

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Unemployment among graduates is the diminishing return on countries investment for higher education and graduate entrepreneurs can reduce the unemployment among them. There are undergraduates in a university starting and running a business while conducting their studies. They are operating their businesses under a limited resource context. The aim of the study is to investigate the entrepreneurial decision-making (EDM) approaches adopted by undergraduate business operators, and whether the EDM approaches change with the owner and business characteristics. In doing so, the study drew on three different concepts of EDM approaches in resource-constrained environments—causation, bricolage, and effectuation. The research was conducted at the University of Peradeniya. The research employed mixed methods including a questionnaire survey with undergraduate business operators (n=81) and in-depth interviews with the subset of the sample (n=15). Data were analyzed using statistical tests (MANOVA and ANOVA) and were supplemented with insights that emerged through qualitative data. According to the findings of this study, undergraduate business operators adopted all three EDM approaches to different degrees and they have adopted effectuation and bricolage than causation. The results further revealed that these approaches significantly vary with the gender and family background of undergraduate business operators ($P < 0.05$). In particular, female undergraduates are highly adopted to effectuation while male undergraduates adopt causation. Undergraduate business operators who have family businesses are highly adopt to effectuation and those who do not have family businesses mainly adopt in causation approach. According to this study, there is not enough evidence to support that these approaches significantly vary with their management or business-related education and the type of business they are involved in (manufacturing, buying and selling, and service type business). The findings of the study could be important when flourishing undergraduates to be successful entrepreneurs.

Keywords: Undergraduate, Start-ups, Causation, Effectuation, Bricolage

The Impact of Postmodern Performance Practices on Post-Conflict Cultural Landscapes in Sri Lanka

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The prolonged civil war in Sri Lanka, concluding in 2009, left complex post-conflict legacies impacting economic, social, and cultural realms, as well as individual mindsets. This study examined the outcomes of a creative performance initiative implemented within these challenging social contexts, probing the efficacy of performance activities in addressing post-war issues. In 2022, the Department of Fine Arts at the University of Peradeniya and La Communauté Inavouable from France introduced the postmodern performance 'Museum (Theatre)' in Kandy. The following year, with the collaboration of the Kalam Cultural Institute of Jaffna, the performance was staged in Jaffna. These productions incorporated diverse creative interventions including drama, photography, installation art, and interactive audience participation. This paper analyzed Hyman Müller's postmodern play 'Hamlet Machine,' as performed during these events, focusing on participant-selected portrait photographs and conducting participant observation to analyze audience engagement. Specifically, the study explored how, in post-war Sri Lanka, approximately 13-14 years after the conflict, the socio-cultural landscapes of the northern and central regions were perceived and how effectively performance practices and installations intervened to capture these nuances. This practice-led research demonstrated the transformative potential of postmodern performance art in fostering dialogue and understanding in post-conflict societies, highlighting its relevance and impact in the specific context of Sri Lanka's post-war recovery and cultural revitalization.

Key Words: Performance Practice, Post-conflict time, Sri Lankan Civil War, Hamlet-Machine.

The Impact of Supply Chain Risk on Supply Chain Agility Performance with the Mediating Role of Supply Chain Integration: Empirical Study of Manufacturing Industry in Sri Lanka

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In Sri Lanka, the manufacturing industry, including apparel, and rubber products, is a major economic contributor, being the second-largest contributor to GDP. However, the industry continuously faces supply chain disruptions, such as longer delivery times, high work backlogs, and stock shortages. These challenges cause significant setbacks for organizations, prompting them to adopt agile practices and improve coordination between internal and external parties. Previous studies reveal inconsistent findings on the effects of supply chain risk on integration and its subsequent effect on agility performance. Therefore, this study was carried out in the context of manufacturing organizations to examine how supply chain disruptions affect supply chain agility performance where supply chain integration mediates the relationship. To examine this phenomenon, a structured self-administered questionnaire was circulated among selected organizations that fit criteria such as operational scale, supply chain involvement, and willingness to participate. The collected data was analyzed using SPSS and SmartPLS 4 software packages. Using a sample of 102, mainly in apparel, rubber, food, and beverages, it was found that supply chain risk significantly influences supply chain agility performance. At the same time, this study suggests that supply chain risk significantly affects supply chain integration, and in turn, supply chain integration significantly impacts supply chain agility performance. Moreover, this study reveals that supply chain integration partially mediates the relationship between supply chain risk and supply chain agility performance. It further reveals that the mediation effect is manufacturing organizations in Sri Lanka are required to adopt agility in their supply chains due to the high degree of risk in the supply chain ecosystem while adopting supply chain integration as the mediator. Further, this study encourages the government to incentivize collaboration among vendors and manufacturers, invest in education and resources for risk management, and support initiatives to enhance supply chain agility performance.

Keywords: Manufacturing Industry, Supply Chain Agility Performance, Supply Chain Integration, Supply Chain Risk

The Potential of Polypore Fungal Species Found in Sri Lanka, to Produce Mycelium- based Leather

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The conventional tanning techniques and animal product involvement of the leather industry relies on present ethical and environmental problems. Mycelium-based leather (MBL) has shown its potential as a green, cost-effective alternative to animal-based leather. This study explored the potential of producing MBL from Basidiomycetes fungi found in Sri Lanka, with improved features. Five potential Basidiomycetes Polypore fungal species were collected from decaying wood from the vicinity of Wilpatthu National Park (8°17'56.8"N 80°08'34.8"E), and five isolates (isolates 1, 2, 3, 4 and 7) were obtained aseptically at SIST microbiology laboratory. Isolates were cultivated under solid-state fermentation (SSF) using rubber sawdust and liquid-state fermentation (LSF) using Potato Dextrose Broth for 7, 10, and 14 days. Mycofabrication techniques were applied to enhance the mycelial mats' robustness, including heat killing, plasticization with glycerol, and beeswax coating followed by heat pressing. Tensile strength and elasticity of the mats were recorded to assess MBL's mechanical properties. Data were analyzed using R-studio version (2022.07.2). Growth rates varied significantly, with isolate 4 showing the highest (102.995mm²/h) and isolate 3 showing the lowest (23.541 mm²/h) values ($P<0.05$). ANOVA results showed significant differences in growth rates between samples. SSF did not yield mycelial mats, but LSF did, with the 14-day fermentation period being the most promising for sample 2,4 and 7. Sample 7 had the highest tensile strength (12.30 N/20 mm) and elongation at break (15.7%), while samples 2 and 4 had tensile strengths of 4.50 N/20 mm and 3.23 N/20 mm, respectively, showing values similar to animal-based leather. These findings warrant the use of Polypores as a renewable resource for sustainable leather manufacturing and offer vital insights for future development and commercialization as a Sri Lankan product in the global leather market.

Keywords: Polypores, Mycelium-Based Leather, Mycofabrication, Tensile Strength, Solid and Liquid Fermentation.

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Unraveling Ambiguities - Exploring Organizational Resilience and its Dimensions

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Resilience is important for an organization to survive and thrive in the dynamic environments in which it operates. Despite studies on individual and team resilience, research on organizational resilience is limited and plagued with problems of ambiguity regarding the definition of organizational resilience and its dimensionality. This paper will propose a set of dimensions for organizational resilience and definitions for the associated concepts through a review of the literature on organizational resilience with a special emphasis on indexed journals obtained from Hinari, Ebsco, Scopus, and Web of Science using the keywords resilience, organizational resilience, organizational resilience, and crisis. The review critically analyses the definitions, and the dimensions used from the indexed articles and proposes readiness, response, and recovery as the dimensions of organizational resilience. It defines organizational resilience as the organization's demonstration of readiness, response, and recovery in the face of disruptions such as pandemic situations, economic crises, and brain drain that are common to all organizations.

Keywords: Resilience, Organizational Resilience, Organizational Resilience and Crisis

Utilizing Machine Learning Algorithms on Microcontroller to Enhance Edge Computing for Sound Regression Applications

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Internet of Things (IoT) became very popular in the recent decade, due to its simplicity and remote accessibility. Machine learning (ML) plays a major role in developing the IoTs to work without human intervention. These unmanned technologies perform with improved functionality and high efficiency. For human sound recognition systems to achieve higher accuracy, more efficient computing devices with a continuous internet connection are required. This article presents an application of sound regression ML algorithms and the edge computing technique without using the internet. The edge computing technique helps transfer the sound regression machine learning model from the microcontroller to another device. The TensorFlow ML algorithm running in the microcontroller was used to create the noise regression model. This ML model is the framework used to train the dataset. 16000 voice samples were used to train the sound capture ML model. In this sound regression ML model, voice was categorized into four categories: forward, backward, left, and right. This trained sound regression model is run on the MagicBit development board (including the ESP32 microcontroller). Also, the ML model and the human voice were compared and found to be similar. An I2C microphone is used to capture human sounds on the MagicBit development board. With a test set comprising 50 samples, the system successfully recognized 46 samples correctly. This demonstrates an accuracy rate of 92%. The results have proven that the trained data sets were correctly matched with the input voice. The next step was transmitting the sound to another device. The ESP32 supported ESP-NOW communication protocol was used to transmit the detected sound to the Magic Key development board (including the ESP32 microcontroller). Hence, the results prove high efficient functionality of the system, and it underscores the fact that this operation doesn't depend on internet connectivity; only power is needed.

Keywords: Machine Learning (ML), Edge Computing, Tensorflow, Microcontroller, Sound Recognition

The electronic equipment essential for the study was provided by Magicbits (PVT) LTD, and the authors gratefully acknowledged the support.

Wind Tunnelling Effect on Different High-Density Building Environments: A Computational Fluid Dynamics Approach

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High-density building environments have become a significant characteristic of modern urban landscapes in response to the requirement of supporting an increasing urban population. The clustering of building structures in these situations presents distinct issues for pedestrian comfort and safety due to the wind interactions with structures such as tunnelling, shielding, and downwash effects. Most past studies on wind effects have focused on a selected arrangement of two or three buildings, without examining wind variations in different building arrangement types. Therefore, through this study, the wind tunnelling effect acting in three main categories of high-density building environments was explored using a block of 25 building units. Computational Fluid Dynamics (CFD) was employed here, utilising the Reynolds-Averaged Navier-Stokes (RANS) method with the Shear Stress Transport turbulence model (2k-ω SST). The mesh size around the building edges was set to 0.9 m, with the element size growth rate as 1.05 in model development. Categories I and II feature a central high-rise building (120 m height), while Category III has a central low-rise building (6 m height). In Category-I, the surrounding buildings have uniform height, with the relative height (λ) being the key parameter. In Categories II and III, the parameter measures the arrangement angle of building heights (θ) to the horizontal plane in negative and positive directions, respectively. The power law wind profile was used with a 5 ms^{-1} reference wind velocity at a height of 10 m above the ground. The parametric study was conducted by observing wind velocity variations at a height of 2 m above the ground (pedestrian level), and it was observed that Categories I and II demonstrated a gradual reduction of the tunnelling effect, which was followed by a subsequent increase with the increment of their respective parameters λ and θ. This gradual reduction in the tunnelling effect is due to the vortex shedding effect being significant, which dampens the tunnelling effect within the specific parameter range under consideration. Category III illustrated a consistent development in the tunnelling effect with the increment of the relevant parameter θ. This research clarifies how pedestrian comfort levels vary with different building arrangements, aiding city designers in optimizing building layouts to enhance pedestrian comfort.

Keywords: CFD Simulation, Pedestrian Comfort, Tunnelling Effect, Turbulence Models, Wind Response

EQUITABLE AND INCLUSIVE DEVELOPMENT

University of Peradeniya

A Case of Mania and Psychosis in a Patient with Dengue Fever

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Dengue is an arboviral infection endemic to the tropical countries. Neurological sequelae like encephalitis is well reported in dengue. There is growing recognition of its psychiatric manifestations like mania, psychosis and post dengue depression specially during convalescence period. We present a middle-aged male who developed mania and visual hallucinations while being managed for dengue during the convalescent phase. A 49-year-old male with 10 days of fever with positive IgM for dengue developed over talkativeness, irritability, visual hallucinations, and disinhibited behaviour during the latter part of the critical phase of the illness. There were no neurological deficits or altered sensorium during the episode. No past history or family history of mental illness. His metabolic screening and non-contrast CT brain were normal. Psychiatry opinion was taken and rapid resolution was noted after starting a small dose of olanzapine and discharged after three days of observation. He had a full recovery within the follow-up period of six weeks. Neuro-psychiatric manifestations of dengue is an emerging entity. These manifestations can be seen during the acute or convalescent phases of dengue due to the direct effect of the virus, capillary leakage or immune mediated derangements. Mood disorders are the most commonly reported psychiatric manifestations without neurological consequences. Our patient has developed psychosis during the leaking phase and it could be cytokine mediated. The pathophysiology behind neuropsychiatric manifestations of dengue remains unsorted. This will be the first reported case of dengue with psychosis in Sri Lanka. Being a dengue endemic country, this case will highlight the necessity of starting large scale studies to identify the pathophysiology of psychiatric manifestations in dengue.

Keywords: Dengue, Visual Hallucination, Mania, Psychotic Symptoms

Aflatoxins Contamination in Commercially Available Areca Nut and Commercially Prepared Areca Nut Products in Sri Lanka

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The prevalence of aflatoxins is a major concern in various agricultural commodities all over the world due to their harmful health effects including mutagenicity, teratogenicity, and carcinogenicity. Aflatoxins, which are produced by *Aspergillus* species, have been found in a wide range of food products in Sri Lanka in recent years. Areca nut is an addictive substance and is consumed by individuals either alone or as part of the betel quid. It has many adverse health effects, including the development of oral potentially malignant disorders and oral cancer. This study reports the status of aflatoxins contamination in commercial areca nuts and prepared areca products available in Sri Lankan market: fresh nuts, sun-dried nuts (karunka), fermented nuts (mada-puwak) and the sweetened form of areca nut (pani-puwak). High-Performance Liquid Chromatography with fluorescence detection was used to determine the concentration of aflatoxins B1 (AFB1), B2 (AFB2), G1 (AFG1), and G2 (AFG2) in the areca products. Out of the four areca nut products, pani-puwak had the highest level of total aflatoxins (28.5 µg/kg) and AFB1 contamination (23.47 µg/kg), exceeding the European Union's maximum permissible levels established for total aflatoxins (4 µg/kg) and AFB1 (2 µg/kg) in tree nuts. AFB2 and AFG1 concentrations in pani-puwak were 2.05 µg/kg and 2.9 µg/kg, respectively. The other commercial areca nut products did not contain any type of aflatoxins above the limits of detection (AFB1: 0.03, AFB2: 0.01, AFG1: 0.02 and AFG2: 0.01 µg/kg) of the analytical method. The occurrence of aflatoxins in pani-puwak may have resulted from fungal growth during improper storage and/ or processing. Our results suggest that the pani-puwak may pose an additional health risk in addition to its well-known effects, which calls for further assessment, the establishment of legal restrictions, and raising public awareness on areca nut consumption.

Keywords: Aflatoxins, Areca Nut, Contamination, Pani-Puwak, Sri Lanka

A GIS-based Spatiotemporal Analysis of Chronic Kidney Disease/Chronic Kidney Disease of Unknown Etiology in the North Central Province, Sri Lanka (2010-2020)

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Chronic Kidney Disease (CKD)/CKD of Unknown Etiology (CKDu), has become a significant public health concern in North Central Province (NCP), Sri Lanka over the last decade. This study aims to analyse the spatiotemporal patterns of CKD/CKDu in the NCP from 2010 to 2020, focusing on hotspots and their correlation with the population over 60 years, the age group with the highest prevalence. The NCP, located in the dry zone, covering 10,472 km², is the largest province in Sri Lanka that has over 3,000 tanks and a population of 1.3 million, with more than 65% engaged in agriculture-related activities. Data collection relies on the Annual Health Bulletin-2020 for CKD/CKDu cases per 100,000 population, demographic data from the Humanitarian Data Exchange and previous research studies. The analysis focused on 03 time phases; 2010-2013, 2014-2016, and 2017-2020 employing multi-temporal mapping, hotspot analysis, and correlation analysis using ArcGIS 10.8.2 and Excel. The study revealed that, from 2010-2013, hotspots were concentrated in Padaviya and Kebithigollawa in the northern Anuradhapura district, and during 2014-2016, this concentration shifted to Madavachchiya and Rambewa. From 2017-2020, hotspots moved to Elahera and Tamankaduwa in the west of Polonnaruwa, areas not previously identified as hotspots. Remarkably, the southern of Anuradhapura has consistently been a coldspot over the past decade. In Horowpothana, Kahatagasdigiliya, Maha Vilachchiya, Padaviya, Lankapura, and Elahera, high incidences of CKD/CKDu correlate with a high elderly population. Conversely, areas such as Galnewa, Kekirawa, Ipalogama, Palagala, and Thambuttegama have a high elderly population but fewer reported cases of CKD/CKDu. Access to drinking Reverse Osmosis (RO) water projects, improved health infrastructure, CKD/CKDu screening and awareness programs influenced the CKD/CKDu hotspot dynamics in the NCP. Identifying these spatiotemporal changing patterns and their correlation with demographic factors provides insights for public health interventions and resource allocation to address the CKD/CKDu burden in the region.

Keywords: Chronic Kidney Disease, CKD of Unknown Etiology, Hotspots, North Central Province, Geographic Information System

A Greek Poet and Roman Citizenship: Cicero's Pro Archia Poeta and its Reflections on the Roman Attitude towards 'Others'

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Cicero's *Pro Archia Poeta* remains as one of the most enduring defenses of the humanities and liberal arts found in classical literature. While defending the poet Archias' right for Roman citizenship, Cicero eulogizes liberal arts and humanities as essential for the wellbeing of the individual and the society. Consequently, the speech had attracted scholarly attention over time, particularly due to its political, cultural and literary significance. However, the present research examines Cicero's *Pro Archia Poeta* and its reflection of the Roman attitude towards 'others'; an aspect that is critical to the understanding of the work itself, as well as certain modern sensibilities associated with citizenship, migration and identity. Methodologically, the study involves the close reading of Cicero's speech in the original Latin as the primary source, along with the consideration of modern scholarly views. Upon close analysis, Cicero's appreciation of Greek literature and admittance of Rome's debt to Greece is apparent throughout the speech. For him Greece is indeed the center of cultural refinement and intellectual vigour. Yet, it is noteworthy that Cicero celebrates Archias more as a poet than a Greek poet. Thereby, he strips off Archias' 'Greekness' to make him appear more 'Roman,' starting with using Archias' Latin name. The very basis of Cicero's argument claims, firstly, that Archias has established himself among the Roman elite, winning their patronage. Secondly, Cicero argues that Archias, through his works, has immortalized the greatness of Rome, thus making Archias' poetic genius a public good conferred on the Romans. Such views appear self-serving for the Roman audience, and possibly used by Cicero due to his undertaking: arguing for a Greek poet's 'worthiness' for Roman Citizenship. Yet, the very fact that Cicero believes such arguments would affect his audience itself is symptomatic of certain racial bias existing in his contemporary Roman society.

Keywords: Cicero, Latin Literature, Oratory, Othering, Post-Colonial Theory

A Human Right to Companionship: Addressing the Post-pandemic Technological Isolation

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The COVID-19 pandemic has significantly exacerbated mental health issues worldwide, with a notable increase in the prevalence of conditions such as anxiety and depression. One of the primary contributors to this surge is the heightened isolation stemming from the widespread adoption of modern technology in work and education. The shift to remote work and online education, while necessary for maintaining societal functions during lockdowns, is continued even in the post-pandemic 'new normalcy' which has given rise to unprecedented forms of alienation and isolation, especially in the institutional frameworks originally designed and intended to facilitate human interactions. The vitality of companionship has been asserted by many psychological, sociological, and neuroscientific studies. Several human rights bodies including the United Nations Human Rights Council have identified the significance of mental health as a global health priority and has recognized the potential effects of COVID-19 on mental health, and the present study seeks to investigate whether the existing international standards on the right to mental health have adequately addressed the human need for companionship as one of its essential components. A close inspection of relevant international and regional human rights treaties and other universal standards reveals that their major emphasis is on the rights of the mentally disabled and that they offer limited opportunities to meaningfully facilitate a human right to companionship. Therefore, this research aims to establish that companionship is a human right stemming from a fundamental human need and the necessity for its formal recognition in the human rights discourse. Given the interdisciplinary nature of this study, the authors engage in mixed methods research in analyzing the socio-psychological impact of the use of technology on human interactions, and in an in-depth qualitative analysis of primary and secondary legal sources to investigate the human entitlement to companionship and the need for its recognition as a fundamental human right.

Keywords: Right to Mental Health, Post-Pandemic 'New Normalcy', Remote Work and Online Education, Human Right to Companionship

An Anatomical Study on Pyramidal Lobe and Levator Glandulae Thyroideae of the Thyroid Gland in Sri Lankan Cadavers

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The pyramidal lobe (PL) is a developmental variant of thyroid gland, representing a persistent remnant of the thyroglossal duct which is found in 10-30% of the population. During total thyroidectomy, careful examination of the PL is crucial to prevent residual thyroid tissue causing persistent hyperthyroidism and acting as a potential site for thyroid carcinoma. Levator glandulae thyroideae (LGT) is a fibromuscular band or muscle present on the neck, typically connecting the pyramidal lobe to hyoid bone, and is another remnant of thyroglossal duct. In this study, the frequency, location, mode of attachment, and dimensions of the PL in the Sri Lankan cadavers were studied. Ten cadavers from the routine dissection classes were considered in the study, which included six males and four females within the age range of 70-90 years. During careful dissection of the thyroid region, PLs were observed and their length and the widths were measured using a digital vernier calliper. Three PLs were found as two (20%) in males and one in a female (10%) cadaver. All PL were originating from the isthmus at the midline. One (10%) of these male cadavers was associated with the thyroid ima artery. The other male and the female cadavers were having LGT (20%), one being fibrous and the other muscular. Both were connected to the pyramidal lobe inferiorly and were attached to the hyoid bone superiorly. The lengths of the PL were 13.5 mm and 22.95 mm, 4.94mm and the widths were 10.40mm and 5.60mm, 4.36mm respectively. One LGT muscle was associated with an accessory thyroid gland. As the presence of a PL is not rare, detailed knowledge is essential for healthcare professionals further, emphasizing the requirement for preoperative imaging. Furthermore, as the sample size is smaller, further studies are needed regarding the variations of thyroid lobes and vasculature.

Keywords: Pyramidal Lobe, Thyroid Gland, Thyroidectomy, Levator Glandulae Thyroideae

Anatomical Variations of Ansa Cervicalis: A Case Series of Sri Lankan Cadavers

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Ansa cervicalis (AC) is a nerve loop in the neck, containing the ventral rami of cervical spinal nerves, C1-C3. The loop is formed over the carotid sheath by the union of the superior root (C1–2) and the inferior root (C2–C3) and innervates the infrahyoid muscles. It innervates muscles involved in swallowing, vocalization, neck stability and is also used in nerve anastomosis in laryngeal paralysis. As it exhibits numerous anatomical variations, proper understanding of the anatomy is important in reconstructive surgery. However, Sri Lankan studies on the area are very minimal. In this case series, seven bilaterally dissected cadavers of routine dissection classes, including five males and two females in the age range of 70-90 years, were observed. Eleven intact ACs were found, in which eight were bilateral and three unilateral. The position of AC was also observed in relation to the internal jugular vein (IJV) and superior belly of omohyoid muscle (Om). In relation to IJV, it was categorized as medial and lateral, where the superior root being medial and inferior root being lateral to IJV, is considered as lateral type, and when both roots are medial to IJV, it is classed as medial type. There were 27.2 % medial type and 72.7 % lateral type ACs. In bilaterally dissected cadavers, two out of four (50%) were symmetrical. Out of the eleven ACs, three (27.2%) were below Om and one (9.09%) above and seven (63.6%) were at the level of Om. Compared to available literature worldwide and in Sri Lanka our findings in relation to IJV were similar however, in those studies, the majority of AC were reported as being superior to Om. Our findings highlight the diverse anatomical variations in the location of the ansa cervicalis. Therefore, we recommend further studies for Sri Lankan population which will be a good guide for the surgeons.

Keywords: Ansa Cervicalis, Anatomical Variation, Cadavers, Cervical Plexus

An Audit on Risk Factors, Spectrum of the Disease and Outcome of Soft Tissue Infections

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Soft tissue infections are a common clinical entity in surgical practice. There are recognized local, regional and systemic risk factors documented in literature with a vast spectrum of presentation. Failure of early treatment could lead to adverse outcomes. There is a minimal number of studies and local data available. This is a descriptive cross-sectional study which was conducted on 53 consecutive patients in Teaching Hospital Peradeniya to describe the risk factors, anatomical site, treatment and the outcome of soft tissue infections. Study population consisted of 30 males and 23 females in the age range of 22 years to 90 years, where 69.8% were above 50 years of age. Cellulitis (54.7%), abscesses (37.7%) and gangrene (13.2%) were the commonest presentations. Surprisingly, the majority had no preceding obvious injury (62.2%), while 30.1% reported a traumatic event. A significant number (80.3%) of the population presented with lower limb soft tissue infections. Diabetes mellitus (41.5%), hypertension (20.8%) and dyslipidaemia (11.3%) were the three main comorbidities identified. 52.8% had scars, 39.6% had an active ulcer and 33.9% had cracked feet which may have contributed. Within the blood investigations 67.9% of patients had increased white cell counts but 77.4% had elevated C-reactive protein levels. Almost all the patients (98.1%) had received antibiotics, mostly in IV route (90.4%). As per surgical management, surgical debridement (28.3%) and incision and drainage (20.75%) were commonly utilized. Out of the study population only 42.5% completely recovered and 51% end up with poor healing ulcers. One patient needed an amputation (2.1%). Therefore, elderly populations with multiple comorbidities are at high risk of developing lower limb soft tissue infections and end up having poor outcomes, despite medical and surgical management.

Key words: Soft Tissue Infections, Gangrenous Infection, Risk Factors, Management, Outcome

Anger, Anger expression and Perceived Stress among Nursing Undergraduates at the University of Peradeniya: A Descriptive Cross-Sectional Study

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Perceived stress is an important issue that can have a significant impact on nursing undergraduate's overall well-being. These issues cause to promote anger. When anger is under-expressed, it leads to negative consequences such as aggression, and physical violence. Therefore, this study aimed to investigate the relationship between anger, anger expression, and perceived stress. A descriptive cross-sectional study was conducted with the participation of 182 nursing undergraduates from the University of Peradeniya. A pre- tested self-administered questionnaire including demographic data, Perceived Stress Scale, Anger Scale, and Anger Expression Scale were used to collect data. Statistical analysis was conducted using SPSS version 27 and the significance level was set as $p \leq 0.05$. The Pearson correlation coefficient was used to examine the relationships between variables. The results showed a weak positive correlation ($r = 0.121$, $p = 0.128$) between moderate stress and moderate anger. A moderate positive statistically significant correlation ($r = 0.310$, $p < 0.001$) was found between stress and anger expression among the participants. Moreover, a moderate positive statistically significant correlation ($r = 0.346$, $p < 0.001$) was revealed between anger and anger expression. The findings showed when students reported feeling angry, they also tended to express that anger in their behaviors. These findings highlight the importance of supporting students in managing stress and handling their emotions in healthier ways. Offering them strategies to deal with stress and anger could make a real difference in their studies and future careers in nursing. It is crucial to give them tools to handle the pressure they face and find positive ways to express their emotions. This way, we can better support their well-being and their journey in to becoming successful nurses.

Keywords: Anger, anger expression, nursing undergraduates, perceived stress

Antibiotic Sensitivity of Soil Leachates and Soil Heavy Metal Status: A Case Study from Gohagoda Municipal Solid Waste Dumpsite, Sri Lanka

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Open dumping is prevalent in developing countries as a primary method of waste disposal without proper environmental safeguards. In Sri Lanka, Gohagoda Municipal Solid Waste Dumpsite is one of the hotbeds for the accumulation of pollutants, which is margined by the River Mahaweli, the main freshwater source for the downstream communities. There is a high chance of contaminating river water with dumpsite leachates, with pollutants like heavy metals, and antibiotic-resistant or less sensitive bacteria. This study aimed to investigate the bacterial abundance, antibiotic sensitivity, and heavy metal status of the Gohagoda dumpsite using soil and leachate samples. Soil samples were collected along four transects, at three distances away from the edge of the dumpsite (0, 10, and 50 m) and at two depths (0-20 and 20-50 cm) at each location. Leachates drawn from soil were used in determining bacterial abundance and antibiotic sensitivity, while soil samples were used for the heavy metal analysis. Bacterial abundance showed a significant difference among transects (p = 0.0012), with the highest abundance in the second nearest transect to the river. Antibiotic sensitivity was investigated using Amikacin (30 µg), Amoxicillin-clavulanate (20/10 µg), Ciprofloxacin (5 µg), Levofloxacin (5 µg), and Gentamicin (10 µg). For Amikacin, significantly reduced sensitivity was observed with an increase in depth (p=0.0185). For Amoxicillin, Ciprofloxacin, and Levofloxacin, sensitivity showed a significant variation among transects ($p<0.05$), with the least antibiotic sensitivity in the transect nearest to the river. Soil analyses revealed higher Manganese (Mn) levels, based on European Union standards, which may cause health implications like neurological defects upon groundwater contamination. High bacterial abundance and the least antibiotic sensitivity of bacteria in transects closer to the river indicates a major public health risk due to this dumpsite. This highlights the importance of more comprehensive studies to guide authorities in managing solid waste properly.

Keywords: Open Dumping, Leachates, Bacterial Abundance, Antibiotic Sensitivity, Heavy Metals

Anti-Candida Effect of Leaf Extract *of Diospyrus Atrata*

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The genus *Candida* belongs to the kingdom fungi that causes superficial and systemic infections in humans as well as animals including pigs, cattle and chicken. Candidiasis is treated with antifungals while antifungal resistance has been documented. *Diospyrus atrata* belongs to the family Ebenaceae which has many floral species with medicinal values. However, studies on anti-C*andida* effect of *D. atrata* are lacking. Objective of this study was to investigate the effect of the leaf extract of *D. atrata* against three medically important *Candida* species; *Candida albicans*, *Candida parapsilosis*, and *Candida tropicalis*. The extract of *D. atrata* leaves was prepared with 99% ethanol using the ground tender leaves followed by rotary evaporation. Then 0.1g of the rotary evaporated product was dissolved in 10ml of 99% ethanol for testing the anti-*candida* effect. Further, 99% ethanol was used as a negative control. Agar well diffusion assay was performed using Muller Hinton Agar plates in triplicate. The readings were taken by subtracting the diameter of the zone of inhibition given by the control from the diameter of the inhibition zone of the plant extract. The mean zone of inhibition against *C. albicans* was 10.67±0.58mm, *C. parapsilosis* was 4.33±1.53mm and *C. tropicalis* was 9.33 ±1.15mm. Above results indicate that the anti-candida activity of *D. atrata leaf extract* was higher against *C. albicans* and *C. tropicalis* compared to *C. parapsilosis.* As the conclusion, ethanolic extract of *D. atrata leaves* demonstrated anti-C*andida* effect against *C. albicans, C. tropicalis* and *C. parapsilosis*, indicating the potential of ethanolic extracts of *D. atrata* leaves to be developed as an anticandidal agent.

Keywords: *Candida, Diospyrus,* Antifungal, Anticandidal

Antimicrobial Activity *of Apis Cerana Bee Honey and Beeswax from Dry and Wet Zones of Sri Lanka*

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Antimicrobial resistance is a current global health crisis, urging the need for novel antimicrobials. *Apis cerana* bee honey and beeswax are natural substances rich in bioactive compounds. The objectives of the current study were to investigate the antibacterial and anti-candidal activity of *A. cerana* bee honey and beeswax. Twelve samples of honeybee colonies were collected; six from dry zone and six from wet zone. Honey and wax were separated and tested against 11 clinically important microorganisms; three Gram-positive bacteria, three Gram-negative bacteria and five *Candida* species (standard cultures). Dilutions of bee honey from 5% to 30% (v/v) were tested in Mueller Hinton Agar using the agar dilution method, to determine the Minimum Inhibitory Concentrations (MICs). The sugar content, density, pH, colour intensity and odour of honey were measured and correlated with the MIC (%). Antimicrobial activity of ethanolic extracts of beeswax was investigated using the well diffusion bioassay. Honey samples from the dry zone exhibited higher antibacterial activity against *Escherichia coli*, and higher anti-candidal activity against *Candida albican*s, *C. parapsilosis* and *C. tropicalis* compared to the wet zone samples. Lower activity was observed against the other test organisms. The sugar content and density of honey showed a weak correlation, pH and odour a positive and colour intensity a negative correlation with MIC (%). There was no significant difference (p>0.05) between inhibition zone diameters obtained for wax samples from dry and wet zones. The highest diameter (25 mm) was produced by beeswax against Methicillin resistant *Staphylococcus aureus* (MRSA) and lower diameters for *Candida* species. High sugar content and acidic pH may be responsible for the antimicrobial activity, particularly in bee honey. Detailed investigations are needed to identify the chemical compounds responsible for the activity. *Apis cerana* bee honey is a promising antimicrobial while the ethanolic extract of *A. cerana* beeswax is a promising antibacterial agent, particularly against MRSA.

Keywords: *Apis Cerana*, Antibacterial, Anti-Candidal, Physico-Chemical, Correlation

Assessing Flood *Prediction Models for the Kalu Ganga Basin using Hec-Hms*

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Rainfall-runoff modeling is a crucial tool for authorities managing flood-prone rivers. In Sri Lanka, flooding ranks among the costliest disasters in terms of property loss and human casualties. The country has 103 significant river basins. 17 associated with flooding issues. Among these, the Kalu Ganga is particularly prone to frequent flooding. The HEC-HMS (Hydrologic Engineering Center's Hydrologic Modelling system) has been successfully used to assess the behavior of rivers in numerous river basins worldwide, including those in Sri Lanka. Therefore, developing an HEC HMS model for the Kalu Ganga basin is an efficient strategy to predict floods and mitigate their damage. The HEC-HMS (Version 4.10) proves invaluable for simulating and analyzing rainfall-runoff dynamics. Event-based hydrological modeling reveals how a basin responds to individual rainfall events, which is crucial for flood prediction. This study evaluates six combinations of rainfall-runoff models using various hydrological approaches to determine the most effective model for catchment up to Ellagawa. The study considers criteria such as rainfall type (Event based), spatial process (Semi-lumped), model type (Empirical), and relevant parameters (Fitted parameters) based on acquired data to select model combinations. Event-based rainfall data from four gauging stations in the Rathnapura district and discharge data from the Ellagawa gauging station for the period of 2018-2021 are for Calibration and Validation. The initial parameters are optimized revealing that each model combination performs differently for each event. Among the selected combinations, the Initial Constant method paired with the Clark Unit hydrograph, the Recession base flow method with Lag, and the Muskingum method exhibit excellent performance. The model evaluation shows a Nash Sutcliff efficiency value of 0.98, RMSE of 0.1, and a Percent bias of 0.16. Visual assessments and statistical indicators demonstrate that the developed model reasonably predicts floods in the basin. Consequently, as we got in the evaluation part, it can serve as a valuable tool for flood prediction, providing forecasts for flood peaks and their timing with a reasonable degree of accuracy.

Keywords: HEC-HMS, Rainfall-Runoff Model, Event-Based Rainfall, Calibration and Validation

Assessment of BRAFV600E Mutation by PCR in Background Thyroid Tissue with Chronic Lymphocytic Thyroiditis Associated Papillary Thyroid Carcinomas of Patients

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Papillary Thyroid Carcinoma (PTC) is the commonest type of endocrine malignancy in Sri Lanka, and it's characteristic BRAFV600E mutation increases cancer risk and aggressiveness. Chronic Lymphocytic Thyroiditis (CLT) is an autoimmune disease studied for its association with PTC globally and in Sri Lanka. In this study, we hypothesized that CLT may serve as an etiological factor of PTC by facilitating an environment conducive to mutation occurrence; hence, the characteristic BRAFV600E mutation may also be present in non-neoplastic CLT areas. The aim of this study was to determine any significant association of BRAFV600E with CLT tissues. Hematoxylin and Eosin-stained slides of 62 PTC cases at National Hospital Kandy from January 2022 to July 2023 were retrieved and screened. Slides containing non-tumor backgrounds were categorized based on the presence and absence of CLT. FFPE tissue blocks of CLT-positive (n=15), and CLT-negative (n=17) cases were sectioned, followed by DNA isolation using an FFPE-specified gSYNCTM DNA Extraction kit. PCR amplification of a <150bp target sequence of BRAF exon 15 containing nucleotide 1799, and real-time mutation detection was performed using a Human BRAF gene mutation detection kit. Fischer's exact test with a significance level α=0.05, and an Odds Ratio (OR) was calculated considering BRAFV600E status as outcome and CLT presence as cause. The RT-PCR found BRAFV600E in 1/15 CLT-positive samples and 0/17 CLT-negative samples. Fischer's exact test revealed no statistically significant difference between the two groups (P=0.46875). Odds ratio of 3.62 (0.136, 95.6) suggests that odds of BRAFV600E occurring in CLT-positive group is 3.62 times higher than CLT-negative group. Although odds ratio indicated a higher likelihood of BRAFV600E in CLT-positive cases, results were not statistically significant. Thus, no significant association between BRAFV600E and CLT in non-neoplastic tissue of PTC patients was established. Further research with larger sample sizes is needed to validate these findings.

Keywords: BRAFV600E, Papillary Thyroid Carcinoma, Chronic Lymphocytic Thyroiditis, PCR, Sri Lanka

Assessment of Satisfaction with Laboratory Services among Patients Attending the Out-Patient Department at Teaching Hospital, Peradeniya, Sri Lanka

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Assessing the patients' satisfaction is an essential strategy for improving the quality of laboratory services. This study aimed to assess patients' satisfaction with laboratory services, who attended the out-patient department at Teaching Hospital, Peradeniya, Sri Lanka in August 2022. A cross-sectional survey was conducted using an interviewer-administered questionnaire among a consecutive sample of 232 patients where laboratory investigations were requested. A 5-point Likert scale with 1 (lowest satisfaction) and 5 (Highest satisfaction), was used to assess the patient's satisfaction. The overall rate of satisfaction for the specific laboratory service was calculated as (the number of very satisfied ratings x 5) + (the number of satisfied ratings x 4) + (the number of neutral ratings x 3) + (the number of dissatisfied ratings x 2) + (the number of very dissatisfied rating x 1) divided by the total number of rating (1-5). Fisher's Exact Test was performed to assess the association between dependent and independent variables using SPSS version 25. P value less than 0.05 was accepted. The majority were female (70.7%) and belonged to the age group of 58 years and above (29.3%). The mean satisfaction score was 3.82 ± 0.386. The mean scores of satisfactions for different laboratory services ranged from 3.17(±.856) to 4.13(± .654). Patients were highly satisfied with the location of the laboratory (82.6%), phlebotomy services (81%), measures taken to assure privacy during specimen collection (80.8%) and the ability of sample collectors (80.4%) while least satisfied with waiting time (63.4%), queue process (68.8%) and cleanliness of the latrines (69.2%). Age (P=0.035), and occupation (P=0.008) had a significant association with overall patient satisfaction. The patients' overall satisfaction was high. However, least satisfied areas were waiting time, cleanliness of latrines, and queue process. Improving these areas will advance the quality of laboratory services in Teaching Hospital, Peradeniya, Sri Lanka.

Keywords: Patient's Satisfaction Level, Laboratory Services, Teaching Hospital Peradeniya, Sri Lanka

Assessment of the Level of Physical Activity and its Awareness among Hypertensive Patients Attending Teaching Hospital, Peradeniya

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Hypertension is a significant global public health concern and approximately 1.28 billion adults aged 30-79 years are hypertensive. Sedentary lifestyles contribute significantly to hypertension, alongside unhealthy diets, tobacco, alcohol, and obesity. WHO recommends 150 minutes/week of moderate-intensity or 75 minutes/week of vigorous aerobic activity for those aged 18 years and above who are healthy or with chronic conditions including hypertension. The aim of this study was to determine the physical activity level in hypertensive patients and assess the awareness about the association between physical activity and hypertension. This cross-sectional study included 349 hypertensive patients above 20 years of age attending the hypertension clinic at Teaching Hospital, Peradeniya. The International Physical Activity Questionnaire validated for Sri Lanka was used to gather data on awareness, physical activity, demographics, disease characteristics, and risk factors. Blood pressure and anthropometrics were measured following standard protocols. Physical activity levels were measured using the metabolic equivalent of task (MET) scores. Analysis was conducted with SPSS version 20. Ethical approval was obtained from the Ethics Review Committee, Faculty of Medicine, University of Peradeniya. The mean age was 63 years and consisted of 70.2% females and 29.8% males. The majority (64.75%) had education beyond ordinary levels; 10.6% had education below grade five. Of the sample, 53% were never employed, 24.9% had retired and 22.06% were currently employed. Only 33% identified physical activity as a modifiable risk factor while 54% engaged in low, 37% moderate, and 9% high physical activities. Factors contributing to low levels of physical activity included time constraints (35%), social stigma (7.5%), body aches/discomfort (21%), lack of suitable exercise facilities (5.8%) and other unspecified factors (5.7%). This study concluded that the physical activity level among hypertensive patients attending the Peradeniya hypertensive clinic was low and awareness about physical activity for prevention of hypertension was poor.

Key words: Hypertension, Physical activity, Awareness

A Study on Comparison of Inter-Arm Difference in Blood Pressure between Patients with Cardiovascular Diseases and Non-Cardiac Conditions in a Tertiary Care Hospital

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An "Inter-Arm Difference" (IAD) in blood pressure (BP) is the difference between right and left-arm BP values which can deviate by more than 10 points, indicating a higher risk for cardiovascular diseases (CVD). Therefore, this study was aimed to compare IAD of BP in between CVD patients and non-cardiac patients (NCP) in a selected tertiary care hospital in Kandy. A descriptive study was conducted, including 124 patients with CVDs and 124 with non-cardiac conditions, selected from the medical wards and hypertension clinics at Teaching Hospital Peradeniya. In each participant, BP was measured simultaneously in both arms, three times in 5 minutes apart using a digital BP monitor while participants were in sitting position. The average of the second and third readings was calculated for each participant. Data were analysed by SPSS version 26. Average right arm systolic BP (SBP) among CVD patients and NCPs were 133±24 mmHg and 117±16 mmHg ($p<0.001$). Average left arm SBP among CVD patients and NCPs were 131±24 mmHg and 116±16 mmHg ($p<0.001$). The mean absolute systolic inter-arm difference of BP (SIAD) was 10±8 mmHg in CVD group as compared to 4±3 mmHg in NCP group ($p<0.001$) and the mean absolute diastolic inter-arm difference of BP (DIAD) was 5±5 mmHg in CVD patients whereas it was 3±3 mmHg in NCP group ($p<0.001$). In the CVD group, 38.7% had clinically significant SIAD of ≥10 mmHg and 12.9% had DIAD of ≥10 mmHg. A statistically significant association was found between the presence of CVDs with SIAD >10 mmHg ($p< 0.001$). Finally, binary logistic regression suggested that SIAD of BP is an independent predictor of CVDs with an odds ratio of 1.25 (95% CI; 1.15 - 1.36). An IAD of BP is associated with the presence of cardiovascular diseases. While the findings lead to the recommendation of measuring BP in both arms at the first instance to prevent the misdiagnosis of hypertension, this local study also emphasizes the significance of SIAD in BP for predicting the CVD risks.

Keywords: Inter-Arm Difference (IAD), Cardiovascular Diseases (CVD), Systolic Inter-Arm Difference (SIAD), Diastolic Inter-Arm Difference (DIAD)

A Study on Trends and Knowledge of using Cosmetics among Undergraduates and Staff at the University of Peradeniya

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Cosmetic is a product that can be applied to the human body which has health and psychological benefits. Its adverse reactions are managed by cosmetovigilance, educational programs, regulations, and safety practices. This study aims to investigate trends and perceptions on using cosmetics and related adverse reactions among undergraduates and staff at the University of Peradeniya. A cross-sectional descriptive study was conducted among undergraduates and staff at the University of Peradeniya using the convenient sampling method (n=403). An ethical approval (AHS/ERC/2023/007) and permission from the Vice Chancellor were granted before conducting the study. A self-administered pre-tested questionnaire and consent forms in all three languages (English, Sinhala, and Tamil) were distributed among undergraduates and staff. It focused usage and purchase of cosmetics and expenditures, participants' experience of cosmetics-related adverse reactions, awareness on cosmetics, and practices regarding cosmetics consumption. The pilot study and validation were done before the main study. The results were analyzed using Statistical Package for Social Sciences (SPSS) software (version 25.0 IBM) by conducting descriptive statistics and significance association at 5% significant level. This study revealed there was a statistically significant association between money spent on cosmetics with income per month ($p = 0.001$), gender ($p = 0.001$), age ($p = 0.001$), and occupation ($p = 0.001$). About 82% of the university population was using cosmetics. Based on the responses, price was an important factor (18%) in purchasing cosmetics. Cosmetics are mainly used for moisturizing (28.1%). The majority of staff (70%) and students (71%) reported usage of both herbal and synthetic cosmetic products concurrently. About 1/3 of participants had experienced adverse reactions in the past mainly on acne (62.6%). Face and hair were mostly affected. There was a statistically significant association between the adverse reaction and gender ($p = 0.007$). This study found that the majority of the population (82%) at the University of Peradeniya use cosmetics. Based on this study, in most of instances, staff have more awareness regarding cosmetic usage than students. When comparing ADR with cosmetics, students have more awareness compared to staff. This study recommends awareness and healthy practices to prevent adverse reactions by cosmetics.

Keywords: Adverse Reaction, Cosmetics, Cosmetovigilance, Knowledge, Trends, Undergraduates and Staff

Bridging the Expectation Gap: Enhancing Non-Financial Reporting Assurance in Sri Lanka

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The global surge in non-financial reporting (NFR) and the corresponding adoption of external assurance practices have been significant trends in the current business world following growing concerns over global warming, climate change, carbon emission, etc. Even though the Sri Lankan companies have mirrored this emergence in NFR, there has been a decline in the number of companies seeking assurance for their reported non-financial information in recent years. Hence, this study investigates the expectation gap in NFR assurance, capitalizing on the novelty of the practice in the global context and the lack of empirical evidence on the subject matter in Sri Lanka. The study adopted a mixed-method convergent design, focusing on NFR assurance providers, reporters, and users in Sri Lanka. Data from 201 questionnaires and 14 semi-structured interviews were analyzed using descriptive statistics, t-tests, ANOVA, and thematic analysis. The findings show convergence between quantitative and qualitative analyses, highlighting knowledge, performance, and evolution gaps in NFR assurance in Sri Lanka. The evolution gap, the major contributor to the expectation gap, exists in the areas of approach and methodology advancements, clarity and consistency improvements, and regulatory framework strengthening. This gap is primarily caused by the inconsistencies in assurance procedures and limitations in assurance statements. Further, the knowledge gap stems from evolving standards, accountability issues of reporters, and literacy-related and communication hurdles. Moreover, the performance gap is mainly due to resource and priority constraints and challenges of reporting standards. Based on these findings, this study underscores significant policy implications, including the establishment of guidelines for NFR assurance, amendments to corporate governance codes, integration of related topics into professional training, and revisions to assurance standards. Furthermore, this study emphasizes managerial implications: the establishment of dedicated NFR reporting units within reporting entities and the implementation of rigorous evaluation processes by award competition organizers to ensure equitable allocation of marks for assurance processes.

Keywords: Non-Financial Reporting Assurance, Expectation Gap, Knowledge Gap, Performance Gap, Evolution Gap

Can Sri Lanka Achieve Global Nutritional Targets by 2025? Time Series Analysis from 2012 to 2020

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It is imperative to grasp both present levels and historical patterns related to nutritional indices, in anticipating future trends to enhance the nutritional well-being of children under five years of age in Sri Lanka. This study was done to examine the recent trends of low birth weight (LBW), stunting and wasting among under five years old children between 2012 and 2020 and to predict these indicators for another five years to see whether Sri Lanka could achieve the global nutritional targets by 2025. Data on child nutrition indices between 2012 and 2020 were obtained from published data from the Ministry of Health and Family Health Bureau. Joint point regression analysis was performed using the JoinPoint Regression Program Version 5.1.0.0. The software takes trend data and fits the simplest join point model that the data allows. Trends were estimated based on the annual percent change from 2012 to 2020. All three indicators, LBW, stunting and wasting, decreased from 2012 to 2020 by 0.4%, 4.1% and 5 %, respectively. If these trends persist, LBW is projected to reach 15.5% by 2025, showing the least improvement. Stunting and wasting are expected to decrease to 8.0% and 8.4%, respectively, by 2025. However, all three indicators are anticipated to be above the global nutritional targets for children under five by 2025.Thus, based on the joint point regression method assessing, the current trends, Sri Lanka would not be able to achieve the global nutritional country-specific target by 2025.

Keywords: Stunting, Wasting, Low Birth Weight, Global Nutrition Target

Challenges in Delivering Oral Care to Patients: A Study of Nursing Practices at National Hospital Kandy

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Maintaining good oral health is crucial for overall well-being, yet ensuring proper care for patients can present a hidden layer of challenges. Nurses play a critical role in patient well-being, but providing quality oral care can face unexpected hurdles. Beyond the familiar tasks of medication and wound care, oral health presents unique challenges for nurses. The present study was designed with the aim to identify the possible challenges for providing quality oral health care by the nurses in National Hospital, Kandy and based on the outcome, to recommend implementation of standard oral health care nursing practices in Sri Lanka in future. This was a descriptive cross-sectional mixed-method study conducted at the National Hospital, Kandy. The quantitative component involved 228 nurses and qualitative component involved 30 nurses who worked in medical, surgical and intensive care units. A self-administered and interviewer-administered, structured questionnaire were used to collect quantitative and qualitative data respectively from the participants. In quantitative analysis, it was identified that 77.61% of the participants had challenges to provide quality oral healthcare for the patients. Most of the participants selected patients' behaviors and physical difficulties (62.18%), and inadequate oral care instruments and materials (48.08%) as major challenges. In qualitative analysis, seven main challenges to oral care were identified as unavailability of guidelines, patients' ineffective corporation, inadequate oral care instruments and solutions, poor supervision, heavy workload, shortage of nurses and time constraints. The nurses face patients-related, health care professional-related, and hospital administration-related challenges, which restricted them from performing effective oral care. Therefore, it is recommended to provide in-service training, awareness programs, standardized protocols, provision of oral care instruments and materials to integrate oral health care into routine patient care.

Keywords: Challenges, Nurses, Oral Health Care.

Changes in Important Biochemical Parameters among Hemodialysis Patients Attending the National Nephrology Hospital Polonnaruwa: A Pilot Study

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Patients on chronic hemodialysis have high mortality rates, but there is little information available in Sri Lanka. According to studies conducted in many countries, hyperphosphatemia (high phosphorus levels), low TIBC (Total Iron Binding Capaity), high ferritin and low post-dialysis potassium levels were identified to be associated with mortality in hemodialysis patients. The main objective of the study was to identify any abnormal changes in biochemical parameters among hemodialysis patients in Polonnaruwa. A pilot study was conducted including 52 hemodialysis patients attending the National Nephrology Hospital, Polonnaruwa. Data were collected from medical records, an interviewer-administered questionnaire and several laboratory investigations conducted before and after dialysis. Dialysis adequacy of the patients were calculated using the Urea Reduction Ratio (URR). The majority of the population (77.5%) have a dialysis vintage < 2 years and most patients attend for dialysis sessions once in five days. The majority were; males (70.3%), >60 years of age (50.3%), with a mean±SD age of 58±12 years. Mean URR of the population was 71.27±10.59%, and 73.8% of patients had an efficient dialysis session. But, the mean level of hemoglobin was 10.9±1.5 g/dL, and 77.2% of the study population had low hemoglobin than the recommended level. Mean levels of serum phosphorus, TIBC, ferritin, and post-dialysis potassium were 5.8±1.9 mg/dL, 33.4±5.2 μmol/L, 469.4±319.6 ng/mL and 5.1±0.7 mmol/L respectively. Here, 59.6%, 96.2%, 61.5% and 43.4% indicated high phosphorus, low TIBC, high ferritin and low post-dialysis potassium levels respectively. Despite receiving adequate dialysis, a significant proportion of participants displayed abnormal levels of biochemical parameters like hyperphosphatemia, low TIBC, high ferritin and low post-dialysis potassium levels which were identified as crucial risk factors of mortality in most available literature. Further research are being conducted to identify the effect of the above mentioned factors and other possible factors on the quality of life and mortality of hemodialysis patients in the Sri Lankan context.

Keywords: Hemodialysis, Hyperphosphatemia, TIBC, Ferritin, Dialysis Adequacy, Urea Reduction Ratio

Clinico-Epidemiology of Brake Fluid Poisoning

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Brake oil is an automobile transmission fluid composed of mainly ethylene glycol. It is a toxic alcohol used also in antifreeze, coolants, preservatives, and chemical solvents. Its poisoning causes multi-organ involvement including depression of the central nervous system (CNS), acute kidney injury (AKI), myocardial infarction (MI), and respiratory failure. The objectives of this study were to describe the epidemiology and clinical features of brake fluid poisoning. This was a prospective observational clinical study of a series of 25 patients with brake fluid poisoning admitted to Teaching Hospital Ratnapura where the study was conducted over 6 years commencing from January 2018. All patients with a history of brake oil ingestion were included in to study (a purposive sampling) and each patient was examined daily. Data were collected using an interviewer-administered questionnaire and the analysis was done using SPSS version 21. There were 25 patients of which 24 (96%) had intentional poisoning and 1 (4%) had accidental poisoning. There were 22 (88%) males and 3 (12%) were females. Their age ranged from 19 to 75 years (mean 30.3±8). Nineteen (76%) were married. Their occupations were: 8 (32%) of drivers, 5 (20%) of manual laborers, 4 (16%) of gem miners, and 2 (8%) of masons. Twenty-one (84%) were alcoholics and the ingested volume ranged from 2 mouth slips to 300 mL. The average hospital stay was 4 days (IQR 3-5). Thirteen patients (52%) had nausea, vomiting, and epigastric pain. Five (20%) had AKI from which haemodialysis was performed to 4 (16%). Cardiac effects were observed in 5 (20%) which included hypotension in 4 (16%), bradycardia in 2 (8%), ventricular ectopic in 1 (4%), and ST elevation MI in 1 (4%). Metabolic acidosis was observed in 7 (28%) and CNS depression was found in 5 (20%). Six (24%) had hypocalcaemia. Four patients (16%) died and 4 (16%) were treated at the intensive care unit. Brake fluid is a deadly poisoning agent and its poisoning causes multi-organ failure.

Keywords: Poisoning, Brake Oil, Ethylene Glycol, Acute Kidney Injury, Sri Lanka

Clinicopathological Presentations of Intra Oral Angiosarcoma and Haemangioendothelioma

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Angiosarcoma and Haemangioendothelioma are malignant and intermediate malignant vascular tumours derived from endothelial cells, constituting less than 1% of all soft tissue sarcomas occurring in the oral cavity. This study aimed to highlight the clinicopathological presentations of primary and metastatic intraoral angiosarcoma (InO-AS) and haemangioendothelioma (InO-HE). We analysed 57 primary and 14 metastatic InO-ASs and 42 InO-HEs from published literature, in addition to three InO-ASs and two InO-HEs from the archives of the department. The results reveal that InO-HE had a notable 34.09% occurrence in children with a mean age of 31.5 years, while primary InO-AS occurred in 11.67% of children with a mean age of 52.33 years, and metastatic InO-AS had a higher mean age of 63.86 years. There was a male predilection with notable differences in the male-to-female ratio between primary and metastatic InO-ASs, with ratios of 1.3:1 and 3.67:1, respectively. InO-HE showed a male-to-female ratio of 1.2:1. Tongue involvement was prominent in primary InO-ASs (35.00%) and InO-HEs (36.36%), whereas metastatic InO-ASs were confined to the maxillary and mandibular gingiva. Approximately 53% of the primary InO-ASs were smaller than 5 cm, and all metastatic angiosarcomas were smaller than 5 cm. The majority (64.7%) of primary InO-ASs were of high grade, whereas all metastatic InO-ASs were of high grade. Approximately 86.36% of reported InO-HE cases were epithelioid HE. Furthermore, treatment outcomes varied, with 35.00% of primary InO-AS patients surviving with no evidence of recurrence over a 36-month mean follow-up period compared to 14.28% in metastatic cases, where 71.43% ended in death due to disease over a 16.5-month mean follow-up period. In contrast, 65.91% of InO-HE patients presented no evidence of recurrence over a mean follow-up period of 45 months, and no deaths were reported. These findings emphasize the distinct clinicopathological features and outcomes of these malignancies, consolidating the literature on intraoral angiosarcomas and haemangioendotheliomas, and offering insights to enhance diagnostic and management strategies.

Keywords: Angiosarcoma, Haemangioendothelioma, Outcome, Oral Cavity

Comparative Analysis of Fatal Road Traffic Accidents: A Study of Nepal and Sri Lanka

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A fatal road traffic accident (RTA) refers to any accident involving at least one road vehicle in motion, resulting in at least one killed person. This review expects to identify the primary factors contributing to fatal road accidents in Nepal and Sri Lanka, utilizing the data from government and international databases. Both Nepal and Sri Lanka are middle-income countries in South Asia, with comparable socio-demographic features and populations. In Nepal, 4622 RTA fatalities were reported in 2016, while Sri Lanka reported 3096 deaths in 2016, which accounts for 15.9 and 14.9 deaths per 100,000, respectively. Nepal spends 5.6% of gross domestic product (GDP) on RTA fatalities, while only 0.05% of GDP is spent on road infrastructure. Similarly, Sri Lanka spends 4.9% of GDP on fatal RTAs, while 0.21% of GDP is spent on road infrastructure development. In both countries, males in age group of 15-49 years are at the most risk of fatal RTAs. Both countries have enforced speed limits on roads, but in Nepal, there is no legally enforced limit for driving under the influence of alcohol. In both countries, wearing helmets is compulsory for motorcyclists, but in Nepal, helmet standards are not regulated. According to data from World Health Organization and World Bank, Sri Lanka has relatively better road networks and regulations for the inspection of imported vehicles and vehicles which have been in use for more than ten years, while Nepal has inspection regulations only for vehicle imports. In both countries, the working age group is vulnerable to fatal RTAs, which has an economic impact in addition to the cost of injuries. This communication emphasizes the importance of strengthening the legislation on motor vehicle use and also the proper maintenance of the road network in order to reduce the fatalities and economic burden on the two countries, ensuring safe road use.

Keywords: Developing Countries, Driving Under the Influence, Head Protective Devices, Motor Vehicles, Traffic Accidents

Comparison of Anti-cancer Effects of Atorvastatin on Hormone Receptor-Positive and Triple Negative Breast Cancers: An in-vitro Study

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Elevated serum cholesterol levels have been identified to implicate oncogenesis in breast tissues. Studying the impact of altering the cholesterol synthesis in breast tissue microenvironment *in vitro* as a potential anticancer treatment option holds significance. Research problem: Can widely prescribed statins exert anticancer effects and if so, differently on different breast cancer (BC) cells *in vitro*? A concentration series of active ingredient atorvastatin calcium (10-160 $\mu moldm^{-3}$) was prepared in complete cell culture media. Prepared concentrations were treated on seeded triple-negative MDA-MB-231 and hormone-receptors positive MCF7 BC cells, and nontumorigenic mammary epithelial cell line MCF10A (n=6) in 96 well plates separately. The treated cells were incubated at 37° for 24, 48 and 72 hours. The cell viability was assessed with 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyl tetrazolium bromide (MTT) assay. Dose effect curves were derived and half maximal inhibitory concentrations (IC_{50}) of atorvastatin were calculated at 24, 48 and 72 hours, compared to negative controls. Induced apoptosis was assessed with acridine orange ethidium bromide (AO/EB) staining. The IC_{50} derived from the dose effective curves at 24, 48, and 72 hours were as follows; for MDA-MB-231; 125.8, 33.9 and 9.5 $\mu moldm^{-3}$, for MCF7; 117.0, 98.5, and 78.3 $\mu moldm^{-3}$ and for MCF10A; 177.9, 90.6 and 13.9 $\mu moldm^{-3}$, respectively. At 24 hours atorvastatin exerts more cytotoxicity on MCF7 cells than on MDA-MB-231 cells. The IC_{50} decreased with prolonged incubation in all the cell lines. However, the decrease in IC_{50} was more prominent in MDA-MB-231 cells than in MCF7 indicating more cytotoxicity to triple-negative BC cells in a time-dependent manner. In the AO/EB staining cytoplasmic blebbing, nuclear fragmentation, and loss of membrane integrity were noted at the IC_{50} concentrations at 24-hour incubation confirming that the loss of cell viability is due to induced apoptosis. The anticancer effect exerted by atorvastatin on hormone receptor-positive BC cells is higher than the hormone receptor-negative BC cells, at 24 hours.

Keywords: Breast Cancer, *In Vitro*, Atorvastatin, Anti-Cancer

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Comparison of Antimicrobial and Cytotoxicity Profiles of Skin Secretions from Endemic Polypedates Cruciger and Cosmopolitan Duttaphrynus Melanostictus

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Antimicrobial peptides (AMPs) in amphibian skin secretions are being explored as potential new antibiotics. Cytotoxicity to mammalian cells is a major challenge in their clinical usage. This study explored antimicrobial properties of skin secretions from endemic *Polypedates cruciger* (common hourglass treefrog) compared to cosmopolitan *Duttaphrynus melanostictus* (Asian common toad) with known AMPs. Secretions were obtained from specimens collected at University of Peradeniya premises by electrical stimulation (5V, DC) and washing skin with deionized water. Secretions were stabilized with glacial acetic acid (50:1 v/v) and sterile filtered. Activity against *Staphylococcus aureus,* multidrug resistant (MDR) *Acinetobacter baumannii, Escherichia coli, Klebsiella pneumoniae,* and *Pseudomonas aeruginosa* were determined using microdilution in 96-well plates with two-fold serial dilutions at 37^0 C for 18-24 hours. Absorbance was measured at 620 nm, and viability was verified by growth on blood agar. Cytotoxicity was determined by incubating secretions with canine red blood cells (RBCs) at 37^0 C with 0.1% Tween 20 as positive control. Kill curve assays were conducted against *S. aureus* and *E. coli* with undiluted skin secretions at 37^0 C. All experiments were duplicated. *S. aureus* and *E. coli* were inhibited by *P. cruciger* and *D. melanostictus* secretions in 1:4 and 1:8 dilutions respectively. Both secretions also inhibited MDR *A. baumannii,* and *P. aeruginosa* at 1:4 dilution, indicating broad-spectrum activity. However, both secretions were inefficient against *K. pneumoniae*. *E. coli* was rapidly killed by *P. cruciger* secretions (10 min post exposure), while *D. melanostictus* secretions needed 1 hr exposure. Both secretions needed at least 2 hr exposure to kill *S. aureus*. Canine RBCs were not affected by *P. cruciger* secretions after 1 hr exposure, while ~20% haemolysis was caused by *D. melanostictus* secretions suggesting significantly lower cytotoxicity in *P. cruciger* secretion, indicating potential utility of AMPs from *P. cruciger* with reduced cytotoxicity as an antibiotic candidate.

Keywords: Antimicrobial Peptides, *Polypedates Cruciger, Duttaphrynus Melanostictus,* Cytotoxicity, *Acinetobacter Baumannii, Staphylococcus Aureus*

Comparison of Yield and Physicochemical Properties of Virgin Coconut Oil Extracted by Different Methods

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Virgin coconut oil (VCO) is extracted from mature coconut meat without the use of high heat or chemicals. This process helps retain the natural flavour, aroma, and nutrients of the coconut oil. In this study three distinct methods were used to extract VCO: The Modified Natural Fermentation Method (MNFM), the Modified Kitchen Method (MKM) and the Direct Heat Method (DHM). The physicochemical properties of the extracted VCO were then compared to a commercial control sample and the standards established by the Asia Pacific Coconut Community and the Codex Alimentarius Commission. The highest yield was obtained using the MNFM (32.83kg/100kg) and the lowest VCO yield was given by DHM (19.15kg/100kg). The total medium-chain fatty acids in the extracted oil ranged from 56.5 % to 62.0 % of the total fatty acids, while the commercial control sample contained 63.7 %. Lauric acid content ranged from 45.3 % to 48.6% with the highest lauric acid content reported in the oil extracted by MNFM. The peroxide value, which indicates rancidity due to the formation of aldehyde and ketones, was measured using the AOAC standard method. The oil extracted using the DHM exhibited the highest peroxide value ($2.52 meqkg^{-1}$) while the MNFM yielded the lowest ($0.86 meqkg^{-1}$). The DPPH assay was used to measure the antioxidant activity. EC_{50} values were 6.63 mg/ml for the MNFN, 10.12 mg/ml for the MKM, 15.23 mg/ml for the DHM and 39.42 mg/ml for the commercial sample. The moisture content of all extracted oils and commercial samples was below 0.05%, meeting the acceptable level for cooking oil. Physical properties were analyzed by a sensory panel with eight persons. The MNFM produced a strong pleasant coconut aroma, whereas the MKM and DHM produced a milder pleasant coconut aroma. All methods yielded colourless VCO without any turbidity. Rancidity was assessed in all samples by monitoring changes in aroma over four months and no changes in aroma were detected in any of the three samples. All physical and chemical properties were within the ranges specified by international standard bodies. The Modified Natural Fermentation Method and the Modified Kitchen Method are the most suitable methods for VCO production.

Keywords: Virgin Coconut Oil, Modified Natural Fermentation Method, Modified Kitchen Method, Direct Heat Method

Computational Insights into the Antiviral Potential of Longispinogenin and Sitakisogenin Against African Swine Fever Virus DNA Ligase

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African swine fever virus (ASFV) is a highly contagious and deadly virus that spreads rapidly among pigs. Recent studies have identified a few antiviral agents that can inhibit ASFV infections. However, there are currently no commercial vaccines or antiviral drugs available, highlighting the urgent need for new treatments. In this study, we conducted an *in silico* analysis of compounds derived from *Gymnema sylvestre*, a widely used herb in traditional and Ayurvedic medicine, against African Swine Fever Virus DNA Ligase (ASFVLig). ASFVLig is involved in the base excision repair (BER) process, which maintains the integrity of the viral genome during infection. We performed a comprehensive electronic search for natural compounds in *Gymnema sylvestre* using the SCOPUS, PubMed, EMBASE, Elsevier, Web of Science, ResearchGate, ScienceDirect, Google, and Google Scholar databases for studies published before April 2024. In the search, we collected 36 natural compounds and evaluated their absorption, distribution, metabolism, and excretion (ADME) properties using SwissADME. Following Lipinski's rule of five, we identified 19 compounds as potentially safe drug candidates. Virtual screenings of selected compounds in 3D SDF form were run using PyRx 8.0, and those with a binding affinity greater than -5 kcal/mol underwent further blind docking using CB-Dock2. The results revealed quercetin, citronellyl formate, conduritol A, gymnemanol, isophytol, longispinogenin, lupeol, nerolidol, n-hexanoic acid, paraben, stigmasterol, sitakisogenin, and squalene as potential inhibitors of ASFVLig. Notably, longispinogenin and sitakisogenin exhibited the highest potential, with a binding affinity of -7.4 kcal/mol and the ability to bind with all four amino acids Asn 153, Leu 211, Leu 402, and Gln 403 in the active site of ASFVLig. Taken together, we recommend further *in vitro* and *in vivo* investigations to confirm the effectiveness of these compounds as antiviral drugs in our fight against ASFV.

Keywords: African Swine Fever Virus, Gymnema sylvestre, ASFVLig, Antiviral, In silico

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Correlation between Serum Heavy Metals and the Risk of Oral Cancer and Premalignant Lesion Development

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Oral cancer is a malignant tumor that develops in the lip or oral cavity, is typically categorized as Oral squamous cell carcinoma (OSCC). The examination of the connection between exposure to heavy metals and the probability of developing oral cancer and oral potentially malignant disorders (OPMD) has been limited in its scope, and the overall consequences of such exposure remain largely unknown. Hence, this study was conducted to identify the serum levels of heavy metals and the risk of OSCC and OPMD development. The amounts of a panel of 7 heavy metals (Cr, Zn, As, Co, Cu, Cd, and Pb) in serum samples from 60 cases (15 from OSCC, Oral lichen planus, Oral submucous fibrosis and Oral leukoplakia) and 15 controls in the Sri Lankan cohort were determined using ICP-OES (Inductively coupled plasma-optical emission spectrometry). The cohort consisted of 48 men and 27 women, with 15 patients each diagnosed with OSCC, OSF, OLK, and OLP, and 15 healthy controls. The study used the Kruskal-Wallis Test to compare metal concentrations across groups, finding significant differences for all metals except As and Pb. Significant associations were observed between age, past medical history, drug history, gender, smoking, alcohol consumption, and betel chewing. The Spearman Correlation test showed significant correlations between the concentrations of Cr, Co, Cu, As, and Zn and the presence of cancer/precancer conditions. The study's findings suggest that heavy metal contamination may be linked to the development of OSCC and precancerous conditions. When comparing OSCC and OPMD cases with controls, the serum concentrations of As and Pb did not differ significantly. However, Cd, Cr, Co, Cu, and Zn exhibited significantly higher concentrations among cases compared to controls ($p < 0.05$). Moreover, we observed significant variations in the levels of five elements among cancerous, premalignant, and healthy, suggesting a potential role in the progression of malignancies.

Keywords: Heavy Metals, Blood, Oral Cancer, OPMD, ICP-OES

Correlation of Inflammatory Markers with Age and Selected Clinical Symptoms Associated with Lumbar Disc Herniation

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Inflammation plays a major role in exacerbating lumbar disc herniation (LDH) due to irritation of neural elements associated with herniated lumbar discs. This eventually results in increased pain and worsening of symptoms. Elevated level of specific cytokines is reported with different pathology. This study aims to assess the correlation of inflammatory markers with age and selected clinical symptom associated with LDH. A cross-sectional study with subjects diagnosed with LDH and undergoing lumbar microdiscectomy were recruited (n=25) using convenience sampling, where age and clinical details such as presence of radicular pain, results of straight leg raise test (SLRT Positive/ Negative) were recorded. Patients who were diagnosed to have autoimmune disorders, any disease within the past two weeks that could elevate inflammatory marker and pregnant females were excluded. Blood specimens were collected to determine the serum levels of Interleukin- 6 (IL-6) and Tumor necrotic factor-alpha (TNF-α) using an Enzyme-Linked Immunosorbent assay technique. The correlation of cytokines level with the aforementioned variables were assessed. Spearman rank correlation test (Python version 3.10) was used to assess strength (R) and significance (p) for the above. Among the LDH subjects, 44% of patients reported with lumbar radicular pain. The patients with radicular pain had increased mean IL-6 (424.14pg/ml) compared to those without radicular pain (209.86pg/ml). whereas similar mean values were observed for TNF- α in patients with (71.59pg/ml) and without (71.88 pg/ml) radicular pain. Statistically significant positive correlation was obtained between IL-6 and lumbar radicular pain ($R = 0.42$, ($p<0.05$), while TNF-α showed a weak positive correlation which was statistically not significant. Further, IL-6 showed a weak positive correlation with age and SLRT, while TNF- α showed a weak negative correlation with SLRT and a weak positive correlation with age and radicular pain which did not show any statistical significance. IL-6 was found to be the predominant cytokine associated with lumbar radicular pain and further studies with a large population are warranted to discover the possible functional role of IL-6 in the pathophysiology of lumbar radicular pain.

Keywords: IL-6, TNF-A, Lumbar Radicular Pain, Straight Leg Raise Test

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Cross-Cultural Adaptation of the Sinhala Version of Kogan's Attitudes toward Older People Scale

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Providing effective care for older people is affected by nurses' attitudes toward older people. Kogan's Attitudes Toward Older People scale (KAOP) is widely used in determining attitudes toward older people. A culturally adapted tool that assesses attitudes toward older people is unavailable in Sri Lanka. This paper reports the cross-cultural adaptation process of developing the Sinhala Version of KAOP. Following the Beaton et al. method, translation and cross-cultural adaptation, consisting of the phases of forward translation, synthesis of translation, backward translation, and pre-test was conducted. The original version of KAOP consists of 34 items. Two independent bilingual translators who had a background in geriatric nursing and nursing education translated the English versions of KAOP into Sinhala. The research team synthesised the common forward translation. Two language experts who were fluent in both English and Sinhala languages conducted the back translations, independently. The research team, forward and backward translators, two nurse academics and one medical doctor reviewed original and forward and backward translations to ensure conceptual, semantic and idiomatic equivalence. Based on a panel of experts' review, the content validity index (CVI) was computed. The panel included one medical doctor, one social worker, three nurses and five nurse academics. Eight nursing students participated in pre-test of the questionnaire, ensuring face validity. Cross-cultural validity of the Si-KAOP scale was established by conceptual, semantic and idiomatic equivalence with the English version. Item-CVIs ranged from 0.8 -1. Scale-CVI was 0.88. Minor changes in the pre-test were incorporated into the scale. The pre-final version of the KAOP was developed with adequate cross-cultural, face and content validity. The establishment of the psychometric properties of the Si- KAOP is required.

Keywords: Nursing STUDENT, Older People, Psychometrics, Sinhala, Validation STUDY

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Cytokeratin-19 and Vascular Endothelial Growth Factor (VEGF): Promising Biomarkers in the Detection of Oral Squamous Cell Carcinoma and Oral Potentially Malignant Disorders

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Oral and oropharyngeal malignancies present a significant global health challenge, ranking sixth in global cancer prevalence. Despite the advancements, the five-year survival rate for oral cancer remains at 50%. Oral squamous cell carcinoma (OSCC) predominates in oral cavity malignancies, with betel quid chewing, smoking, and excessive alcohol consumption as major contributors. However, despite educational efforts, the persistent use of tobacco, alcohol, and areca nut suggests primary prevention measures are insufficient. The oral cavity's accessibility allows for early identification of OSCCs and Oral Potentially Malignant Disorders (OPMDs). This study aims to evaluate the levels of Vascular Endothelial Growth Factor-A (VEGF-A) and Cytokeratin-19 (CK-19) mRNAs in whole blood as a potential method for the early detection of OSCC and OPMDs. The study included 40 patients (each from OSCC, Oral Submucous Fibrosis (OSF), Oral Leukoplakia (OLK), Oral Lichen Planus (OLP), and 10 healthy controls. The expression levels of VEGF-A and CK-19 mRNAs were measured from extracellular RNA extracted from whole blood samples using real-time reverse transcription polymerase chain reaction (RT-PCR) with sequence-specific primers. Receiver operating characteristic (ROC) curve analysis was used to evaluate the effectiveness of these biomarkers in diagnosing. GraphPad Prism 4.0 software was employed for statistical analyses and the generation of diagrams. As the dataset is not normally distributed, the Wilcoxon signed-rank test was applied for two specific comparisons: OSCC versus controls and OPMD versus control. Analysis of 50 participants with OSCC, along with Oral Lichen Planus, Oral Submucous Fibrosis, Oral Leukoplakia, and healthy controls, revealed significant differences in biomarker levels between diseased and healthy groups. Combined VEGF-A and CK-19 biomarkers showed a 60% predictive probability for OSCC patients. In conclusion, this study highlights the efficacy of blood mRNA transcriptome diagnostics in early OSCC detection, presenting a promising clinical approach for improving cancer outcomes.

Keywords: Oral Cancer, OPMD, Risk Factors, Biomarkers, Blood, Predictive Probability

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Dental Anxiety among Pregnant Women in Yatinuwara MOH Area, Kandy District, Sri Lanka

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Ensuring optimal oral health during pregnancy is crucial to prevent adverse pregnancy outcomes. However, dental anxiety (DA) often acts as a significant barrier to accessing necessary dental care during this period. This study assessed the prevalence of DA and its associated factors among pregnant women attending antenatal clinics in the Yatinuwara Medical Officer of Health (MOH) area, Kandy district, Sri Lanka. A mixed-method approach was used. Descriptive analysis, inferential statistics, and content analysis were used during quantitative and qualitative analyses, respectively. First, a cross-sectional survey was conducted with 138 pregnant women attending antenatal clinics in the Yatinuwara MOH area. An interviewer-administered questionnaire and the Modified Dental Anxiety Scale (MDAS) were used for data collection. The finding revealed that 15.9% of the pregnant women were experiencing severe DA, and while 70.3% were having mild DA. The mean MDAS score was recorded as 12.6±4.7. Higher monthly household income, Sinhalese ethnicity, and gestational hypertension were linked to increased maternal DA. Secondly, the inductive qualitative methodology was used to explore the factors associated with DA in more detail using semi-structured interviews. This was done until the point of data saturation with 20 pregnant women who exhibited severe DA (MDAS scores ≥ 19). Content analysis identified three common factors contributing to DA: (1) anxiety related to the dental setting, (2) anxiety towards the behaviour of the dental team, and (3) women's perceptions and previous experiences of dental care. Based on the factors explored through the qualitative analysis, improvements to the dental healthcare settings and improvement of the behaviour of the healthcare team to build better doctor-patient or nurse-patient relationships would help to alleviate maternal DA, promoting better attendance for dental care during pregnancy.

Keywords: Dental Anxiety, MDAS, Oral Health, Pregnancy, Sri Lanka

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Design of a Smart Bus Tracking System and a Passenger Counting System to Enhance the Efficiency of Public Transportation

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It is a timely requirement to implement a smart bus tracking and a passenger counting system to trace the vacant seats using a mobile app in Sri Lanka to enhance the efficiency of public transportation. This research is about the design and implementation of a smart bus tracking system and a passenger counting system using a mobile app. This system integrates real-time GPS tracking, precise passenger counting through IR sensors, Firebase Realtime Database, and a user-friendly mobile app that has been developed using a Flutter Framework. The hardware component involves the integration of an ESP8266 microcontroller with a Neo 6M GPS module, addressing challenges related to power stability. The passenger counting mechanism utilizes IR sensors strategically placed near bus entrances, with fine-tuned ESP8266 code ensuring accurate counting. Firebase Realtime Database serves as the central hub for storing and synchronizing real-time data between the bus and the mobile app. The embedded part with the passenger counting mechanism and IR sensors should be placed on the side of a door in the bus. The latest installation version, named the ".apk" file should be installed on any smartphone with an Android operating system and iOS. An active internet connection is required to synchronize the mobile phone and the embedded part of the bus. Accordingly, any passenger who is waiting for a bus can track the location of the bus as well as the passenger count to get an idea about vacant seats using the mobile app. The outcome of this research contributes to the introduction of smart transportation systems, emphasizing the potential for technology-driven solutions to revolutionize public transport services due to the key differentiators of Smart Bus Tracking Systems with a novel feature of precise real-time passenger count data using IR sensors. This feature is not available in any current systems in Sri Lanka. The Smart Bus Tracking Systems is specifically designed to meet the needs of Sri Lanka's public transportation, where no integrated solution for bus location and passenger count currently exists. It is developed with a user-friendly mobile app with Flutter for an intuitive, cross-platform experience for easy use by any passenger.

Keywords: Bus tracking, passenger counting, transportation, integration, mobile app

Detection of Pathogenic Microflora in Complete Denture Biofilms using PCR Technique

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Edentulism; the loss of natural teeth in humans, is an important global public health issue, particularly affecting the elderly. A complete denture is an oral prosthesis that replaces the missing teeth in a dental arch. A removable complete denture is often used to treat edentulism. Over time, a dense layer of microbial communities is deposited in the polymeric surface of the denture, forming a biofilm. Thus, denture biofilms serve as reservoirs for pathogenic microbes potentially progressing into systemic or localized diseases. Only a few studies have investigated the microflora that colonizes dentures and their effect on oral health. The utilization of culture-based techniques to determine the presence of oral microbes is limited due to their fastidious nature. In this study, a culture-independent molecular method, based on PCR was exploited to identify the prevalence of selected clinically significant microorganisms; *Streptococcus mutans, Porphyromonas gingivalis, Helicobacter pylori, Escherichia coli, Candida albicans* and *Staphylococcus aureus*. Complete denture biofilm samples were collected from 35 complete denture wearers without any diagnosed clinical implications, who sought treatment from the Dental Teaching Hospital, Peradeniya upon their informed consent. Relevant demographic data were recorded using a questionnaire. Microbial species were detected by PCR amplification using species-specific primers mainly based on the 16s rRNA gene. The results showed that complete denture biofilms harbored *S. mutans* (28/35), *P. gingivalis* (24/35), *H. pylori* (8/35), *E. coli* (25/35), *C. albicans* (11/35) and *S. aureus* (29/35). The findings of this study indicate that complete denture biofilm contains clinically important microorganisms. Hence, proper denture hygiene is necessary to avoid opportunistic infections by these potential pathogens among complete denture wearers. Given the accuracy of the molecular detection of opportunistic pathogens within a short period of time, the use of the PCR technique will help strengthen existing clinical diagnosis protocols.

Keywords: Edentulism, Health Care, Microbial Biofilms, Molecular Detection, Oral Microbiome

Development of a Device to Measure Peak Expiratory Flow Rate and Peak Inspiratory Flow Rate during Manual Hyperventilation

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Manual Hyperinflation (MHI) is a technique used to hyperinflate the lungs and remove secretion in mechanically intubated patients. The two-phase gas-liquid exchange theory states that the peak expiratory flow rate (PEFR) should be 10% more than the peak inspiratory flow rate (PIFR). It is reported that even after demonstrating the correct technique many physiotherapists often performed the technique in a manner that did not assist secretion removal. Any type of feedback offers insights into the results and performance during task execution, aiming to minimise errors and assist in attaining objectives. Hence it can be hypothesised that visual feedback of PEFR and PIFR will enable physiotherapists to change their technique such that it facilitates secretion clearance. This study aimed to design and develop a device to measure PEFR and PIFR with real-time visual feedback during the application of MHI in a laboratory setting. The device is equipped with two air pressure sensors, model HX710B, which were modified to measure the airflow rates. The device is connected to the MHI instrument. The input from two sensors was processed using an Arduino UNO microcontroller device. A simple application was developed to visualise the two outputs of PEFR and PIFR with a dual line graph. The PEFR and PIFR were measured when the patient connector was kept open for one selected Manual Hyperventilation unit. No significant expiratory flow rate was observed compared to the electronic and device noise of the developed device. However, the device should be calibrated and validated to be utilised in a training environment where feedback will assist in modifying the procedure for better results.

Keywords: Manual Hyperinflation, PEFR and PIFR Measurements
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Development of the Sinhalese Version of General Rehabilitation Adherence Scale (GRAS-Sin)

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The success of physiotherapy treatment is partly based on the patient's adherence to the programme. Non-adherence may result in increased healthcare costs and poor recovery. Therefore, measuring adherence to remove barriers and facilitate adherence is important. No validated tool exists to measure adherence to physiotherapy treatment among Sinhala-speaking patients in Sri Lanka. This study aimed to develop a Sinhalese version of the General Rehabilitation Adherence Scale (GRAS-Sin). In the first phase, the original version was translated and culturally adapted to the Sinhala language. During the second phase, a cross-sectional survey was conducted among 200 patients. We evaluated psychometric properties in patients seeking physiotherapy for musculoskeletal problems at the National Hospital, Kandy, Sri Lanka, and Teaching Hospital, Peradeniya, Sri Lanka. The present study comprised 143 female (71.5%) and 57 male (28.5%) participants. The majority of the patients (54.5%) adhered to physiotherapy treatments with high levels (20-24 of total score out of 24) of compliance. The relationship between treatment adherence and gender was significant (X^2 =17.46, p =0.001), whereas age, employment status, educational level, and economic status were not significant. The content validity index of the scale was 0.89. There was an acceptable level of internal consistency (Cronbach's alpha =0.82) and test-retest reliability (intraclass correlation coefficient= 0.907, p=0.000). Sampling adequacy was satisfactory (KMO =0.755, Bartlett's test p-value <0.05). Construct validity was measured using exploratory factor analysis that revealed a 3-factor model with a 73.4% variance. Incremental fit indices; normed fit index, comparative fit index and Tucker Lewis index, were reported > 0.95 while an absolute fit index of root mean square of error of approximation was 0.065. These values indicated a good model fit. No floor and 27% ceiling effects were found. GRAS-Sin is a valid and reliable tool to assess physiotherapy treatment adherence among Sinhala-speaking patients following physiotherapy management in Sri Lanka.

Keywords: Sri Lanka, Physiotherapy Treatment Adherence, Rehabilitation
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Dynamics of formal rules and informal norms in the broiler poultry sector in Sri Lanka

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Broiler meat significantly contributes to food and nutrition in Sri Lankan households, offering an affordable protein source compared to higher-end meats such as beef, pork, and mutton. The growth of the commercial broiler industry has expanded the production and distribution network (PDN), introducing more actors. While there is a set of formal rules imposed by the government that the officials are hands-on in enforcing, the study set out to determine if actors follow informal norms other than formal rules and evaluate the impact that this may have on applying formal rules, specifically regulating implementing biosecurity practices. Participants of this study were divided into three types; Farm Managers, Factory/ Processing Plant Managers, and Farm/Factory/Processing Plant Labourers from three scales of operation; Mega, Large, and Small/Medium. This study collected secondary and primary data through ethnographic methods such as semi-structured interviews and field observations. A total of 19 in-depth interviews at 10 broiler farm sites were conducted. Thematic analysis was conducted on MAXQDA software to analyse the collected data. Results indicate that a combination of formal rules and informal norms governs the poultry industry in Sri Lanka. Formal rules refer to laws and policies established by governmental or private entities that dictate the management practices of the industry. Informal norms are unwritten and implicit behavioral expectations not codified into formal rules. This study found that formal rules lack integration and are not consistently applied across the broiler PDN. Informal norms affect the implementation of formal rules in many ways. Norms determine the degree to which formal rules are followed; whether they're followed to the letter or disregarded altogether. To what extent rules or prescribed practices are followed determines the risk of disease outbreak and product quality. In conclusion, the large-scale farmers who represent most of the broiler farm population often lack the ability or interest to maintain proper biosecurity measures, resulting in poor-quality poultry products. This can be a constraint when entering potential export markets and competing with imported broiler meat products.

Keywords: Rules, Norms, Broiler, Biosecurity, Livestock, Poultry

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Effect of Beta Thalassaemia Trait in Pregnancy with Particular Reference to its Complications and Outcome

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Beta-thalassaemia trait condition is expected to have no significance to the person besides the mild anaemia. Pregnancy is expected to increase the anaemia in beta-thalassaemia traits, but how this and other factors could affect maternal and fetal outcomes are unclear. Many previous studies on this issue give inconsistent and even contradictory results. Thus, we decided to study the outcomes of pregnancy in pregnant women with beta-thalassemia trait. The prospective case-control study included 121 pregnant women with beta-thalassaemia trait and 121 normal pregnant women. Patients in case and control groups were matched according to maternal age, gestational age and number of previous pregnancies. Participants were followed up at similar intervals for the duration of the pregnancy, and clinical information was obtained from available medical records without interfering with the management. Hb, MCV, MCH and MCHC in all three trimesters were significantly lower among cases (Hb in g/dL; 9.50 ± 0.64, 9.03±0.85 and 9.52±0.68) than controls (Hb in g/dL; 11.62±1.15, 11.01±1.94 and 11.74±1.81). Overall, the signs and symptoms, anaemia and rate of blood transfusion (2nd trimester; 18.3% vs 0%, 3rd trimester; 16.7% vs 0.83%) were significantly high among cases ($p<0.05$) compared to the controls. No statistically significant differences were observed for pregnancy complications (preeclampsia, eclampsia, pregnancy-induced hypertension, oligohydramnios, polyhydramnios, IUGR, placental abruption and preterm labor), perinatal outcomes (postpartum hemorrhage, packed cell transfusion and Apgar score<7 at 5 min, resuscitation at birth and liquor and ICU admissions) and neonatal outcomes (congenital abnormalities and neonatal complications, birth weight, body length and head circumference). However, in labor, the rate of caesarean deliveries (cases;61%, controls;45%) was significantly higher among cases ($p<0.05$) with no definite indications for such in most cases. In conclusion, the perinatal, maternal or neonatal outcomes in pregnancies are unlikely to be affected by the beta-thalassaemia trait condition except for the intensification of maternal anaemia.

Keywords: Beta-Thalassemia Trait, Pregnancy Outcomes, Neonatal Outcomes, Maternal Anaemia, Case-Control Study

Effect of Electrotherapy along with Active Movements for Lower Limb Musculoskeletal Conditions with Sub-Acute and Chronic Pain of Athletes in University of Peradeniya, Sri Lanka: A Randomized Controlled Trial

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Lower limb musculoskeletal conditions are considered as an important problem in the athletic population with higher incidence rate, often delaying return to optimal performance. Proper treatment and rehabilitation strategies are essential for facilitating athletes' return to peak performance levels. Therefore, this study aimed to evaluate and compare the effect of different therapeutic interventions; Transcutaneous Electrical Nerve Stimulation (TENS) and Interferential Therapy (IFT) along with active movements for lower limb musculoskeletal conditions with sub-acute and chronic pain among university level athletes at the University of Peradeniya, Sri Lanka. A double-blind randomized controlled trial was conducted with four study groups. The athletes who aligned the inclusion criteria with lower limb musculoskeletal conditions exhibiting sub-acute and chronic pain (after 10days of onset) were recruited as participants for the study. Seventy-seven athletes were randomly assigned to these study groups; IFT with active movement group (n=19), TENS with active movement group (n=19), IFT only group (n=20) and TENS only group (n=19). Pain intensity, knee and ankle range of motion and ability to perform daily tasks were assessed using Numeric Rating Scale (NRS), goniometer, and Lower Extremity Functional Scale (LEFS) respectively. The collected data were analyzed using one-way ANOVA. Significant improvements in pain and LEFS were observed across all four groups after two weeks of the treatment ($p < 0.05$). Furthermore, significant enhancements in knee flexion, knee extension, ankle dorsiflexion, ankle plantarflexion and ankle eversion range of motion were noted within all the groups ($p < 0.05$), with no significant differences between the groups except for knee extension. The findings highlighted the effectiveness of TENS and IFT used with or without active movements, on pain, functional outcomes, and range of motion in athletes affected by lower limb musculoskeletal conditions.

Keywords: Athletes, Chronic Pain, Electrotherapy, Performance of Daily Task, Range of Motion

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Effect of Vinegar as a Natural Disinfectant: An In-Vitro Study Done for Planktonic Escherichia Coli

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Disinfectants are well known for eliminating microorganisms from surfaces and transmission media, which are important in maintaining ecological health and human safety. Despite the decreased effectiveness of commercially available chemical disinfectants, the emergence of disinfectant resistance has grown to be a serious threat to the safety of life and health. Thus, addressing disinfectant resistance necessitates thorough innovations prompting many countries to explore natural products such as grapes, dates and apple vinegar. Hence, this study focuses on cost-effective coconut vinegar, widely available in Sri Lanka. *E. coli*, isolated from biofilms associated with poultry, was used for the *in vitro* study where ATCC *E. coli* was used as the positive control. First, the isolates were confirmed as *E. coli* by PCR using *16s rRNA* gene-specific primers which were then exposed to grow in a series of concentrations of commercially available vinegar (0.25% - 4%) and ampicillin (3.125 µl/ml – 6400 µl/ml) in 96 well plates at planktonic state using standard protocols to detect minimum inhibitory concentrations of vinegar and ampicillin. *E. coli* growth was observed through a plate reader under 570 nm wavelengths. Ampicillin treatment on ATCC *E. coli* 25922 was the control to assess test accuracy. The experiments were independently repeated using three different bacterial broths from the same sample. As CLSI recommended the quality control strain *E. coli*, 25922 gave the inhibitory concentrations as 2-8 mg/ml of ampicillin, confirming the test's validity. For vinegar, 90% of planktonic *E. coli* growth reduction was observed (92% reduction in positive control) at a 2% concentration of coconut vinegar use indicating the efficacy of vinegar to work as a natural disinfectant. The study is expanding to detect the effectiveness of different vinegar products on planktonic and biofilm *E. coli* to further confirm vinegar as a cost-effective remedy for commercial disinfectants and disinfectant resistance.

Keywords: *Escherichia Coli*, ATCC, *16s Rrna* Gene, Planktonic, Vinegar 5

Effectiveness of Dharma Therapy on Psychological Distress among Adult Cancer Patients in North Central Province of Sri Lanka: A Mixed Methods Study

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Cancer presents complex multifaceted physical and psychological issues. Research indicates that reducing Psychological Distress (PD) is as crucial as medical treatment for cancer patients. This study investigated the effectiveness of a Buddhist principles-based intervention, Dharma Therapy Intervention (DTI), developed by Sik Hin Hung, in reducing PD among cancer patients in Anuradhapura, Sri Lanka. Ethical approval was obtained from the Ethics Review Committee of the Faculty of Medicine & Allied Sciences, Rajarata University of Sri Lanka. A mixed-methods design was used, consisting quasi-experimental nonequivalent groups and qualitative analysis of diary entries from participants. Forty participants, selected based on pre-determined criteria, were randomly allocated to intervention and non-intervention groups. PD was measured at pre-intervention and two post-intervention stages. Measurements included a demographic questionnaire, GHQ-30 Sinhala version for PD, and a Daily Record Book for qualitative data. The DTI comprised five individual counselling sessions and daily mindfulness practice. Data were analysed using IBM-SPSS-25 and thematic analysis. At the pre-intervention, ninety-five percent of the participants reported severe PD. Post-intervention statistical analysis showed a significant reduction in PD for the intervention group which received DTI (t (19) = 7.43, p < .001, two tailed, d = 1.96). Therefore, the effectiveness of DTI in reducing PD was noted at comparison levels of PD reported by non-intervention group (t (38) = 9.82, p < .001, two tailed, d = 3.1). Qualitative analysis revealed four positive themes; changes in attitudes about life and death, learning to regulate emotions, changes to behavioural patterns, and acquiring new knowledge. In conclusion, DTI of Sik Hin Hung showed significant impact on reducing PD among cancer patients in the study and was deemed as feasible intervention for Sri Lankan context, with relevant adaptable modifications for population characteristics. Future research with a 98andomized controlled design is proposed to verify these findings.

Keywords: Cancer Patients, Dharma Therapy, Mindfulness Based Psychotherapies, Psychological Distress, Sri Lankan Context

Enhancing Government Hospital Resource Management Through Smart Technologies: A Survey of Healthcare Professionals in Sri Lanka

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Inefficiency in resource management is a significant challenge in Sri Lankan hospitals. Novel technologies such as Artificial Intelligence, the Internet of Things, Machine Learning, and Smart Systems have the potential to decrease this; An approach yet to be introduced to the local settings. This survey aimed to assess the need and identify research gaps to enhance resource management in Sri Lankan hospitals using smart technologies. An e-survey was conducted among 59 healthcare professionals, 93.2% working in Government Hospitals. Of the respondents, 35.6% were based in National Hospitals, 30.5% in Teaching Hospitals, 11.9% in Divisional Hospitals, 10.2% in District General Hospitals, 6.9% in Base Hospitals, 1.7% in Provincial General Hospitals and 3.4% in other government Hospitals. Among these professionals, 47.5% were doctors, 28.8% were consultants, and 22% were consultant trainees. A substantial majority, 98.3%, perceived current resource management as inefficient. However, 78% believed that smart technology could improve efficiency, 11.9% were unaware, and 10.2% disagreed. Types of resources inefficiently managed were identified as human resources, medication, consumables, equipment, investigations, spaces, vehicles, electricity, water, food, ward beds, surgical theaters, and ICU facilities. Suggested improvements focus on the development of an updated patient record database, a dynamic resource allocation system for staff, theaters, medications, and consumables that adjusts based on workload, and enhanced tracking systems for medical investigations. Additionally, it recommends a sophisticated stock management systems that automatically reorder medications by analyzing usage patterns, regular maintenance schedules for medical equipment, and the implementation of electronic systems for patient referrals, remote monitoring, outpatient appointments, and clinic management, as well as systems for analyzing trends in hospital admissions. In conclusion, the survey reveals a significant need for integrating smart technologies into Sri Lankan government hospital resource management, suggesting that such advancements could revolutionize the current healthcare system by enhancing efficiency and effectiveness.

Keywords: Resource Management, Sri Lankan Hospitals, Smart Technologies, Healthcare Efficiency

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Evaluation of Cephalic Index and Facial Index in a Sri Lankan Population

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Standardized data regarding Cephalic Index (CI) and Facial Index (FI) measurements within a specific population is essential for determining racial and gender differences in both anthropological and clinical settings. The objective of this research was to evaluate the CI and FI among a representative sample of a Sri Lankan population, as there has been a lack of assessment regarding CI and FI in this population. This study examines CI and FI values in a cohort of 623 healthy young individuals representing various ethnicities and different provinces in Sri Lanka, comprising 250 males and 373 females aged 18-30 years. The ethnicity was confirmed by three generation pedigree and the province was selected according to the period of residence in the district. Standard anthropometric measurements were employed to determine CI and FI. Highly significant associations were found between CI and sex (P=0), ethnic group (P=0.0047) and the province (P=0). Mean CI of the population is calculated as 82.41±4.24. Mean CI of males and females were calculated as 81.68±4.25 and 82.90±4.18 respectively. The highest mean CI was found in Muslim females (86.17±3.15). Meanwhile, the highest mean CI (84.28±4.23) was found in Sabaragamuwa province. Factors such as sex (P=0) and province (P=0) were significantly associated with FI. However, there was not any significant association between the ethnicity and the FI (P=0). Mean FI of the population was calculated as 89.44±8.65. Mean FI of males and females were calculated as 91.79±8.83 and 87.87±8.16 respectively. The highest mean FI was found in Muslim males (95.20±3.96). Meanwhile the highest mean FI (92.66±9.84) was found in Central province. This study provides foundational data for defining CI and FI measurements to a representative sample of a Sri Lankan population, offering valuable insights for anthropological research, and facilitating in clinical setting and treatment planning for adults in Sri Lanka.

Keywords: Cephalic Index, Facial Index, Sri Lanka

Evaluation of Larvicidal Properties of Aqueous Extracts of Papaya Leaf, Fruit Peel and Seed against Aedes aegypti and Aedes albopictus

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Dengue Fever (DF) is an infection caused by the dengue virus, which is still a public health problem in Sri Lanka. Resistant populations have been produced by chemical insecticides such as larvicides used to control *Aedes aegypti* and *Aedes albopictus*. Higher dosages are therefore required, which naturally have harmful impacts on people, animals, and the environment. To combat insects as pests and vectors, researchers have thus turned their focus to naturally occurring plant-based compounds with insecticidal qualities. Because of its nutritional and medicinal significance, the papaya *(Carica papaya*), an herbaceous fruit crop in the Caricaceae family, has gained attention among academics. Therefore, the study was aimed to determine the larvicidal efficacy of aqueous extracts of papaya leaf, seed, and peel against *A. aegypti* and *A. albopictus*. For that aqueous extracts of leaf, seed and peel of *C. papaya* were prepared with distilled water and they were freeze dried. Obtained extracts were subjected to larvicidal assay and the results showed that the seed and peel extracts have a higher larvicidal activity against *A. aegypti* than leaf extracts with LC_{90} at 1023.29 ppm and 954.99 ppm respectively. Also, the aqueous extracts were checked for Lethal Time (LT90) and results obtained for seed and peel were 48.97 hr and 50.11 hr respectively. The results showed that papaya seed and peel extracts were effective in killing larvae of *A. albopictus* with Lethal Concentration (LC90) 794.32 ppm and 870.96 ppm and Lethal Time resulted were (LT90) at 42.65 hr and 47.86 hr respectively. Therefore, the utilization of *C. papaya* seed and peel aqueous extracts as environmental friendly vector control agent, particularly for *A. aegypti* and *A. albopictus*, can be considered as one of the potential sources for isolation of new larvicidal agents.

Key words: *Aedes aegypti*, *Aedes albopictus*, *Carica papaya*, Larvicidal activity

Evaluation of Physicochemical Properties of Extracted Mucilages and Powders from Three Selected Plants in Sri Lanka

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As natural mucilages are non-toxic, inexpensive and stable, this study evaluated the physicochemical properties of mucilages and powders extracted from fruits of *Dillenia retusa* (DR), leaves of *Aloe vera* (AV) and *Neolitsea cassia* (NC) with the aim of analyzing the gelling property to develop as pharmaceutical excipient. The physicochemical properties such as solubility, pH, colour, texture, loss on drying, swelling index and density were assessed for extracted mucilages, and freeze-dried powders. Both DR extracts dissolved readily in water at room temperature and 45 °C, but less soluble in organic solvents. Mucilage and powder observed pH 4.6 - 4.2 and pH 4.8 - 4.1 over 70 days, with light brown and dark brown colours along with 98.0% and 97.1% of loss on drying respectively with medium swelling index (10.0%). Bulk density, tapped density, and bulkiness of powders were 0.2 g/ml, 0.3 g/ml, and 5.0 ml/g. The solubility of DR and AV were comparable. AV mucilage and powder observed pH 3.7–3.3 and pH 4.1–3.4 over 70 days, with slightly yellow and dark yellow colours respectively with lowest swelling index (4.0%) along with 99.7 % and 99.0% loss on drying for powder and mucilage respectively. Its tapped density (0.09 g/ml) was the lowest, while bulkiness (7.1 ml/g) was the highest. NC mucilage dissolved in organic solvents, while powders displayed similar solubility in water at both temperatures but not in organic solvents. NC mucilage and powder observed pH 5.8 - 5.1 and pH 6.2 - 5.1 over 70 days with dark green and light green colours respectively along with 90.6% and 96.2% loss of drying respectively with highest swelling index (11%). According to results, slight variations in physicochemical properties were observed in mucilages and powders. Both mucilages and powders had suitable solubility, density, swelling index, pH and organoleptic properties to develop as an excipient and these plant materials will be considered for further analysis of gelling property.

Keywords: Mucilages, Powders, Physicochemical Properties, *Dillenia Retusa, Aloe Vera, Neolitsea Cassia Financial assistance given by the CINEC campus, Malabe is acknowledged.*

Evaluation of The Effectiveness of Fruit Pulp Mixed Toxic Sugar Baits against Adult Aedes Aegypti (Diptera: Culicidae) In the Laboratory

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Aedes aegypti is the primary vector for dengue, a severe viral disease. Current vector control methods often fail to effectively reduce *Ae. aegypti* populations and control dengue transmission. Attractive Toxic Sugar Baits (ATSB) offer a promising "attract and kill" strategy for mosquito control. This study developed and evaluated an ATSB formulation comprising fruit juice, sugar, and boric acid against male and female *Ae. aegypti* mosquitoes. The formulation included boric acid (1%, 1.5%, 2%, 2.5%), 10% sucrose, and 3% blue dye. Lethal concentration (LC_{50} and LC_{90}) values by "Probit Analysis" for boric acid within 24 and 48 hours were determined. For females (25), 24-hour LC_{50} and LC_{90} were 1.30% and 2.40%, with 48-hour values of 0.86% and 1.64%. For males (25), 24-hour LC_{50} and LC_{90} were 0.88% and 1.39%, with 48-hour values of 0.67% and 1.11%. Bioassays were performed with three replicates, repeated three times with different mosquito generations under controlled laboratory conditions (24±2°C, 70±10% RH, and a 12L:12D photoperiod). Choice tests in a 30x30x30cm cloth cage with 25 males and 25 females assessed the attraction index of three fruit juice-based ATSBs: "Kilo guava", "Karathakolomban mango", and "Mauritius pineapple". Pineapple juice-ASB exhibited the highest attraction index and was selected for further evaluation. The pineapple juice-ASB, augmented with 4% boric acid, induced 90% mortality within 24 hours and 100% within 48 hours of exposure to *Ae. aegypti* mosquitoes. These findings highlight the efficacy of the pineapple juice-ASB with boric acid as a promising method for *Ae. aegypti* control in dengue-endemic regions, offering an innovative approach to vector management.

Keywords: *Aedes aegypti*, Dengue, Attractive Toxic Sugar Baits (ATSB), Boric acid, Mosquito control strategies

The support given by the School of Entomology, Medical Research Institute, Sri Lanka is acknowledged.

Evidence-based Antidiabetic Effectiveness of Cinnamomum Zeylanicum (Ceylon Cinnamon)

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The alarming rise in type 2 diabetes mellitus (T2DM) underscores the urgency for innovative approaches. While pharmaceuticals often entail chronic usage with associated adverse effects, nutraceuticals offer a promising alternative by potentially mitigating these effects. *Cinnamomum zeylanicum* (Ceylon cinnamon), is popular due to its dual role as both a flavorful spice and the potential health benefits. However, the evidence-based reviews on the beneficial effects of *C. zeylanicum* on T2DM are limited. Thus, the current study aimed to review the antidiabetic potential of *C. zeylanicum* in T2DM patients by conducting a systematic review. Google Scholar, PubMed, and Embase were used as the main search engines. PRISMA-2020 guidelines were used to select primary papers between 2011 – 2024. Out of a total of 20,000 initial articles, only eight primary articles met the inclusion criteria. The quality of the included studies was evaluated using the Critical Appraisal Skills Programme (CASP) tool. All the selected studies have used powdered *C. zeylanicum* bark as the intervention. Sample sizes of the primary studies included in the review ranged from 25 to 210 T2DM patients. The duration of the studies varied, ranging from 8 to 16 weeks, with doses ranging from 1g/day to 3g/day. In all selected studies effectiveness was tested using fasting blood glucose (FBG) and glycosylated hemoglobin (HbA1c) levels. Out of eight studies, six showed that T2DM patients who received *C. zeylanicum* showed a significant reduction ($p<0.05$) in fasting blood glucose compared to the control group. Also, there was a clear reduction in HbA1c % ($p<0.05$) in T2DM patients compared to those who received a placebo. The available evidence suggests that chronic use of *C. zeylanicum* positively affects glycemic control in patients with T2DM. However, there are limitations in comparing published data due to concerns about the quality and heterogeneity of the studies, including variability in doses and administration forms. Consequently, more conclusive evidence is needed to determine the safety and efficacy of chronic cinnamon use and to compare the acute effects with chronic use.

Keywords: Ceylon Cinnamon, *Cinnamomum Zeylanicum*, Chronic Studies, Antidiabetic Effectiveness, T2DM Patients

Examination Timetable Scheduling based on Quadratic Assignment Problem

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Timetable scheduling is crucial for the efficient functioning of any institute. The type of timetable varies according to institutional requirements, with many factors to consider for creating an effective schedule. In particular, the examination timetable plays a pivotal role in the smooth operation of an academic institution. Consequently, the examination-timetabling problem is an active research area with various methods in literature, and new approaches continually emerging to meet diverse institutional needs. In this study, scheduling the examination timetable is formulated as a quadratic assignment problem. By considering both hard and soft constraints and assigning weights to courses based on student enrolment, an algorithm is proposed using the branch and bound technique—an effective method for such problems. Given that the number of exams may exceed the available time slots, the objective function prioritizes satisfying hard constraints to minimize conflicts. As a real-world application, the proposed algorithm was implemented to prepare the end-of-semester examination timetable for the Faculty of Applied Sciences at Wayamba University, Sri Lanka, using data from the university's 2010/2011 academic year handbook. The implementation involved 309 students and 39 courses. The generated timetable successfully met all hard constraints and most soft constraints. During the process, two key matrices were introduced: a course conflict matrix to prevent conflicts among courses with shared students, and a time slot matrix to minimize simultaneous exams for each student and ensure sufficient intervals between exams. These matrices, being Boolean, facilitate efficient implementation for larger numbers of courses with minimal computational cost.

Keywords: Examination Timetable, Quadratic Assignment Problem, Branch and Bound Algorithm, Constraints

Examining the Coping Strategies of Parents of Children with Neurodevelopmental Disorders amidst Negative Attitudes of Society

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Neurodevelopmental disabilities are any physical or mental conditions that may limit a child's capacity to develop cognitively, physically, and emotionally in comparison to other children. Raising a child with a neurodevelopmental disorder can be challenging, but with effective coping mechanisms, parents can maintain their well-being and overcome the difficulties. This study focuses on the coping strategies of parents of children with neurodevelopmental disorders amidst the negative attitudes of society in Sri Lanka. For this purpose, the current study used semi-structured interviews to gather qualitative data from ten parents of children with neurodevelopmental disorders using the snowball sampling method. The results revealed that parents faced negative societal attitudes and used various coping strategies. Acceptance was powerful in managing a parent's life challenges and stressors. Social support helped parents handle stress and emotions significantly, providing resources and support. In addition, spiritual support was a successful coping method, as spiritual beliefs and practices could provide comfort, strength, and a sense of purpose during tough times. However, a small number of parents used maladaptive coping strategies, claiming that they helped with temporary relief and distraction from painful situations. Gender differences in coping methods were observed. Women employed religious engagement and openness, while men preferred to hide emotions and choose harmful coping tactics such as alcohol use. In conclusion, parents believed that having a realistic perspective on their child's condition and accepting the circumstances as they were, enabled them to cope. Parents felt free to share their positive and negative emotions and experiences with their social circles. Although spirituality can provide relief for parents raising a child with a neurodevelopmental disorder, it should be viewed as a coping mechanism and not a replacement for the assistance of professionals. The gender difference in coping mechanisms indicated that males tend to resort to maladaptive coping mechanisms than females.

Keywords: Neurodevelopment Disorders, Parents of Children with Neurodevelopmental Disorders, Negative Attitudes of Society, Coping Strategies

Exenteration in a Stallion as a Treatment of Ocular Squamous Cell Carcinoma under General Anesthesia- A Case Report

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Ocular squamous cell carcinoma (SCC) is the most prevalent ocular cancer in horses, causing rapid vision loss. Horses with unpigmented skin around their eyes are more prone to developing SCC, with ultraviolet light exposure being a significant risk factor. This case study involves a 5-year-old stallion with a 7.5 cm mass on its right eye, present for five months. The stallion exhibited blindness and infected conjunctiva and the preoperative blood tests were unremarkable. Fine needle aspiration cytology showed atypical epithelial cells arranged in clusters, indicative of SCC prompting a clinical recommendation for enucleation. Procaine benzyl penicillin (22 mg/kg) intra-muscularly and flunixin (1.1mg/kg) intravenously (IV)) were administered as an antibiotic and analgesic respectively, and detomidine (0.01 mg/kg) and butorphanol (0.01mg/kg) IV were used as pre-anesthetic agents. Anesthesia was induced with ketamine (2.2mg/kg) IV and midazolam (0.05mg/kg) IV and the horse was intubated with 18 mm size tube and positioned in left lateral recumbency. Anaesthesia was maintained with 100%(v/v%) isoflurane and oxygen, with continuous infusion 1.2mg/kg/hr of ketamine (1000mg) and detomidine (10mg), and dobutamine (125mg) administered via a syringe pump. The surgical site was prepared with chlorhexidine, and lidocaine was infiltrated locally. Exenteration, by suturing the eyelids followed by transecting the canthal ligaments, dissecting around the conjunctival sac to detach the extraocular muscles and transecting the optic nerve was performed. The orbital cavity was thoroughly debrided and was covered with a bandage. Post-surgical wound care was instituted every other day for two weeks, and the frequency was reduced. The wound healed completely without complications. Histopathology revealed highly atypical squamous epithelial cells and frequent central keratin pearls along with predominantly composed of neutrophils with intracellular bacteria. This report is notable as the first documented successful exenteration of a horse using a gaseous agent to maintain general anesthesia in Sri Lanka.

Keywords: Horse, SCC, Exenteration, Isoflurane

Exploring Intersections of Identity among Individuals who are Homosexual in Sri Lanka: A Sociological Study

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In Sri Lanka, the intersections of identities among homosexual individuals are influenced by a complex interplay of socio-cultural, legal, and personal factors, including the criminalization of homosexual relations under Sections 365 and 365(A) of the Penal Code of Ceylon. This sociological study investigates how intersecting identities such as gender, ethnicity, and religion affect the self-perception and social interactions of homosexual individuals. Using a qualitative methodology, the research employed snowball sampling to identify 10 participants aged 20–30 from Colombo and Kandy, ensuring diversity in ethnicity and religion. Data was collected through in-depth interviews and analyzed thematically. The findings reveal significant regional differences: individuals in Colombo reported greater openness about their sexual identity, engaging more freely with LGBTQ+ social networks, while those in Kandy often concealed their orientation due to pervasive social stigmas and fear of repercussions. Gender emerged as a crucial factor, with female participants generally being more open about their identity compared to male participants, who exhibited higher levels of repression and internalized stigma. Ethnicity and religion also played a significant role: Tamil participants experienced slightly more familial acceptance compared to Sinhalese participants, who faced greater family pressure to conform. Additionally, individuals from conservative religious backgrounds, including Buddhism and Christianity, encountered more severe discrimination, with some facing exclusion from religious and community events. Discrimination was pervasive across genders and sexual orientations, particularly impacting access to healthcare, education, and employment, especially for those of lower socio-economic status. LGBTQ+ communities and personal relationships were vital for providing support and resilience. This study highlights the complex dynamics of intersecting identities among homosexual individuals and advocates for targeted, evidence-based interventions to foster inclusivity and uphold human rights. By amplifying diverse voices and experiences, the research aims to contribute to broader societal acceptance and equality.

Keywords: Intersections, Homosexual, LGBTIQ+, Sexual Orientation, Stigma

Exploring Variation in Smoking Pack Years Across Demographics and its Relationship with Blood Pressure

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Sri Lanka, a multicultural and multiethnic nation, faces economic challenges and unequal resource distribution. Cultural and religious beliefs greatly influence health behaviours. Hypertension, a prevalent health issue, is significantly linked to smoking. Despite implementing international standards for blood pressure control, various demographic factors complicate achieving the health goal. This study aimed to assess differences in smoking habits across demographics—sex, religion, ethnicity, occupation, income, and education—and examined its association with systolic and diastolic blood pressure levels and blood pressure control. A cross-sectional descriptive study was conducted at the Teaching Hospital Peradeniya, a tertiary care hospital in Sri Lanka, from March 2020 to April 2024, involving 247 diagnosed hypertensive patients. Data collection utilised interviewer-administered questionnaires and clinically measured parameters. The smoking habit was measured in pack years. A one-way ANOVA test, linear regression, and binary logistic regression analyses were performed. 247 patients were analysed, with a mean age of 62.9±14.1 and 45.4% being female. The majority (87%) identified as Sinhala Buddhists. Housework dominated (35.6%), many had education below GCE-Ordinary Level (45.8%), and 9.35% had less than 10,000 Sri Lankan rupees in income. The mean pack year was 4.76. The one-way ANOVA showed significant differences in pack years between genders ($p = 0.002$) and among occupations ($p = 0.012$). The mean systolic and diastolic blood pressures were 139.6±21.7mmHg and 83.9±14.6mmHg, respectively. Regression analyses revealed no significant association between smoking pack-years and either systolic or diastolic blood pressure, nor with blood pressure control ($p>0.05$). In conclusion, there was a significant variation in packyears between genders and among occupations among patients attending Teaching Hospital Peradeniya, Sri Lanka. Interestingly, the study found no significant link between their pack years and blood pressure levels or control, suggesting that even former smokers can achieve adequate blood pressure control with standard management.

Keywords: Smoking Pack Years, Demographic Factors, Systolic Blood Pressure, Diastolic Blood Pressure, Bood Pressure Control

Factors Influencing Students' Grade Point Average: A Case Study of Level II Undergraduates in the Faculty of Science University of Ruhuna, Sri Lanka

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Academic performance use to evaluate the student achievements within an educational environment. At the university level, academic performance is often quantified through grades and the Grade Point Average (GPA). Many factors can affect the GPA. This study aims to investigate the factors affecting the GPA of level II undergraduates of the Faculty of Science, University of Ruhuna, Sri Lanka. Specifically, the study investigates the effect of Z-Score, results of Level I English, lecture attendance, Degree Program, gender, stay in the hostel or not, and attempt at GCE A/L examination on GPA. The study collected secondary data of 619 undergraduates. The descriptive statistical analytical techniques, Kruskal-Wallis test, Wilcoxon rank sum test, ANOVA in Bootstrap, and two sample t-test in Bootstrap were used in the data analysis. Ordinary Least Squares method (OLS) and bootstrap regression methods were used to construct the regression models. According to the results, a higher proportion of female students (58%) showed a better academic performance than male students (p-value < 0.001). The performance of male students who following Physical Science Degree was lower than the other degree programs. The students who got admission to the university on their 1st attempt performed better in the university. The non-parametric tests and Bootstrap approaches showed that, GPA was not affected whether students staying in the hostel or not (p-value> 0.05). The paired bootstrap regression method yielded a model with better accuracy. We can conclude that Z-Score, results of Level I English, lecture attendance, and Degree Program, gender, and attempt at the GCE A/L examination influenced to the students' GPA and, the bootstrap approach can be used effectively for the data set with unknown distributions. These results will further assist students, lecturers, administrators, and policymakers in observing and taking appropriate action to improve academic performance.

Keywords: Academic Performance, Grade Point Average, Bootstrap, Regression, Non-Parametric Methods

Formulation and Development of an Herbal Syrup from Mangifera Indica Leaves for the Management of Gastritis

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Gastric ulceration is a common condition affecting up to 10% of the global population. Though conventional treatments have shown positive results, they have also shown drawbacks such as recurrence and side effects. Consequently, there is growing interest in using medicinal herbs as natural remedies. The dried leaves were reflux extracted to obtain the aqueous extract and freeze-dried extract was incorporated in different strengths as 0.8 g. 1.6 g and 3.2 g into the syrup base and prepared three formulations as S1, S2, and S3 respectively. The *In-vitro* acid neutralizing capacity of the formulated syrup formulations was determined using Fordtran's titration method, and the duration of consistent neutralization on artificial gastric acid was evaluated using the modified Vatier's artificial stomach. Gaviscon syrup was used as the positive control, while distilled water was used as the negative control. Finally, stability and physico-chemical properties were evaluated of the final herbal syrup formulations. The S1 syrup formulation showed the highest acid neutralizing capacity of 13.28±0.05 mmoL while 89.57±0.03 mmoL and 2.63±0.04 mmoL for the positive control and negative control respectively. S1 formulation was consistently neutralized artificial gastric acid for 157.66±1.15 mins.while 382.66±0.58 mins and 82.33±0.58 mins for the positive control and the negative control. According to this study, the herbal syrup formulation that includes *M. indica* L. leaf extract has the ability to neutralize gastric acid, making it a safer option for treating ulcers. Further research is recommended to carry out preclinical and clinical investigations, clarify molecular mechanisms, and apply for regulatory approval in order to optimize the procedure.

Keywords: *Mangifera Indica,* Herbal Syrup, Acid-Neutralizing Capacity, Gastric Ulceration

Genetic Predisposition of Preeclampsia among Asian Population

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Preeclampsia, characterized by new-onset hypertension after the 20th week of gestation, is linked to genetic factors associated with hypertension. Research has confirmed a genetic contribution to its susceptibility, although the exact pathogenesis unclear. Since, Asian populations have been understudied in this regard, this systematic review aimed to analyze data from 4608 pregnant women across six articles out of 15808 initial articles published on CINAHL, Google Scholar, and PubMed databases from 2014 to 2024. The review highlighted a varied genetic susceptibility landscape to preeclampsia among Asian populations. Three Chinese cohort studies highlight correlations between genetics and preeclampsia. One study reveals elevated renalase levels and specific renalase polymorphisms (rs10887800, rs2576178), indicating heightened susceptibility to long-term preeclampsia. Another study identifies seven alleles, including genes like AGT, IL-10, TNFα, NOS3, APOE, and ERAP2, significantly associated with preeclampsia in the Han Chinese population. The third study links CRP haplotypes and the rs2794521 genotype to preeclampsia risk in Han Chinese, with certain haplotypes showing either susceptibility or protective effects. In a Sri Lankan study IL1A and MBL1 polymorphisms are associated with heightened preeclampsia risk, while MBL1 rs1800450 demonstrates reduced prevalence in preeclampsia cases. Genotyping analysis in a Pakistani population revealed that the MTHFR:c.665C > T variant is associated with increased susceptibility to preeclampsia (OR = 2.79, 95% CI = 1.18–6.59; P* = 0.046 in over dominant model, OR = 2.91, 95% CI = 1.29–6.57; P* = 0.0497 in dominant model). However, the F5:c.1601G > A, VEGFA: c.-2055A > C, and VEGFA: c.*237C > T variants showed no relationship with the disease. Moreover, the IL-4 VNTR polymorphism confers a higher risk of preeclampsia in the Iranian population. In conclusion, correlations between specific genetic variants and preeclampsia risk, such as elevated renalase levels and polymorphisms, and CRP variants, underscore the significant role of genetic factors in the development and susceptibility to preeclampsia, emphasizing the need for further investigation in this area.

Keywords: Preeclampsia, Genetic Predisposition, Polymorphisms, Asian Population

Gender Dimensions in the Backyard Poultry Sector in Sri Lanka

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Many households in Sri Lanka depend on backyard poultry production for both income and nutrition. The main objective of this study is to explore gender roles associated with backyard poultry farming in Sri Lanka along with documenting the key practices which influence health risks and their association with gender, region and ethnicity. The study employed secondary and primary data collected through ethnographic methods such as semi-structured interviews and field observations. Households raising backyard chicken in Northern (N), North Western (NW), and Eastern (E) provinces were selected using snowball sampling as those three consist of the highest number of registered backyard farms in Sri Lanka. Fifteen women and fifteen men from twenty-seven farms were interviewed for this study. Data was analysed using thematic analysis on the MAXQDA software. This qualitative study found that backyard farms exhibit a significant gender-based division of labour in North Western and Eastern Provinces. Men perform the heavy work, while women perform daily caregiving tasks and tasks that require less physical strength. However, in the Northern Province Tamil women not only performed strenuous tasks but were also more independent in decision-making and financial management. The study found laxity towards health and hygiene, with higher chances of spreading zoonotic diseases in all three provinces regardless of gender or ethnicity. There was considerable reliance on traditional treatment methods, informal purchasing of medicine over the counter, and consulting of fellow farmers in the case of birds' illnesses. The results represent that the gendered division of labour is prominent among Sinhala and Muslim communities within the backyard poultry farms whereas Tamil women are independent in many senses due to their pre-exposure to war and hardship. However, hygienic practices were poor regardless of gender or ethnicity in all three provinces. In conclusion, there is a visible gender division of labour within the backyard poultry system in Sri Lanka and the management practices pose higher health risks to the farmers irrespective of the ethnic group or region.

Keywords: Gender, Poultry, Labour, Hygiene, Empowerment

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Hexon Gene Loop 1 Region Phylogeny of Fowl Adenoviruses Associated with Inclusion Body Hepatitis in Broiler Chickens in Sri Lanka

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Inclusion body hepatitis (IBH) is an acute disease in 3–7week broiler chickens, caused by Fowl adenoviruses (FAdVs) of the genus Aviadenovirus, family *Adenoviridae.* FAdV-D (serotypes 2, 3, 9, and 11) and FAdV-E (serotypes 6, 7, 8a, and 8b) mainly target the liver of the infected bird causing IBH. Our previous study detected, serotypes 8b and 11 from the North-Western Province (Kurunagala and Kuliyapitiya) and serotype 8b from the Central Province (Gampola). The objective of this study is to determine the hexon gene loop 1 (L1) region based phylogenetic relationship of these serotypes. The sequencing data from the serotypes were analysed by Basic Local Alignment Search Tool N (BLASTN) against sequences in the GenBank database. The results revealed that FAdV 8b isolate from Kurunagala had 98.75% sequence homology to a FAdV isolated from South Africa (HQ117899.1), and, 98.63% and 98.52% nucleotide homology to FAdVs isolated in France (MK572865.1) and India (MH379248.1) respectively. The FAdV 8b isolate from Gampola had a 99.19% sequence similarity to a FAdV reported from France (MK572865.1), 99.07% to a Canadian FAdV (JN112373.1) and 98.96 % to a South African FAdV (HQ117904.1). The FAdV 11 isolate from Kuliyapitiya had a 99.88% sequence similarity to a FAdV found in Japan (LC650578.1), 99.77% to a FAdV in Trinidad and Tobago (MG676334.1) and 99.77% to a Saudi Arabian FAdV (MK995483.1). The pairwise sequence comparison of the two FAdV 8b isolated from Kurunagala and Gampola revealed 99% sequence similarity to each other. This study suggests that genetically close related FAdV 8b serotype had been circulating in the two different geographically distant provinces in Sri Lanka. Sequencing of recently isolated FAdV serotypes from these two provinces is on-going.

Keywords: Broiler, Fowl Adenovirus, Inclusion Body Hepatitis, Phylogeny, Serotype

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Impact of Audit Expectation Gap on the Shareholders' Confidence with Special Reference to Public Listed Companies in Sri Lanka

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Annual financial statements are prepared by management to communicate the corporate financial performance and position while auditors provide an independent opinion on the true and fair view of these statements over very many years. The Audit Expectation Gap (AEG) is still considered as a critical issue which arises from the differing expectations of shareholders and auditors. Accordingly, the study initially assesses the AEG within the context of the Public Listed Companies in Sri Lanka and then investigates the impact of the auditors' role on the Shareholders' Confidence. The study followed a quantitative approach and data were collected using a structured questionnaire distributed among auditors and shareholders. The study employed independent sample t-tests and Simple regression analysis to analyze the collected data. Based on a questionnaire survey with auditors and shareholders, the study explored shareholders' perceptions of unreasonable AEG from various aspects. The findings of this study revealed that the existence of an AEG is negatively related to shareholders' confidence, and the greater the AEG, the lower the shareholders' confidence in the audit. Furthermore, it revealed a significant difference between auditors and shareholders on the expectation of audit in terms of auditor independence, communication, and responsibility for fraud detection. However, no significant difference for the expectation of audit which was found concerning the reliability of the auditor's report. Regression analysis confirmed that auditor independence, communication, and report reliability enhance shareholder confidence. However, perceptions diverged on the impact of fraud detection responsibility, with auditors downplaying its effect, contrary to shareholders' views. These findings emphasize that there is a necessity to address the AEG in order to improving transparency in the audit process, ensuring accurate financial disclosures, and fostering shareholder confidence.

Keywords: Auditors, Audit Expectation Gap, Shareholders, Shareholder Confidence, Sri Lanka

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Impact of National Interest on Diplomatic Policies: A Study of Ancient Relations between Athens, the Ionian Islands, and Egypt

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Greece and Egypt are two ancient nations that developed in Europe and Africa respectively. History reveals a long-lasting mutually beneficial relationship between these two nations. Significantly, both literary and archaeological evidence reveal strong relations between Egypt and selected Greek city-states, Athens and the Ionian islands. The primary aim of the research was to identify the factors that affected diplomatic policies and interactions between Athens, the Ionian Islands, and Egypt during ancient times. The research developed into understanding the nature and dynamics that nourished the significant diplomatic relations between two ancient nations from the 8th century BCE to the 4th century BCE. The research mainly followed a historical method in acquiring knowledge from primary sources, Herodotus and Thucydides, and adopted an analytical and eclectic research method under qualitative research methodology to extract the findings from the gathered information. The research recognized several significant grounds developed between Greece and Egypt that strengthened their bilateral relations. A close examination of the evidence revealed this diplomatic understanding was mainly built between Athens, the Ionian states, and Egypt as a result of national interest, the impact of necessity, geographical proximities, political and social practices, and cultural similarities of each party involved. The research identified an influential 'Intellectual Triangle' that developed between Athens, the Ionian states, and Egypt bridging these regions enabling the exchange of a vast amount of knowledge in areas such as philosophy, art and architecture, medicine, mythology, and religion that enriched the culture of Greece. Further, they shaped the socio-political and military dynamics of ancient Greece and Egypt. In conclusion, this diplomatic understanding has evolved up to the development of mutually beneficial diplomatic agreements signed between Greece and Egypt in the 21st century while continuously strengthening the alliance between these two nations among other countries in the Mediterranean basin.

Keywords: Athens, Diplomacy, Egypt, Intellectual Triangle, National Interest.

Impact of Perceived Academic Stress on Academic Performance and Coping Mechanisms among University Students

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Academic stress (AS) is a distressing state that could arise when academic demands surpass an individual's capacity to adapt during exams, tutorials, and practical sessions. This can vary by individual and significantly affect their performance. Different coping mechanisms may help the students to overcome the perceived stress. This cross-sectional study was conducted at the University of Peradeniya, Sri Lanka which provides a unique academic environment. The sample represented the proportion of students across all faculties. The data were collected through an online questionnaire and the AS was evaluated through academic stress scale (PAS). The analysis was performed with IBM SPSS version 25. Among the 506 respondents, majority were female (60.3%, n=305). Overall, a high academic stress was observed (mean PAS score = 54.5), particularly among female students and those followed the Veterinary Medicine and Animal Science. No marked differences in stress levels were noted between students in health-related and non-health-related courses. Notably, students with higher GPAs reported lower stress levels. Headache was reported as the main associated symptom (66.6%) followed by sleep disturbances (55.7%). The most common coping strategies were talking to family or friends (73.9%), engaging in leisure activities like listening to music (69.8%) and watching online content (61.7%). The study highlights the variability of AS across gender, the study programs, and the academic performance. The most common coping strategies included seeking social support. Thus, fostering a supportive social environment could be beneficial in managing students' stress effectively.

Keywords: Academic Stress, Perceived Academic Stress, Coping Mechanisms, Academic Performance, Social Support

Incidence of Enterobiasis in Paediatric Patients and Their Guardians' Knowledge, Attitudes and Practices towards Prevention – A Descriptive Cross-Sectional Study in a Tertiary Care Centre, Batticaloa

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Enterobius vermicularis is a common parasite affecting about 200 million people worldwide. This study was done to investigate the current status of enterobiasis in paediatric patients (n=191) at the University unit of the Teaching Hospital Batticaloa and to assess their guardians' knowledge, attitude and practices in prevention of enterobiasis. Adhesive cellophane peri-anal swab preparations were used to collect parasitic samples and an interviewer administered detailed questionnaire to collect the information. The incidence of pinworm infection was 15.7% (n=30) where, 70.0% (n=21) were boys and the highest number of infected children (76.7%, n=23) were aged between 1-5 years. The mean knowledge score was 6.24±3.12 where 68.1% of them had good knowledge regarding prevention. The mean practice towards prevention was 5.4±3.11 where 16.7% of them had practiced adequate prevention techniques. The mean attitude was 4.7±3.12 where 76.4% of guardians showed positive attitudes towards prevention of infection. There were significant associations found with knowledge, attitude and practices where higher the knowledge better the practices and better the attitudes. Multivariate binary logistic regression was performed to identify the risk indicators. Out of the socio-demographic factors, only gender male (p=0.007), Family monthly income between 20,000–30,000 LKR (p=0.030) and the size of the family/ families with four members (p=0.021), were found to be significantly associated with enterobiasis. Knowledge (p=0.943) and attitude had no significant relationship with enterobiasis (p=0.061). However, knowledge, attitude, and practices were significantly associated with birth order (p=0.037), school (p=0.036) and the Guardian's level of education (p=0.053). Boys had a higher risk of infection, and further studies are required to assess the behavioral practices leading to the higher infection among them. As enterobiasis in the population is found to be multifactorial, reducing poverty and overcrowding (number of children per family) could be identified as the controlling measurements at least in the study population.

Keywords: *Enterobius Vermicularis*, Knowledge, Attitude, Practice, Enterobiasis.

In Silico Quest: Gymnema sylvestre's Chemical Arsenal Against Influenza a Virus Neuraminidase

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Influenza (flu) is a highly contagious respiratory illness that poses a significant global health threat. Frequent mutations in the influenza A virus (IAV) often reduce the effectiveness of antiviral drugs, highlighting the urgent need for new therapeutic agents. *Gymnema sylvestre*, a medicinal plant from the *Apocynaceae* family, found in Asia, Africa, and Australia, has been used in Ayurvedic and traditional medicine to treat hyperglycemia. This plant contains various phytochemicals with known anticancer, antioxidant, antiviral, anti-inflammatory, hepatoprotective, glucose-lowering, and lipid-lowering properties. In this study, we conducted an *in silico* analysis of compounds derived from *Gymnema sylvestre* against IAV neuraminidase (NA) (PDB: 3TI6). NA is crucial for the propagation and dissemination of the IAV within the host, making it a key target for antiviral drugs. From a comprehensive literature search, we identified 36 natural compounds and evaluated their absorption, distribution, metabolism, and excretion (ADME) properties using SwissADME. Following Lipinski's rule of five, we identified 19 compounds as potentially safe drug candidates. Virtual screenings of these selected compounds in 3D SDF form were conducted using PyRx 8.0, and those with a binding affinity greater than -5 kcal/mol underwent further blind docking using CB-Dock2. The results revealed four compounds—cedrane-v6, squalene, stigmasterol, and lupeol—showed higher binding affinities (-6.9, -7.1, -7.9, and -8.0 kcal/mol, respectively) to IAV NA compared to oseltamivir (-6.6 kcal/mol), a known NA inhibitor (PubChem: 65028). These compounds effectively interacted with key amino acids in the active site of IAV NA, potentially inhibiting the enzyme's function and blocking the release of viral progeny. Our findings suggest that these four compounds from *Gymnema sylvestre* could serve as effective IAV NA inhibitors. However, further *in vitro* and *in vivo* studies are needed to validate their pharmaceutical potential and protective effects against influenza.

Keywords: In Silico, Influenza, Gymnema Sylvestre, Swissadme, Neuraminidase

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Intracardiac Thrombosis in a 5 years-old German Shepard

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Intracardiac thrombosis (ICT) is rare in dogs and thrombi in the left sided heart chambers are even rarer. Predisposing factors for ICT include cardiac dilatation, arrhythmias, and hypercoagulability. This report describes multiple intracardiac thrombi; a large left ventricular thrombus and three other small thrombi in the right ventricle, in a 5-year-old German shepherd. At the presentation, the patient was recumbent, severely dyspnoeic and had an enlarged abdomen, hind limb oedema, urinary incontinence, and constipation. Physical examination revealed 8% dehydration, hypothermia, tachycardia, generalized dependent oedema, pale mucous membranes, and open- mouth breathing. Right lateral thoracic radiographs showed cardiomegaly (VHS of 12.5, RI: 9.2-10.5), prominent cranial pulmonary veins, and pulmonary oedema. Echocardiograph revealed enlarged cardiac chambers and a mild pericardial effusion. A 41mm diameter spherical hyperechoic mass freely moving between the left ventricle and mitral valve was identified with three smaller masses in the other three chambers. In addition to the mass lesions, there was mitral valve regurgitation and aortic and a tricuspid insufficiency. Complete blood count revealed regenerative anaemia, thrombocytopenia and serum biochemistry identified azotaemia, and elevated creatinine. Differential diagnoses for the mass lesions included intracardiac thrombosis, valvular endocarditis and neoplasia. Despite the treatments with amoxicillin/clavulanic acid, furosemide, spironolactone, omeprazole, and supportive care, the dog died on the day after admission. Necropsy confirmed presence of a 44 mm grey-tan mass occupying the left ventricle and smaller masses in the right atrium and ventricle, along with renal and splenic infarcts secondary to thromboembolism. Histopathology of the large and small masses revealed concentric layers of platelets, white blood cells, fibrin, and red blood cells (lines of Zahn) which were consistent with thrombi. The exact aetiology of ICT in this dog was suspected to be multifactorial and have not been studied.

Keywords: Intra Cardiac Thrombi, Left Ventricle, Dog, Lines of Zahn

Investigating Quality of Handwritten Outpatient Prescriptions in Sri Lanka: A Prescription Survey on Completeness and Legibility

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Prescription errors significantly contribute to medication errors causing serious health problems. Despite extensive studies conducted globally, a limited number of research has been conducted in community pharmacy settings in Sri Lanka. This study aimed to evaluate the quality of handwritten outpatient prescriptions related to the completeness of the layout and content, legibility and the presence of possible drug-drug interaction. The study was conducted in four different community pharmacies situated in an urban and a sub-urban area in Sri Lanka. Four hundred handwritten outpatient prescriptions with more than two drugs were collected as 100 prescriptions per pharmacy using the convenience sampling method. Data were collected from June 2023 to September 2023 using a pre-tested checklist. It contained four parts for the assessment of layout, content, possible drug interactions and evaluation of the legibility of the prescriptions. Data analysis was carried out using SPSS (version 25). Patient's name (61.5%), age (78%) and gender (74.5%) were present in more than 60% of the prescriptions. Average completeness of the layout was 63.52%. Presence of contact details of patient and prescriber was significantly different between two study areas (respectively, p=0.010, p=0.001) and approximately similar between specialists and general practitioners (respectively, p=0.721, p=0.528). More than half of the prescriptions had nonstandard abbreviations and incomplete units, while 12.3% of prescriptions were found with avoidable decimal points. Only 122 (30.5%) prescriptions were found as legible prescriptions. Serious potential drug-drug interactions were identified in 7% (n=28) of prescriptions. Average completeness of the layout was comparatively higher in collected prescriptions and nonstandard abbreviations and incomplete units were frequently used in prescriptions. Among, collected prescriptions, less than 50% were legible. High workload, tiredness, negligence may have caused these errors and use of standard prescription writing process and computer-generated prescriptions can be used as a solution to these problems.

Keywords: Prescription Errors, Non-Standard Abbreviations, Legibility, Completeness, Quality of Prescription

Investigating Knowledge and Attitudes Regarding Antibiotic Use among Consumers in Kandy District, Sri Lanka: A Call for Targeted Educational Interventions

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Antimicrobial resistance represents a significant global health challenge, primarily due to the inappropriate use of antibiotics. Understanding public knowledge and attitudes is crucial for managing this misuse. This study aimed to examine antibiotic use, knowledge, and attitudes among consumers at community pharmacies in the Kandy district, Sri Lanka. A self-administered, cross-sectional survey was conducted with 400 participants at three state pharmacies within the district. Data collection utilized a validated questionnaire divided into four sections: demographic characteristics, self-reported antibiotic use, knowledge of antibiotic use, and attitudes toward antibiotic use. Descriptive statistics summarized the data, while Chi-square and Fisher Exact tests explored the influence of demographic characteristics on knowledge and attitudes about antibiotic usage. The results revealed an equal distribution in the timing of last antibiotic use. Notably, 8% of participants admitted to self-medicating with antibiotics. A moderate level of knowledge was observed in 52.3% of respondents, and 78.0% correctly identified that antibiotics are intended for bacterial infections. However, a significant majority (82.8%) reported the misconception that antibiotics are effective against viral infections, and 32.8% believed that taking antibiotics for cold symptoms would expedite recovery. Despite these misconceptions, 90.0% of participants were aware of the potential for antibiotic resistance stemming from excessive use. While the study highlighted considerable knowledge about antibiotics among the public, it also uncovered a disconnect between their knowledge and attitudes. Consequently, the study underscores the need for educational interventions to promote the judicious use of antibiotics among consumers in Kandy's community pharmacies.

Keywords: Antibiotics, Public Knowledge, Attitudes, Antibiotics Usage, Sri Lanka

Investigating the role of AI (Chat GPT) in Evaluating Writing Skills for IELTS Exam Preparation in English Language Teaching

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Considering the rapidly changing world, with AI applications making a breakthrough and ChatGPT becoming popular in various fields and jobs, we need to be increasingly aware of whether it has the potential to become a viable tool for language teaching. With that in mind, the present study tries to assess the potential of AI in teaching and evaluating English. Specifically, this study aims to fill the gap in the literature by examining the efficiency and reliability of ChatGPT in evaluating the writing skills of learners in an IELTS course to demonstrate whether it can be an effective tool for teachers. To find consistency and alignment between ChatGPT's evaluations and those provided by a human expert, ten writing essays are first evaluated by the system. ChatGPT's feedback and grades, which are based on predetermined criteria, are then compared to those of an experienced IELTS teacher. Using a qualitative methodology, the study employed a detailed interviewing process to gather the expert teacher's opinions on ChatGPT's effectiveness as an assessment tool and its implications for teaching English. The results indicate that the grades given by both the teacher and ChatGPT were greatly similar to any other measures, and teachers' opinions conveyed their experience with the efficiency and effectiveness of ChatGPT as an evaluation tool in English language teaching. The study explores the potential of AI and human teachers in improving writing skills, highlighting the similarities between ChatGPT and human teacher assessment. It suggests that AI can complement or replace human assessment in specific contexts, enhancing writing instruction and evaluation. Hence, the ChatGPT, as an AI, can effectively serve as an educational tool, providing constructive feedback to the learners of the IELTS course, thereby enhancing their writing skills.

Keywords: Artificial Intelligence, Chatgpt, English Writing Skills, IELTS Exam Preparation, Language Evaluation

Investigation of the Mechanical Properties of Blended Sea-Sand Concrete

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In tandem with global urbanization and infrastructure development, the escalating demand for concrete has prompted a search for eco-friendly alternatives against the extraction of river sand for fine aggregate. This research explores the feasibility of using a combination of sea sand and manufactured sand (M-sand) as a reliable replacement for fine aggregate in concrete. Initially, the study assesses the workability and compressive strength of concrete using both types of sand individually. Subsequently, it investigates the blends of 25%, 50%, and 75% manufactured sand with sea sand on these characteristics. The findings indicate a decrease in the workability of sea sand and manufactured sand individually compared to river sand. However, an increment is evident in the sample that contains a blend of 50% manufactured sand with sea sand. It also satisfies the ASTM standards for the gradation under sieve analysis. Furthermore, concrete formulated with sea sand and manufactured sand, both individually and in combination, exhibits a reduction in compressive strength compared to river sand. However, the mix containing 50% sea sand and 50% manufactured sand demonstrates compressive strength that closely resembles that of river sand concrete. Therefore, the analysis of the mechanical properties of these combinations demonstrates that the 50% sea sand and manufactured sand sample would be suitable for use for industrial requirements.

Keywords: Sea sand, Manufactured sand, Compressive strength, Workability

Knowledge and Attitude about Veterinary Physiotherapy among Sri Lankan Veterinary Undergraduates

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Veterinary physiotherapy is an established profession and mainly focuses on the physiotherapy assessment, diagnosis, treatment, and rehabilitation of animals. It is regulated globally but is not widely practiced in Sri Lanka. Expanding the knowledge and attitude about veterinary physiotherapy in Sri Lanka could play a crucial role in advancing the practice in the country. Veterinary physiotherapists receive referrals from veterinary surgeons to facilitate the proper rehabilitation. Hence, this study focused on evaluating the knowledge and attitudes about veterinary physiotherapy among all veterinary medicine undergraduates reading in Sri Lankan government universities in 2022. A cross-sectional study was conducted using a self-constructed and pretested electronic-based questionnaire, which was analysed using the statistical software SPSS (V26). The knowledge was assessed with five Likert scale questions. The attitude was assessed with seven questions, including yes-or-no questions and multiple-choice questions. The response rate was 71.24%. Of the 218 participants, the majority of undergraduates (88.99%) possessed adequate knowledge of veterinary physiotherapists' responsibilities and adequate knowledge in specialised areas (40.83%), manipulative (40.83%), electrotherapy (46.33%), and mobilisation (47.25%). Among them, final-year and third-year undergraduates displayed the highest knowledge about specialised areas (>50.0%), physiotherapist's responsibilities (>84.0%), and treatment methods (>52.0%). Participants believed that veterinary physiotherapy is beneficial for animal health (94.96%) and were interested in adding more about veterinary physiotherapy to their curriculum (96.79%). The majority of participants would like to continue the same as their postgraduate studies (82.11%). There was no significant linear relationship observed among academic years in terms of knowledge levels, while attitudes were consistent across batches. The study indicated that adequate knowledge exists among students on veterinary physiotherapy, while students exhibited a positive inclination towards the benefits, prescription, study preference, and effectiveness of veterinary physiotherapy. This study paves a pathway to adding more knowledge to veterinary undergraduates regarding veterinary physiotherapy.

Keywords: Attitude, Knowledge, Sri Lanka, Veterinary Physiotherapy, Veterinary Undergraduate

Land Grabs and Trends in Dispossession in Sri Lanka: Contradictions of Land Policies Leading to and in Response to 'Crisis'

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The Gotabaya Rajapaksa government came into power in 2019 on a populist Sinhala-Buddhist nationalist mandate to restore national security and deliver economic prosperity. One of the key campaign platforms and initiatives of the government was rural upliftment and revitalisation. Once in power, acting contrary to its commitment to sustainable development and environmental protection, the government removed protections to non-reserve forest cover extending over 500,000 hectares by way of cancelling circulars No. 05/98, 05/2001, and 02/2006. This came at a time when the national forest cover has an ambitious 32% target to achieve by increasing its current official forest cover of 29%. This move effectively enabled highly politicised, and ad hoc land grabs by patrons of the regime. We argue that this land grab drive was an expansion or acceleration of the patron-clientelism all governments had pursued to increased extraction of environmental resources to maintain a racialised, patronage-based political system as available resources to maintain political clientelism became increasingly scarce at a time of national economic slowdown. This paper focuses on two localities where most of the land grabs happened during this period in the south of the country, and where certain forms of farmer-led resistance emerged subsequently: Ampara and Monaragala districts. Our objective is to document the patronage politics which enabled this type and scale of land grabbing. These land rent schemes also dispossessed affected rural communities of their already limited access to these forest areas, for seasonal and marginal agriculture, cattle-rearing, etc. The impact and dynamics of rural dispossession will also be critically analysed. The methodology used in this paper include analysis of secondary sources on land policies and land grabs in Sri Lanka (including media articles, government documents and statements, academic scholarship) and primary data collected through interviews with officials and affected individuals/communities in the localities studied in this paper. The theoretical framework employed in this paper is one which captures dynamics of land grabs linked to elite contestations and democratization struggles (Klopp, 2012). This approach involves an analysis of patronage politics and how linkages with elites in power grant preferential access to lands and land resources for supporters. In cases where governments are less democratic, the opportunity and incentive to use lands as political resources are higher. Lands then become subject to different pressures depending on the elite contestations that impact these patronage networks.

Keywords: Land Policy, Land Grabs, Sri Lankan Crisis, Patronage, Rural Poverty

Male and Female Broiler, Layer and Backyard Poultry Farmers in Kurunegala District, Sri Lanka: A Case Study on Knowledge of Government Policies and Regulations Pertaining to the Poultry Industry

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The poultry industry in Sri Lanka which consists of broiler, layer and backyard sectors is regulated by the Sri Lankan government through policies and regulations. It is imperative that all stakeholders involved in this sector should be informed such that they can comply with these policies and regulations and be equipped with the required technical expertise in order to ensure the sustainability of the sector. In Sri Lanka, both men and women farmers are actively involved in poultry production, but their access to the regulatory framework governing the industry varies. Therefore, this study was conducted to investigate the awareness and understanding of male and female poultry farmers regarding government policies and regulations in relation to the poultry industry in Sri Lanka. The study focused on farmers residing in the Kurunegala District, one of the districts in Sri Lanka with a high poultry density. The study was qualitative in nature, thus focus group discussions were used to gather data. The sample comprised 30 broiler, layer, and backyard poultry farmers (22 male farmers and 8 female farmers) selected on a convenience sampling basis. The responses were audio-recorded, transcribed, and analyzed using thematic analysis. The findings of the study were twofold. Firstly, there was a significant gender disparity in the level of awareness: with males manifesting a higher degree of conversance with policies and regulations. Secondly, a notable difference could be observed between layer & broiler farmers and backyard farmers with the former showing a higher degree of familiarity with regulatory measures. The study highlighted the need for policy-level interventions to bridge the gap in knowledge and awareness of poultry-related policies between men and women farmers to ensure the equitability and long-term sustainability of the poultry industry in Sri Lanka.

Keywords: Poultry, Policies, Gender, Knowledge, Sustainability

Marked Emperipolesis by Malignant Neoplastic Cells: Three Cases in Dogs

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Emperipolesis is the presence of intact haemopoietic cells within tissue cells of the host. In emperipolesis, both the host cell and the cell that gets internalized by the host cell stay viable without any structural or functional alterations. Occasionally, neoplastic cells also show emperipolesis. It has been suggested that emperipolesis is an immune evasion mechanism used by neoplastic cells. This report describes clinical and cytological features of severe emperipolesis observed in two dogs diagnosed with cutaneous squamous cell carcinoma and one dog diagnosed with mammary carcinoma. The first case was a 3-year-old German shepherd diagnosed with a nail bed squamous cell carcinoma in the left thoracic limb. The neoplastic epithelial cells showed extremely high anisocytosis and anisokaryosis and approximately 70% of the neoplastic cells contained 1-5 intracytoplasmic neutrophils indicating severe emperipolesis. Some of the neoplastic cells contained lightly basophilic intra-cytoplasmic spherical structures suspected to be viral inclusions. Plain lateral radiographs of the left carpus showed mild bone lysis in the digits just beneath the mass. The dog was treated by surgical excision of the tumour and digit amputation. The second dog was a 6-year-old male Rottweiler with a nail bed squamous cell carcinoma in the pelvic limb. Except for the location, absence of bone lysis in radiographs and presence of viral inclusions in cytological preparations, all other features were similar to the first case. The third case was a mammary carcinoma diagnosed in a 6-year-old female mixed breed dog. Severe neutrophilic emperipolesis was identified in neoplastic epithelial cells and peripheral blood monocytes. The mammary neoplasm was treated by surgical excision. All three dogs died 2-3 months after surgery and tumour metastasis was suspected although necropsies could not be performed for confirmation. Current findings suggest that emperipolesis should be further explored as it may prove to be a criterion of malignancy.

Keywords: Emperipolesis, Criteria of Malignancy, Squamous Cell Carcinoma, Mammary Carcinoma

Marriage Rituals and Caste Concept in the Kandyan Period

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The primary objective of this research is to conduct a comprehensive examination of the relationship between marriage rituals and the caste concept prevalent during the Kandyan period. This examination prompts an investigation into the formalization and organization of the caste concept during the Kandyan period while bringing to light its impact on marriage rituals. Thus, this research holds significant importance in the realm of social history as it uncovers the complex interplay of social, political and cultural forces that shaped the lives of the Kandyan people. Accordingly, the research was conducted using historical methods and facts were gathered from both primary sources such as Rājāwaliya, Mahāwaṁsa, Travelogues by foreign travelers, legal documents and contracts and secondary sources to ascertain relevant facts pertinent to the research inquiry. The research was conducted using the thematic analysis method to study; the marriage rituals in contemporary social strata and the influence of the Sinhala caste concept. According to the thematic analysis method, findings were analyzed under the sub-themes: Social Corporation during the Kandyan period, Caste concept in the Kandyan period, Marriage law in the contemporary period, Caste honor and marriage, Marriage restrictions, Marriage system and ownership of property, Specific services for castes during wedding ceremonies. The research problem is centered on how the caste concept is emphasized in the marriage rituals within the social structure of the Kandyan period. Finally, this research substantiates that; the same caste marriages gained social acceptance during this period with each caste trying to safeguard against caste mixing through imposed restrictions which reflects a high sense of caste pride in matrimonial affairs, and that the property ownership arrangements within marriage rituals were intricately tied to caste affiliations while each caste fulfilled specific services in wedding ceremonies. These findings unequivocally demonstrate the significant impact of the caste concept on marriage rituals during the Kandyan period.

Keywords: Caste Concept, Marriage Rituals, Kandyan Period, Marriage Law, Social History

Molecular Epidemiological Investigation of Theileriosis in Dairy Cattle in Kurunegala District, Sri Lanka

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Bovine theileriosis has a significant economic implication for dairy production globally. Investigating the prevalence of bovine theileriosis, the species and genotypes involved in dairy cattle, is crucial, particularly in the Kurunegala District of the Intermediate Zone, which houses the third largest cattle population in Sri Lanka. Sixty blood samples and questionnaire data were collected from three dairy farms in Galpokuna (n=20), Koulwewa (n=20), and Andigama (n=20) areas. Packed Cell Volume (PCV) analysis identified anaemic conditions, while Giemsa-stained blood smears facilitated microscopic analysis. A Fisher's Exact Test ($p< 0.05$) compared the prevalence of infection among age groups (adults and calves) and farms. For PCR, microscopically positive (n=9) and negative (n=9) samples were selected representing each farm. PCRs were conducted for *Theileria orientalis* and *Theileria annulata* using species-specific primers which are designed to amplify regions of *MPSP* and *18s rRNA* genes were conducted followed by sequencing, which allowed phylogeny of the species detected. Three farms practised semi-intensive farming with animals in a 'closed' setup, limiting movement. The overall theileriosis prevalence in dairy cattle was 55% (Koulwewa: 65%, Galpokuna: 50%, Andigama: 50%) based on microscopy in the Kurunegala District, with 33% (20/60) of cattle being anaemic based on haematocrit results. Anaemia was significantly higher in *Theileria*-tested-positive calves (45%) than in adults (25%; $p = 0.030$). PCR analysis revealed the presence of both *T. orientalis* (55%; 10/18) and *T. annulata* (22%; 4/18). The sequencing and phylogenic data revealed that the *T. orientalis* genotype present in the Kurunegala District was *type* 7. This is the first report on *T. orientalis* and *T. annulata* in dairy cattle in the Intermediate zone of Sri Lanka. Among them, *T. orientalis* was more common compared to *T. annulata.* Comprehensive studies on *Theileria* pathogenicity in cattle are mandatory for a deeper understanding of potential health risks to livestock production.

Keywords: *Theileria orientalis*, *Theileria annulata,* Genotype *7*, Prevalence, Anaemia

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Molecular Identification of Candida Albicans from Patients with Oral Candidiasis and Analysis of Their Sensitivity to a Polyherbal Oral Health Care Formula

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Oral candidiasis is the most common opportunistic mucocutaneous fungal infection of the oral cavity and *C. albicans* is the predominant cause of oral candidiasis. Due to the emergence of antifungal drug resistance in *C. albicans,* natural products have gained global attention as alternative antifungal drug leads. This study aims to precisely identify *C. albicans* in clinical samples from patients with oral candidiasis and analyze their sensitivity to a polyherbal oral health care formula containing the bark of Cinnamon, fruit peel of Pomegranate, leaves of Jasmin, fruits of Cardamom, and flower buds of Clove developed at the Faculty of Dental Sciences. Initially, *C. albicans* colonies were identified on CHROMagar Candida medium and subsequently confirmed using a *C. albicans*-specific primer pair, SC1F and SC1R to amplify a 670-bp fragment of the *KER1* gene. Sequencing of the PCR amplicon and its alignment with the reference sequence from the NCBI database further confirmed the presence of *C. albicans*. Of the 10 clinical isolates tested, 6 were confirmed as *C. albicans*. When their sensitivity to the methanol extract of the tested polyherbal formula was analyzed using the Kirby-Bauer disk diffusion method (n=3), with 2 % Chlorhexidine as the positive control, all 6 isolates exhibited sensitivity to the tested polyherbal formula with activity indices of 1.27, 0.86, 0.93, 1.20, 1.09, and 1.10. As per the micro broth dilution assay findings, the Minimum Inhibitory Concentration (MIC) was 1 mg/ml. Hence, our study demonstrates that the species-specific SC1F and SC1R primers provide greater specificity and accuracy in the PCR-based detection of *C. albicans* compared to traditional culture-based methods. Furthermore, the polyherbal oral healthcare formula developed at the Faculty of Dental Sciences offers potential for new anticandidal drug development.

Keywords: Oral Candidiasis, *Candida Albicans*, PCR, Gene Sequencing, Oral Health Care Formula, Kirby-Bauer Disk Diffusion
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Molecular Identification of Streptococcus Mutans from Patients with Dental Caries using PCR and Gene Sequencing

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Dental caries is the most prevalent oral disease in the world. Even in Sri Lanka, its prevalence is considerably high with a huge negative impact on our society and economy. *Streptococcus mutans* is the major bacterial etiological agent of dental caries. Precise identification of *S. mutans* from saliva or dental biofilms is important in the preparation of clinical isolates for testing the efficacy of oral healthcare formulas against dental caries and its risk assessment in vulnerable populations based on their counts in saliva. Since oral microbiome contains numerous species of *Streptococci* with subtle changes in morphological and biochemical characteristics, precise identification of *S. mutans* based on these characteristics is a tedious task. This study aims to precisely identify *S. mutans* from dental biofilms using PCR and gene sequencing. DNA was extracted using an optimized chemical method. Using species-specific *Sm479F/R* primers, a segment of the *HtrA* gene of *S. mutans* was amplified. Agarose gel electrophoresis of the PCR product confirmed the presence of a 479-bp PCR amplicon. Sequencing of the PCR product and alignment of it with sequences available in the NCBI database showed that it has 97.8% identity to the *S. mutans* reference sequence. Among the 32 *Streptococcus* bacteria isolated from clinical samples on Mitis Salivarius agar, 23 were confirmed to be *S. mutans*. In conclusion, PCR with species-specific primers *Sm479F/R* is an effective method for precise identification of *S. mutans* among multitude of *Streptococci* in the oral cavity. The *S. mutans* clinical isolates confirmed in this study can be used to test the efficacy of oral healthcare formulas. Further, this PCR can be improved to quantify *S. mutans* in saliva and utilized in population screening for risk assessment of dental caries, which may help early interventions to prevent the occurrence of dental caries in high-risk individuals.

Keywords: Dental Caries, *Streptococcus Mutans*, *Sm479F/R* Primers, Molecular Identification, PCR, DNA Sequencing

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Morbidity and Mortality Trends due to Non-communicable Diseases in Sri Lanka, 2004-2019

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Annually, 41 million lives are lost to non-communicable diseases (NCDs), comprising 74% of global deaths. Cardiovascular diseases, diabetes, chronic respiratory diseases, and cancers are the main types of NCDs. This study serves as an initiative to determine the trend in NCD-related mortality and morbidity in Sri Lanka from 2004 to 2019. Data were extracted retrospectively from indoor morbidity and mortality statistics reports published by the Medical Statistics Unit, Ministry of Health, for the period of 2004 to 2019. Data were compiled into a Microsoft Excel spreadsheet and analyzed. Morbidity and mortality rates were calculated per 1,000 population for each year based on population projections of the Department of Census and Statistics. During the study period, total deaths due to NCDs increased by 88.12%, from 15,868 in 2004 to 29,852 in 2019, resulting in an increased NCD-related crude death rate, from 0.82 to 1.37 per 1,000. Male deaths were higher (58.15%) than female deaths (41.85%) during these years. From 2004 to 2019, a total of 14,122,878 NCD live discharges were observed. Total live discharges due to four NCDs increased from 639,632 in 2004 to 1,130,796 in 2019, resulting in an increased NCD-related morbidity rate from 32.9 to 51.9 per 1,000**.** Cardiovascular diseases, cancer, chronic respiratory diseases, and diabetes mellitus are the major diseases that are responsible for NCDs in Sri Lanka. The highest number of morbidity and mortality were reported among males in our study. Both the morbidity and mortality rates showed an increasing pattern from 2004 to 2019. Understanding disease trends is crucial for designing primary care services to prevent and control NCDs. Changes in policies, along with community level education and awareness about the risk factors, are needed.

Keywords: Non-Communicable Diseases, Mortality, Morbidity, Sri Lanka

Morphometry of the Hepatic Duct in Human Cadavers

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Human extrahepatic biliary tract consists of right (RHD) and left (LHD) hepatic ducts, common hepatic duct (CHD), cystic duct, common bile duct, and gall bladder. Knowledge of the measurements of these ducts is helpful in both surgical and radiological practice and few are available from Sri Lanka. Objective of this study was to analyze external measurements of human hepatic ducts in preserved Sri Lankan cadavers. This descriptive study was done at Department of Anatomy, Faculty of Medicine, University of Peradeniya. Biliary system in preserved cadavers was dissected and lengths (from origin at hepatic confluence to commencement at union of intrahepatic ducts or cystic duct) and external diameters (2 measurements perpendicular to each other at midpoint of duct, were averaged) of RHD, LHD, and CHD were measured using a calibrated digital vernier caliper. Descriptive analysis and Spearman's rho test for correlation were used. Twenty cadavers (female-60%) with main hepatic duct variants were studied. Mean lengths of RHD, LHD and CHD were 11.7 mm (SD-7.09) (range 6.41-25.6), 13.6 mm (SD-5.46) (range 3.01-25.1) and 23.2 mm (SD-7.68) (range 9.52-41.6) respectively. Mean diameters of RHD, LHD and CHD were 4.16 mm (SD-2.1, 2.265-7.63), 3.77 mm (SD-0.888, 2.05-5.39) and 5.60 mm (SD-1.28, 3.51-8.72) respectively. There was a moderate positive correlation between lengths of RHD and LHD (Spearman's rho=0.303) and diameters of RHD and LHD (Spearman's rho=0.392) however no statistical significance (p for lengths=0.195, p for diameters=0.097) was observed. Among the studied samples, both the highest mean length and diameter were found in CHD. Although there is a moderate correlation between lengths and diameters of RHD and LHD, it is not statistically significant. Our findings vary from some previously reported postmortem data, while similar averages were reported worldwide in few cadaveric/ imaging studies. Values reported here are well within the average ranges reported in literature.

Keywords: Right Hepatic Duct, Left Hepatic Duct, Common Hepatic Duct, Correlation, Morphometry

Parental Stress and Coping Strategies in Response to the Severity of Symptoms in Young Children with Autism Spectrum Disorder: A Descriptive Cross-Sectional Study

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The prevalence of autism spectrum disorder (ASD) has been on the rise, drawing attention to the challenges faced by families with affected children. Understanding the relationship between the severity of symptoms in children with ASD and the resultant stress experienced by parents is crucial for developing targeted interventions and support systems. This study mainly aimed to determine the relationship between parental stress and the severity of symptoms in young children with ASD. Other than that, determine the coping level and correlation between level of parental stress and coping strategies. A descriptive cross-sectional study was carried out among 85 parents of children aged 2 to 7 years with ASD at the Psychiatric Clinic of Sirimawo Bandaranayake Specialised Children's Hospital from October to November 2023. Data were collected using an interviewer-administered questionnaire which consisted of socio-demographic characteristics, severity level of ASD, parental stress, and coping strategies. The Autism Parental Stress Index (APSI) was used to measure parental stress and the Brief COPE questionnaire assessed coping strategies utilized by parents. Significance level was set as $p \leq 0.05$. A significant positive correlation ($r= 0.383$, $p= .000$) between the severity of ASD symptoms and parental stress was found. High stress levels were reported in areas related to communication ability (40% of parents often create stress, 8.2% of parents feel unable to cope with the stress) and social development (29.4% of parents are very stressful daily, 5.9% of parents feel unable to cope the stress). Coping strategy analysis revealed predominant use of planning (mean=3.70, SD=0.50), active coping (mean= 3.56, SD=0.48), emotional support (mean= 3.06, SD=0.87) and self-distraction (mean= 2.72, SD=0.67). The identified stressors underscore the need for targeted interventions addressing communication challenges, social development, and acceptance by others. Coping strategy insights provide valuable information for designing support programs tailored to the specific needs of parents. The findings offer practical implications for developing support systems that address the unique challenges faced by these families.

Keywords: Autism spectrum disorder, coping strategies, parental stress, symptoms

Acknowledgent: Sirimawo Bandaranayaka Specialised Children's Hospital

Participation of Dental Practitioners in Continuing Professional Development in Sri Lanka

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Continuing Professional Development (CPD) is a cornerstone to staying abreast of the latest procedures and techniques, as well as ensuring safe practice. In most developed countries, and a few developing ones, dental professionals are required to participate in such programs as a prerequisite for renewing their licenses to practice. Although CPD is not compulsory in Sri Lanka, engaging in such programs demonstrates a dentist's commitment to enhancing the quality of patient care. This study seeks to investigate the significance of participation among dental practitioners in Sri Lanka and to uncover the factors that impact their involvement in CPD. A self-administered questionnaire was sent to dentists registered with the Sri Lanka Medical Council, via Google Form. Data analysis utilized SPSS version 21, employing descriptive statistics, chi-square, and logistic regression tests. The response rate was 18%, and the majority of the respondents were aged 31-50 (58.8%), female (56.6%), and married (83.8%). Most of the dentists had 11-30 years of experience (53.3%). 90.0% indicated participation in CPD at some point in their career, while 91.6% intended to engage in CPD within the next two years. Commonly reported reasons for attendance were to improve knowledge (95.7%), learn new skills (81.8%), and socialize with colleagues (49%). Dentists working only in the government sector had lower odds (OR = 0.567, p = 0.036) of socializing with colleagues. Among the different types of CPD activities, lectures (84.5%), workshops (66.1%), discussions with dental colleagues (64.1%), and web-based learning (62.8%) were common. Dentists working only in the private sector (OR=3.022, p=0.029) and those aged 31-50 (OR=2.067, p=0.040) were more likely to engage in discussions with dental colleagues. Factors influencing attendance included course content (95.7%), lecturer identity (87.3%), and delivery mode (86.9%). The results of our study underscore the active involvement of Sri Lankan dental professionals in CPD, indicating their favorable attitude and dedication to continuous learning and skill refinement.

Keywords: CPD, Dental Practitioners, Participation

Physical Activity Level and Associated Factors among Pregnant Women Attending Two Antenatal Clinics in Kandy District, Sri Lanka: Facility Based Cross Sectional Study

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Physical activity during pregnancy has a major impact on a mother's health and fetal growth. The objective of the study was to assess the level of physical activity and associated factors (maternal age, parity, educational level and occupation) among pregnant women attending two antenatal clinics in Kandy District. A facility based cross sectional study was conducted at two antenatal clinics (Asgiriya and Mahaiyawa) in Kandy District. Sixty pregnant women were selected by convenience sampling and data was collected using pregnancy physical activity questionnaire. According to the results, the physical activity status of the study participants was classified as sedentary (68.33%), low (26.66%) and moderate (5%). The highest proportion (29.2%) of the sedentary participants were within the 21-25 years age group and the lowest proportion of them (4.9%) were within the 36-40 years age group. 66.66% of the participants with moderate physical activity were within the 31-35 years age group and 33.33% of them were within the 36-40 years age group. All the primiparous women (100%) were identified as sedentary and all the participants with moderate physical activity (100%) were multiparous.73.18% of the sedentary participants had only secondary education while 26.82% of them had higher education.66.66% of the participants with moderate physical activity had higher education and the rest of them (33.33%) had only secondary education.56.09% of the sedentary women had no occupation while 43.91% of them were employed. All the participants with moderate physical activity (100%) had no occupation. The study revealed that the sedentary physical activity was highly prevalent among primiparous women in the 21-25 years age group with no higher education and no occupation. In conclusion, further studies should be conducted to assess the physical activity level and associated factors as a preventive health care strategy for the optimization of health during pregnancy.

Keywords: Physical Activity, Pregnancy, Sedentary, Primiparous, Multiparous

Pilot Study to Implement Molecular Detection of Triplet Expansion Repeats in A Cohort of Patients Suspected to Have Friedreich's Ataxia

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Background: Friedreich ataxia is a rare slow progressing autosomal-recessive neurodegenerative disease with a global prevalence of 1 in 40,000. It predominantly affects the nervous system resulting in ataxia of all limbs, cerebellar dysarthria, absent reflexes in the lower limbs, sensory loss and pyramidal signs. Along with non- neurological symptoms such as cardiomyopathy and diabetes. Main objective of this study was to genotype selected variants associated with Friedreich's ataxia in a cohort of clinically suspected Sri Lankan patients. Methodology: We conducted a cross-sectional retrospective study on patients clinically suspected to have Friedreich ataxia. They were tested using the molecular method of GAA repeat expansion. Patients were recruited from the Human Genetics Unit, Faculty of Medicine, University of Colombo following written informed consent. We selected 12 clinically suspected patients. Since this is a rare condition only 12 patients were found on the rare disease database which consists of over 600. DNA sample were extracted from the blood samples using QIAGEN blood DNA extraction kit following manufacturer's protocol. DNA samples were initially analyzed using conventional PCR followed by TP-PCR. Long Range PCR and Sanger sequencing was done to validate the genotyping assay. Results: Patients who were homozygous for Friedreich ataxia didn't give any bands on conventional PCR and gave ladder like bands for TP-PCR. Patients who were homozygous for the wild type of Friedreich ataxia variant had a single band with both conventional PCR and TP-PCR. Three samples were identified as homozygous mutant and nine samples were identified as homozygous wild type for Friedreich ataxia. In LR PCR, two confirmed homozygous mutant cases showed GAA repeats range between 580 to 800. Patient with homozygous wild type showed 5 GAA repeats in their DNA sequencing. Conclusion: This pilot study confirms that molecular detection of GAA triplet expansion repeats in patients suspected to have Friedreich's ataxia as a useful cost- effective confirmatory test that can be implemented in Sri Lanka. We hope to expand the sample population further in a future study.

Keywords: Friedreich's ataxia, GAA triplet expansion, Molecular testing, Sri Lanka, TP - PCR, Rare diseases

Portrayal of Mental Health and Symptoms in English Newspapers in Sri Lanka: A Prospective Study

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Newspapers play a vital role in disseminating information and shaping public attitudes. Portraying mental health-related content accurately and positively can help raise awareness and promote mental well-being. However, inaccurate and negative portrayals can perpetuate negative stereotypes and stigma, discouraging help-seeking behaviour in individuals affected by psychological conditions. Therefore, the objective of this study was to explore how mental health, mental illnesses, and their symptoms were portrayed in English newspapers within the Sri Lankan context. Considering the sales numbers, the three most widely-read weekend English newspapers were studied prospectively over five consecutive weeks. Thematic analysis was conducted on 60 articles that portrayed mental health-related content. The predominant theme was mental health awareness and education, which was presented with minimal misconceptions. This theme focused mainly on causes of mental distress and the availability of services and treatment, with a particular emphasis on stress. Mental health in the digital environment and the workplace was also highlighted. Prevention and recommendations for maintaining positive mental health was an equally significant theme. Addiction, particularly to illicit drugs, was also given considerable attention, probably reflecting the contemporary efforts to weaken drug abuse within the country. Some life stories of celebrities afflicted with drug addiction were reported. Success stories of individuals with mental health conditions and criminal behaviour of people with mental illness were both minimally reported. Suicides were briefly reported including causes and methods. In conclusion, the prominence of education and promotion of mental health in weekend English newspapers suggest a largely positive outlook towards mental health. However, reporting causes and methods of suicides could endanger readers searching for means of self-harm. The pragmatic representation of mental health in the workplace and the digital environment was timely and commendable. Additionally, increased representation of related success stories may further inspire empathy and help-seeking behaviour in the community.

Keywords: Mental Health, Symptoms, English Newspapers, Sri Lanka, Themes

Portrayal of Mental Health and Symptoms of Psychiatric Illnesses in Tamil Newspapers in Sri Lanka: A Prospective Study

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Newspapers play a crucial role in shaping public perceptions and attitudes toward mental health. The literature concludes that responsible reporting reduces stigma, increases understanding, and encourages help-seeking, while negative reporting undermines self-esteem, discourages help-seeking, contributes to social isolation, and perpetuates stigma. This study explored the portrayal of mental illness, symptoms of psychiatric illnesses, and mental health in Tamil newspapers in Sri Lanka. The three most widely read weekend Tamil newspapers were studied prospectively for 5 consecutive weeks. Thematic analysis was used for each article that portrayed mental health-related content. The extracted themes are discussed as follows. Culture was the most prominent perspective, through which mental health is viewed in Tamil newspapers. The causes and remedies for mental health issues were predominantly portrayed through astrology, pseudo-psychology, and exercises including yoga. While the majority of content provided accurate information about mental health thus making an attempt to educate the reader, some content provided inaccurate information. Certain details provided on mental health and symptoms were vague and unclear. The content on mental health was predominantly focused on stress ignoring other mental illnesses. Information provided on pathways to psychiatric care was minimal and help-seeking was not encouraged. The analysis of the identified themes concluded that the heavy influence of culture could be detrimental to understanding mental health issues and that they delay those afflicted from seeking help. Even though accurate information educates the reader, the large focus on stress and limited presentation of other mental health conditions and illnesses may inaccurately convey that mental health is mainly focused on stress. Lack of information on pathways to care in public newspapers was noted as a weakness as it may also delay treatment. Providing misinformation and vague information may mislead the readers, causing harmful consequences to the public opinion on mental health and those affected.

Keywords: Tamil Newspapers, Mental Health, Mental Illness, Symptoms of Psychiatric Illness

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Ticks transmit a variety of zoonotic pathogens, making them medically significant. Given that Sri Lanka is a biodiversity hot spot, ticks are abundant, infesting both domestic and wild animals. During feeding, ticks inject saliva to the host, thereby facilitating the transmission of pathogens to the host. This study aims to identify bacteria present in saliva of ticks infesting diverse domestic animals in Kandy District. Hitherto, 10 ticks were collected: 3 from cattle, 1 from a horse and 6 from dogs. Tick species were identified using morphological keys, and they were aseptically dissected to collect salivary glands. Each salivary gland was inoculated in buffered peptone water at 37^{o}C for 2 hours, cultured in blood agar and then incubated at 37^{o}C for 18-24 hours. Morphologically distinct bacterial colonies were sub-cultured, and multiple conventional biochemical assays were conducted for bacterial identification. Identified ticks represented *Boophilus* (3), *Ixodes* (2), *Ornithodorus* (1), *Haemaphysalis* (1), *Octobius* (1), *Rhipicephalus* (1) and *Aponoma* (1) species. Colony morphology revealed the presence of 18 distinct bacterial isolates, of which 10 were Gram-positive cocci and 8 were Gram-negative rods. Among the Gram-positives, 5 were coagulase-positive Staphylococci. Available biochemical tests for Gram-negatives indicated that 6 isolates suggest the presence of Citrobacter species; however, further testing is required to confirm the remaining isolates. According to previous literature, ticks are known to transmit bacteria such as *Aeromonas hydrophila*, *Staphylococcus aureus*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Citrobacter* species, *Serratia* and *Enterobacter* species, where our findings are very much consistent with previous publications. Thus, aside from intracellular protozoans transmitted by ticks, ticks carry a variety of bacterial pathogens that can infect both animals and humans. *Staphylococcus* species, the most frequently isolated bacterium from tick saliva, demands further exploration of its antimicrobial profiles since it is resistant to most drugs and poses a zoonotic concern.

Keywords: Identification, Bacteria, Tick, Domestic, Animal

Pre-Post Training Analysis of Knowledge on Poultry Diseases, Vaccination, and Biosecurity of Small-Scale Backyard Poultry Farmers in Sri Lanka

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This study investigates the effectiveness of target-specific training methods in improving the knowledge of small-scale backyard poultry farmers in Sri Lanka regarding poultry diseases, vaccination, and biosecurity practices. With the increasing global concern over the spread of infectious diseases among poultry populations, effective biosecurity practices are essential to mitigate disease transmission and safeguard public health and food security. The research employs a two-phase approach: a pre-training evaluation to establish baseline knowledge levels and a post-training evaluation to measure the impact of the educational intervention. In both training phases, data were collected through the same structured questionnaire. The training pedagogy integrates two distinct methods: combination of discussions and hands-on farm demonstrations (Type 1) and a formal lecture method (Type 2). The formal lecture method provides a theoretical understanding of biosecurity principles and the hands-on farm demonstrations offer practical insights into implementing biosecurity measures effectively within the farm environment. Five workshops were conducted with the participation of 178 farmers (Type 1 n=84, Type 2: n=94) selected using a convenient sampling method. Demographic data showed that 45.5% of farmers were 18- 40 years old with 58.4% with secondary education with a male-to-female ratio of 44:56. Quantitative analysis reveals that the overall knowledge of farmers significantly improved (WSRT =-10.859 /P<0.001) after the training from 45.69 to 89.61. When comparing the impact of pedagogical methods both training types are statistically significant (type 1: W= -7.815/P<0.001, type 2: W=-7.536/P<0.001) with the effect sizes of -0.60 and -0.54 respectively. This shows that type 1 training has addressed the diverse needs and challenges faced by small-scale farmers rather than type 2 as it indicates medium effect size according to Cohen's classification. Understanding the impact of this pedagogical approach through training evaluations will inform the development of future training programs aimed at promoting biosecurity practices and ensuring food safety.

Keywords: Biosecurity, Food Safety, Training

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Prevalence and Associated Factors of Work-Related Musculoskeletal Disorders among The Health-Supportive Staff of a Tertiary Care Hospital in Kandy, Sri Lanka

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Introduction: In hospital settings, Attendants and Health Care Assistants, who are commonly referred as Health Supportive Workers (HSWs), are responsible for handling patients and other medical equipment manually, which can lead to Work-Related Musculoskeletal Disorders (WRMSDs). Therefore, this study was focused on determining the prevalence and identifying associated factors of WRMSDs among the health-supportive staff of National Hospital Kandy, Sri Lanka. Methodology: A descriptive cross-sectional study was conducted at National Hospital Kandy, Sri Lanka from November to December 2023. The required sample size was 403 HSWs, who were selected from each ward set-up using a random sampling method. The standard Nordic Musculoskeletal Questionnaire was used to assess WRMSDs. The chi-square test was used to describe associations between variables. Results: Out of the total sample, 88.6% (n=357) of HSWs were suffering from WRMSDs. The most affected areas of the body were the lower limb (n=283,70.2%), lower back (n=182,45.2%), and neck (n=179,44.4%). The majority of workers (n=171, 42.4%) had been suffering from WRMSDs for more than one year. Forceful exertion (n=259, 64.3%), lifting weights (n=193, 47.9%), and awkward postures (n=190, 47.1%) were identified as the most prevalent risk factors for WRMSDs. A statistically significant association between gender and WRMSDs was found (p=0.009), however, age ($p=0.101$), years of experience ($p=0.949$), and educational level ($p=0.241$) did not show any statistically significant association with WRMSDs. Conclusion: The majority of HSWs suffer from WRMSDs as a result of risk factors like forceful exertions, lifting weights, awkward postures, gender, etc. Lifting weights with awkward postures exert an effect on the lower limb and lower back. Therefore, it is recommended to organize ergonomics training programs, introduce a self-evaluation checklist, introduce an ergonomic-friendly work environment and instruments to prevent WRMSDs among HSWs.

Keywords: Work-Related Musculoskeletal Disorders, Risk Factors, Prevalence, Health Supportive Staff.

Prevalence and Molecular Characterisation of Ovine Theileria in Jaffna Sheep, Sri Lanka

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Theileriosis affects small ruminant production and causes a serious impact on the economy. The present study aimed to investigate theileriosis in Jaffna sheep, an indigenous sheep population in Jaffna, reared for meat and manure by local communities. Hundred blood samples (5 ml) were taken from the jugular vein and altogether 57 ticks were collected from sheep in three farms in the Jaffna District. A questionnaire collected information on farm management practices and demographic data of sheep (age and gender). Geimsa-stained smears were prepared at the sample sites and nested-PCR was carried out using five *Theileria* species: *T. ovis*, *T. annulata T. separata*, *T. lestoquardi,* and *T. luwenshuni* (*Theileria* sp. China 1). Primary PCR employed outer primers *Thei-F1* and *Thei-R1*, targeting the amplification of a 1700 bp region (of *18S rRNA* gene). Secondary PCR with the inner primers *Thei-F2* and *Thei-R2* were further specific to *the 18S rRNA* gene, to amplify target regions between 1417 bp- 1426 bp. Selected amplicons were subjected to bidirectional sequencing. Microscopic examination of 50 Giemsa-stained blood smears and nested-PCR revealed 38.0% and 90.9% prevalence of *Theileria* spp., respectively with a statistically significant difference ($Z = -3.1813$, $p = 0.00148$). The phylogenetic analysis showed that the *Theileria* species identified had 99.5% sequence identity to the highly virulent *Theileria luwenshuni* species found in *Antilope cervicapra* in a zoological park in India. Although *T. luwenshuni* was well tolerated by Jaffna sheep, they can act as reservoir hosts and challenge the health of immunocompromised animals. Four tick species were identified as *Haemaphysalis bipsinosa, Rhipicephalus haemaphysaloides, Rhipicephalus linneai* (formerly known as *Rhipicephalus sanguineus* sensu lato tropical lineage), and *Hyalomma marginatum isaaci,* the most prevalent being *H. bispinosa* (68.4%). This is the first report and molecular characterisation of *Theileria luwenshuni* in Sri Lanka and possible tick vectors responsible transmitting theileriosis in Jaffna sheep.

Keywords: *Theileria luwenshuni*, Jaffna sheep, Tick-borne Haemoparasites, Sri Lanka.

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Prevalence of Candida Species Isolated from the Oral Cavities of Healthy Sri Lankan Child Cohort

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Oral candidiasis is a common oral fungal infection due to *Candida* species. The oral *Candida* carriage of healthy children varies from 23 - 71%. Children belonging to the age group of 6 - 12 years sometimes experience malocclusion indicating orthodontic therapy. Orthodontic therapy promotes oral dysbiosis which can lead to candidiasis. Understanding the prevalence of *Candida* in children of above age category is crucial for improving their oral hygiene to prevent Candidiasis due to orthodontics. This study aims to investigate the prevalence of oral *Candida* in a healthy cohort Sri Lankan child from the Dental Teaching Hospital, Peradeniya. Oral rinse samples were collected from 60 healthy children aged 6- 12 years who visited the Hospital, seeking orthodontic treatment and had not undergone any previous orthodontic therapy. They also had not taken a course of antibiotics or antifungal agents for 3 months prior to sample collection. Concentrated oral rinse samples were obtained from the subjects and cultured on Sabouraud Dextrose Agar (SDA) and the Colony Forming Units (CFU) counts were calculated. The prevalence of *Candida* species was identified using culture characteristics on SDA, CHROMagar and gram staining. Prevalence of *Candida* in the study sample was 50% (30/60). The majority of the isolates were *Candida albicans* (86.67%), followed by *Candida tropicalis* (5%) and *Candida krusei* (3.33%). The mean oral carriage of *Candida* was 205.3 CFU/ml. The oral *Candida* carriage healthy Sri Lankan cohort of children was 50% and the leading *Candida* species was *Candida albicans*. Therefore, it is important to improve their oral hygiene and their awareness of oral health prior to Orthodontic therapy.

Keywords: *Candida,* Orthodontic Treatment, Oral *Candida* Carriage.

Prevalence of MRSA Colonization, Antibiotic Sensitivity, and Associated Neonatal Outcome in Term Pregnant Women, Eastern Province, Sri Lanka

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Staphylococcus aureus and methicillin resistant *Staphylococcus aureus* (MRSA) are pathogens capable of causing a range of infections from localized to life-threatening. Individuals colonized with MRSA act as a reservoir for its spread and colonized pregnant women can spread it to their newborns. This study aimed to determine the MRSA colonization rate in pregnant women at term/at delivery, analyze their antibiotic sensitivity pattern and associated neonatal infection related outcomes. In this descriptive cross-sectional study, involving 235 pregnant mothers admitted for delivery at the Teaching Hospital in Batticaloa, three swabs (nasal, rectal and lower vaginal swab) were collected from each participant from May to August 2023. Routine microbiological methods and disc-diffusion antibiotic sensitivity testing (ABST) were done to identify the *Staphylococcus aureus* and MRSA strains. The association between MRSA colonization and outcome of the neonate at one month was analyzed using the Pearson Chi-square test. Of 235 pregnant women enrolled in this study 36 (15.32%) were colonized with *Staphylococcus aureus*; 9 (3.83%) in the nasal area only, 24 (10.21%) in the recto-vaginal region only, and 3 (1.28%) at both sites. Thirty-three (14.04%) participants were colonized with MRSA. Three participants were colonized at both sites, bringing the total number of MRSA strains to 36. Overall, MRSA was isolated from nasal site 12 (5.11%) and 24 (10.21%) from recto-vaginal sites. The sensitivity of MRSA isolates was as follows: clindamycin (25, 69.44%), ciprofloxacin (32, 88.89%), co-trimoxazole (31, 86.11%), and tetracycline (34, 94.44%), and erythromycin (01, 2.78%). No significant association was found between overall MRSA colonization and neonatal outcome such as hospitalization (p=0.3741) and infections within one month of birth (p=0.1738). Overall, a 14.04% colonization rate with MRSA was found among pregnant women in admitted for delivery at the study site, indicating the need for further assessment of risk factors for colonization.

Keywords: MRSA, Colonization, Pregnancy, Risk Factors, ABST

Quality of Life of Chronic Kidney Disease Patients in High Prevalence Areas of Chronic Kidney Disease of Uncertain Etiology in Sri Lanka: KDQOL- SF-36 Based Analysis

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Thousands of patients with chronic kidney disease (CKD) have been reported over the past two decades, primarily in North Central and Uva provinces of Sri Lanka. Given that the majority are in the late phases of CKD, effective patient management is crucial for preserving their quality of life. The study was performed to assess the Quality of Life (QOL) of CKD patients using the KDQOL- SF-36 questionnaire and functional methods. A total of 180 CKD patients were selected from Thanthirimale and Wilachchiya, Anuradhapura; 9 patients in stage 1, 26 in stage 2, 26 in stage 3A, 53 in stage 3B, 46 in stage 4 and 18 patients in stage 5. Basic demographic characteristics, clinical information, physical measures like Body Mass Index (BMI) and responses to SF-36 questionnaire were collected from all patients. The Short Physical Performance Battery (SPPB: group of measures that combines the results of the gait speed, chair stands, and balance tests) was also measured. The CKD cohort was predominantly males (63%) with a mean (±SD) age of 62.25 (+9.63) years. Mean serum creatinine levels in men and women were 205(±107.4) and 154.5 (±100.6) µmol/L respectively. The mean estimated glomerular filtration rate (eGFR) for the entire cohort was 40.36 (±22.33) ml/min/1.73m^2. The average BMI was 21.4 (+3.8) and 23.8 (±5) in males and females respectively. Significant Pearson correlations were observed between SPPB ($p<0.01$, $r = 0.494$), serum creatinine level ($p<0.01$, $r=-0.253$), eGFR ($r=0.454$, $p<0.01$) and the total score of SF-36. Multiple regression analysis was conducted on significantly correlated variables where age, CKD stage and total score of SF-36 were identified as determinants of QOL of the CKD population. Low total score of SF-36, older age and low SPPB score were identified as determinants of QOL in the selected CKD population.

Keywords: Chronic Kidney Disease, Quality Of Life, Short Physical Performance Battery, Serum Creatinine, Egfr

Salivary Transcriptomic Diagnostics: Findings from a Study in Sri Lanka on Oral Squamous Cell Carcinoma, Oral Submucous Fibrosis, and Oral Lichen Planus

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Oral cancers, encompassing tumors in the oral cavity, pharynx, and salivary glands, are increasingly prevalent globally, with oral squamous cell carcinoma (OSCC) representing over 90% of cases. Oral Potentially Malignant Disorders (OPMDs) are conditions affecting the oral mucosa, posing an increased risk of malignancy. These disorders often manifest as visible changes in oral mucosal color or thickness, detectable during oral examination. Early identification of OPMDs is crucial to minimize the risk of malignant transformation. This study evaluated the levels of extracellular *IL-1β*, *IL-8*, *SAT*, *S100P*, and *OAZ1* mRNAs in saliva as a potential method for early detection of OSCC and selected OPMDs. The study involved nine OSCC, eleven Oral Lichen Planus (OLP), ten Oral Submucous Fibrosis (OSF) patients, and ten healthy controls. Expression levels of the aforementioned mRNAs were assessed in saliva samples using real-time reverse transcription polymerase chain reaction (RT-PCR) with sequence-specific primers. Statistical analyses and diagram creation were conducted using GraphPad Prism 4.0 software. As the dataset is not normally distributed, the Wilcoxon signed-rank test was utilized for two specific comparisons: OSCC versus controls and controls versus OPMD. Efficiently combining multiple significant biomarkers provides more discriminate ability when compared to single or not significant markers. Receiver operating characteristic curve (ROC) curve analysis determined the effectiveness of these biomarkers in OSCC and selected OPMD detection. The study found that when these five biomarkers were used together, they provided a 90% predictive probability for OLP patients (AUC = 0.945, p = 0.001), 80% for OSF patients (AUC = 0.96, p = 0.001), and an impressive 100% for OSCC patients (AUC = 1.000, p = 0.000). This underscores the efficacy of salivary transcriptome diagnostics in OSCC detection, offering a powerful, efficient, and reliable tool for early cancer detection.

Keywords: Saliva, Biomarkers, Oral Cancer, mRNA, Gene Expression Analysis

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The Effect of Co-Existing Iron Deficiency on Hb A2 Level and The Diagnosis of Beta Thalassemia Trait

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The diagnosis of beta-thalassemia carrier state (BTT) is based on elevation of the HbA2 level>3.5% and is usually determined by HPLC or CE technology. HbA2 level is affected by many factors, including iron deficiency anaemia (IDA). Whether the IDA affects the accurate diagnosis of BTT is still controversial. Those who are with borderline HbA2 values will be at a higher risk of being misdiagnosed. This study was designed to determine the effect of IDA on the diagnosis of BTT in thalassaemia screening using IDA patients with both normal and borderline HbA2 values. This was an interventional study in which 92 individuals (males;15.2%, females;84.8%), aged between 12–57 years, who had low MCV (≤80 fl) and MCH (≤27 pg) with HbA2 levels<3.5% during thalassaemia screening were further analyzed for iron deficiency using iron parameters. People with serum ferritin<30 ng/mL were prospectively analyzed for changes in HbA2 level after three to six months of iron treatment. Those who had increased HbA2 levels>3.5% after the iron treatment were further analyzed by using the Sanger sequencing method for mutations. Dysfunctional uterine bleeding (35.9%) was the major aetiological factor for the IDA of this cohort. All hematological parameters (Hb in g/dL; 9.73±1.26, 12.26±0.98) HbA2 (2.36±0.43%, 2.63±0.37%) and iron parameters (Serum ferritin in ng/mL; 11.09±7.00, 46.60±16.11) were significantly increased after iron treatment. However, the increase in HbA2 level (3.40±0.92%, 3.43±0.20%) in the borderline group was not statistically significant (P>0.05). Only 3 out of 8 samples exceeded the value of 3.5% after iron treatment, but none had beta mutations. Further, there was a positive relationship between Hb and HbA2 levels (r (92) =0.388, p=0.000). In conclusion, iron therapy for IDA patients increases the HbA2 level significantly, but the impact the elevation could have in true borderline and genetically proven BTT iron deficient individuals could not be ascertained from this study.

Keywords: Beta Thalassaemia Trait, Iron Deficiency Anaemia, HbA2, Borderline

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The Effect of Taxpayers' Ethical Perceptions on Tax Evasion: A Study in Sri Lanka

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Generally, taxes are considered as a primary source of revenue for governments. However, at times the government fails to collect income from income taxes as expected, because of tax non-compliance. Tax non-compliance, such as tax evasion is considered widespread, causing countries to face many problems (Giray & Gercek, 2015). Thus, in terms of Sri Lanka, the study initially assesses the level of tax evasion and then investigates the impact of taxpayers' ethical perceptions (i.e., tax knowledge, tax discrimination, tax fairness and tax corruption level) on tax evasion. A quantitative methodological approach was followed, and primary data were collected using a self-administered questionnaire from Sri Lankan taxpayers. Then the collected data are analyzed using one-sample t-tests and multiple regression analysis. Regarding the level of tax evasion in Sri Lanka, the findings suggest that there is an increased possibility of avoiding paying taxes on their income since the mean value (3.19 out of 5) is above the test value of 3 with a significant mean difference of 0.19. Interestingly, regarding taxpayers' ethical perceptions, the level of perception of tax knowledge and tax corruption seems to be higher whereas the level of perception of tax discrimination and tax fairness seems to be lower. Correlation analysis results suggested that there were significant positive associations between tax evasion and taxpayers' ethical perceptions of tax knowledge, tax discrimination, tax fairness and tax corruption level. Taxpayers evade taxes due to government corruption. Further, tax evasion is willfully and fraudulently evading tax assessment, payment, or fraudulently claiming a tax refund. However, multiple regression analysis results revealed that taxpayers' ethical perceptions of tax knowledge, tax discrimination and tax corruption level have a positive impact on tax evasion whereas tax fairness shows an insignificant impact. The study findings provide potential implications for reducing tax evasion by understanding.

Keywords: Tax Corruption, Tax Discrimination, Tax Evasion, Tax Fairness, Tax Knowledge, Taxpayers' Ethical Perceptions

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The Gender-Based Views towards Sexual Education among Young Adults in the Gampaha District of Sri Lanka

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The Education Ministry of Sri Lanka has recently developed a textbook to provide sexual education (SE), and withdrawn. International scholars mentioned that children should receive SE. Scholars of Sri Lanka suggested that SE should adhere with culture. Some scientific data showed that SE is taboo among most females. Sri Lankan findings based on these areas exhibit rarity attributable to the research gap. The study examined gender-based views towards SE, via SE-oriented demographics (main way received SE -SE1, personal satisfaction of SE -SE2, idea on providing formal SE -SE3). Responses (n=406) were gathered via an online self-administered questionnaire through the convenience sampling. In this descriptive and cross-sectional study, data were analyzed using the chi-square test with the assistance of SPSS 26. There are significant relationships between, 'gender and SE2', and 'gender and SE3', also 'yes' was more likely than 'no or neutral' to be associated with gender. There is no significant relationship between 'gender and SE1'. Moreover, within the total responses, 55.4% received SE via informal manner, 51.9% were personally satisfied with the SE level, and 86.5% responded yes to providing formal SE; 95% males and 80.8% females. The results showed that a higher percentage of responders might expect the development of SE. Accordingly, ground-level attitudes towards SE would be positive. More than 50% of responders received SE informally, although satisfied with the SE level they have. Therefore, well-developed SE might lead to a higher percentage of satisfaction with SE level. It is difficult to explain these findings compared to previous studies, due to the higher research gap. The findings are only representing the Gampaha district. Thus, future researches are needed to explore gender-based views towards SE, and the relationship between gender and SE, to develop an SE system that is culturally acceptable and enhancing the feasibility of Sri Lankan education.

Keywords: Culture, Gender, Sexual Education, Young Adults

The Impact of Negotiated English-Speaking Activities in the ESL Classroom

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Negotiation empowers students to develop a deeper understanding of the learning process. Moreover, negotiation including discussions with friends and conversations with teachers, fosters essential life skills like communication and problem-solving while promoting a more student-centred learning environment. The research gap identified is that while there is a substantial body of research on negotiated English-listening activities, there is a notable absence of studies in the context of negotiated English-speaking activities. The primary objective of this study is to measure the impact of using negotiated English-speaking activities in the ESL classroom. This study aimed to understand the extent to which using negotiation in English-speaking activities impact grade 8 ESL learners of St' Bernadette's college, Polgahawela. The grade 8 ESL learners were selected using a convenience sampling method and divided into two groups for data collection: an experimental group and a control group. The experimental group received instructions that incorporated negotiated English-speaking activities, while the control group received instructions following the standard curriculum. A final test was administered to the students after a week of teaching to measure the impact of negotiated English-speaking activities. In developing the activities and tasks, the theoretical framework of Nation and Newton (2009) based on "Teaching ESL/EFL Listening and Speaking" was used as a guiding model for the study. A quantitative data analysis approach was used to measure the impact of using negotiated English-speaking activities on the grade 8 ESL learners. In the results obtained, 18.4% of impact on the grade 8 ESL learners was observed in the experimental group with negotiated English-speaking activities compared to the control group, as determined by calculating and comparing the average marks of both groups. Further, this study provides recommendations for future research studies to encourage the incorporation of constructivism, interaction hypothesis, and sociocultural theory in the ESL classroom.

Keywords: ESL Classroom, ESL Learners, English-Speaking Activities, Negotiation

The Impact of the English Curriculum on Student Performance in Sri Lankan State and International Schools

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Currently, both state/national and international schools provide secondary education in Sri Lanka. Research on the English curriculum of secondary education has expanded significantly in recent years. However, there remains a notable gap in understanding the influence of the English curricula of state/national and international schools on student performance. Therefore, this study aims to explore the significant impact of the English curriculum on student performance in these diverse educational settings. In particular, this study directs to evaluate the English curriculum of Grade 10 students in both types of schools referred to above and the influence of the said curricula on student performance. To this end, a hybrid study will be conducted with 10 Secondary-level English language teachers and 100 students in Grade 10 from the Central Province. Semi-structured interviews will be conducted to gather data from the English language teachers, and close-ended questionnaires will be distributed among 50 students. Further, an assessment will be given to 25 students from each type of school and their performance will be evaluated. Finally, all sorts of data will be arranged, analysed, and interpreted employing the Thematic Analysis (TA). This study may demonstrate that the effects of the two distinct curricula on student performance may differ. An additional objective is to determine how the curriculum of the international schools may differ from the curriculum of the State schools and how they influence the listening, speaking, writing, and reading abilities of Grade 10 students. Finally, this study has ramifications for institutions, authorities, English language teachers, students, and material designers who are in charge of designing and offering the required training programmes at the school level. Future researchers may execute an extension of this study directing it at state and private universities of Sri Lanka.

Keywords: Sri Lanka, English Curriculum, State Schools, International Schools, Student Performance, Medium of Instruction

The Interplay of Caste and Education in Sri Lanka: A Case Study

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Sri Lanka is inherently rich with cultural diversity and historical complexities, yet consistently struggles with persistent inequality. Caste marginalization, pedagogical prejudice, socio-political discrimination, and unequal resource allocation remained unresolved. Education is a basic human right that plays a vital role in social mobility and economic growth, yet it is a "double edged sword" with the power to both empower and oppress individuals. The objective of the study is to critically examine the intersectionality of caste and education, which remains a significant barrier to social justice and access to quality education in Sri Lanka. This study further investigates how teacher allocation and resource distribution make a marginalized school more disadvantaged. Firsthand data were collected from two villages belong to the caste "Achiri" (metal workers) in Kekirawa, North Central Province, Sri Lanka during field visits to a Primary School. A qualitative research design was used throughout the case study to collect data. The case study is presented as a "fiction" to reveal the harsh reality concealed within society. The findings revealed that people from "Achiri" are victimized by systematic biases and barriers within the existing educational system. It was found that this Primary school, a school serving marginalized communities encounters unequal resource allocation and teacher distribution making them more vulnerable within mainstream society. This research contributes to a deeper understanding of the complex interplay between caste and education in Sri Lanka highlighting the need for transformative approaches to address systemic inequalities and promote social justice in education, especially within caste-based schools. Policymakers, educators, and researchers need to work towards an equitable and inclusive education system to ensure quality education for all regardless of caste.

Keywords: Cast, Education, Fiction, Inequality, Marginalization

The in Vitro Efficacy of Cinnamon (Cinnamomum Verum) Bark Oil against Prototheca Spp Isolated from Canine and Bovine Clinical Cases

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Prototheca is the only algae causing diseases in humans and animals. Among them, prototheca mastitis in cattle causes severe economic losses and canine disseminated protothecosis mostly has a fatal outcome. Currently there are no effective treatments against protothecosis. This study *in vitro* efficacy of cinnamon bark oil against *Prototheca spp* isolated from a bovine mastitis case and a dog with disseminated disease. The experiments were conducted in 1.5 mL microcentrifuge tubes containing 500 µL of potato dextrose broth (pH 6.4), 500 µL of 0.5 McFarland standard inoculum prepared from each prototheca isolate and varying concentrations of cinnamon bark oil dissolved in ethanol (range10 - 0.156 µL/mL). Additionally, each experiment included two culture tubes with itraconazole (30µg/mL) and fluconazole (30µg/mL), positive and negative controls and an additional control with inoculum and ethanol. The cultures were incubated at 37°C for 24 hrs with shaking (100 rpm). All experiments were duplicated. Viability of the cultured organisms was assessed by inoculating 30 µL from each tube on potato dextrose agar plates (37°C for 72 hrs). In addition, the morphological changes of the organisms were assessed using Gram-stained smears prepared from culture tubes. No colonies were detected in the plates corresponding to cultures with 10-1.25 µL/mL of cinnamon bark oil. Very few colonies were observed in plates corresponding to cultures with 0.625 and 0.315 µL/mL of cinnamon bark oil. No growth inhibition was observed in plates corresponding to lowest concentration (0.156 µL/mL) of cinnamon bark oil, itraconazole, fluconazole or the control with ethanol compared to the positive control. The capsule of the organisms was either absent or distorted in the cultures with 0.625 and 0.315 µL/mL cinnamon bark oil compared to the positive control. These results confirm that cinnamon bark oil has an excellent *in vitro* activity against prototheca that may be used for prophylaxis.

Keywords: Prototheca, Cinnamon Bark Oil, Canine, Bovine Mastitis, Prophylaxis

The Prevalence and Associated Risk Factors of Candida Sp. Infections in Foot Ulcers in Patients with Type 2 Diabetes Mellitus: Single Centered Study

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Diabetes Mellitus, characterized by elevated blood sugar levels, frequently leads to complications such as foot ulcers exacerbated by poor glycemic control and Candida infections. This cross – sectional study, conducted with ethical clearance from the Faculty of Allied Health Sciences, University of Peradeniya, aimed to investigate the prevalence and risk factors of Candida spp. infections in foot ulcers among patients with type 2 diabetes mellitus. The study enrolled 107 diabetes foot ulcer (DFU) patients after obtaining written consent at Teaching Hospital Peradeniya. Exclusions included recent antifungal therapy and participants under 18 years old. Swab samples, collected from all patients, underwent Candida sp. identification tests, using gram staining, sabouroud dextrose agar, rice plate culture, germ tube testing, and Candida Chrom Agar. Sociodemographic and risk factor data were collected via structured interviewer-administered questionnaires following a pilot study to validate questionnaires. Descriptive analysis using IBM SPSS Statistics version 25 and Fisher's Exact Test were employed for statistical evaluation. DFU patients, with a mean age of 61.00 years, were 63.6% male and 36.4% female. In the chose participated, 10.3% exhibited Candida sp. prevalence. Most samples (61.7%) showed no Candida growth, while 28.0% displayed non-Candida growth. Among significant Candida growth cases, 5.6% were C. albicans, 0.9% C. glabrata, 1.9% C. tropicalis, 0.9% C. krusei, and 0.9% C. auris. Significant associations were found between Candida prevalence and tobacco smoking, fasting blood sugar level, foot ulcer duration, and footwear practices. No significant associations were observed with gender, education, income, dietary choice, alcohol consumption, duration of DM, medication use, and wound dressing. Our study identified notable links between Candida spp. growth and footwear habits, tobacco usage, uncontrolled diabetes, and foot ulcer duration. Underrated fungal infections lasting over the month demand regular culture testing in DFU patients to optimize treatment. Further investigation is essential to evaluate the integration of fungal culture and antifungal therapies**.**

Keyword: Diabetes Mellitus, Diabetic Foot Ulcer, Swab Sample, *Candida* Spp.

The Prevalence of Externalized Behavioural Problems among 4 to 6 years old Preschool Children in Kandy District

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Externalized behavioural challenges manifested as aggression, defiance, and hyperactivity among preschool children pose notable hurdles for both the children themselves and their families. These external behaviours, along with juvenile delinquency, have emerged as pressing public health concerns globally. It has been noted that around half of these children continue to exhibit problematic externalized behaviors later in life. In the Kandy District of Sri Lanka, research indicates that 14% of children aged 6-18 experience behavioral issues, with 6.6% displaying internalized problems, 23.3% exhibiting externalized problems, and 7% showing borderline disorders. However, the current study aims to address the research gap concerning the prevalence of externalized behavioral problems among preschool children in the Kandy district, with the goal of enhancing the overall well-being and development of children in this age group. There has been insufficient exploration of externalized behavioral issues among preschoolers in developing nations. This study primarily aims to ascertain the prevalence of externalized behavioral problems among 4 to 6-year-old preschoolers in Kandy District, Sri Lanka. Additionally, it seeks to explore the connections between socio-demographic factors and externalized behavioral problems in these preschoolers. This quantitative research utilized a questionnaire-based approach employing a cross-sectional survey design, employing multistage random sampling. A total of 239 parents from Sinhalese, Tamil, and Moor ethnic groups participated in the study. Data collection involved a questionnaire incorporating the locally developed Child Behavior Assessment Inventory (CBAI) alongside socio-demographic inquiries. The Tamil version of the CBAI underwent translation and validation through a rigorous Delphi process. The study uncovered a prevalence rate of 5.4% for externalized behavioral issues among preschoolers in the Kandy district. Furthermore, it identified several socio-demographic factors linked to children's behavioral outcomes, including the presence of siblings as a positive influence and parental exposure to domestic violence and substance use as contributing factors to behavioral problems.

Keywords: Externalized behavioural problems, preschool children, parents' behaviours, family environment.

SWOT Analysis to Assess the Efficiency of Vaccination Programs Targeting Family Poultry in Western Province, Sri Lanka

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The poultry industry in Sri Lanka comprises commercial-level poultry farms and small-scale farms, also known as family poultry. Both are vital for the country's economy, providing employment opportunities, income generation, and food security. However, the industry faces challenges, especially in terms of diseases including Newcastle disease, infectious bronchitis (IB), infectious bursal disease (IBD), Marek's disease, fowl pox and salmonellosis. While vaccination programs are implemented, they do not always deliver the expected outcome in relation to disease control. This study was conducted to identify the major factors influencing effective vaccination programs implemented in the family poultry sub-sector. A strength, weakness, opportunity, and threat (SWOT) analysis was conducted with the participation of three key participant categories: 11 veterinarians (7 males,4 females), 9 livestock development inspectors (LDIs) (7 males, 2 females), and 9 family poultry farmers (8 males, 1 female) representing all the veterinary ranges of the Western Province. According to the results, all 3 parties agreed that the free availability of some vaccines and the presence of an established system are strengths while they saw, willingness to train as an opportunity. There were several concerns among the participants. Veterinarians noted the unavailability of vaccines tailored to specific locally circulating strains of poultry viruses, as well as the lack of data on antibody titres for common poultry diseases prevalent in local flocks. The LDIs reported that delivering vaccines from the local veterinary offices to the farmers is a challenge. Among the issues raised by the farmers, the major problems were the lack of awareness about the importance of vaccination and associated financial constraints. Nevertheless, all parties identified free availability of some of the vaccines, as beneficial. Addressing the limitations and challenges faced by the family poultry sector in Sri Lanka is crucial in controlling disease outbreaks and ensuring overall sustainability and growth of the sector.

Keywords: Family Poultry, Vaccination, SWOT analysis, Veterinarians, Farmers, Livestock Development Inspectors.

The New Yardstick: The Relationship between Emotional Intelligence and Leadership Styles of Senior Male Managers in Colombo District

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Emotional Intelligence (EI) is considered as one of the key factors that detect potentially effective leaders. Trait EI includes emotion related characters and self-perceptions. Leadership is the process of influencing people to strive willingly towards achieving the group goals beside dictating and controlling. There are three main types of leadership styles (LS): Transactional, Transformational, and Laissez-faire. This study addresses the gap in research on the EI in senior managers by examining EI levels and LS in Office Automation Industry (OAI) of Sri Lanka, a field that requires a high innovation, adaptability and decision-making. This quantitative research employed purposive sampling with the participants who were well experienced and knowledge in the OAI. The objectives of this study were to assess the EI levels of senior male managers, identify the highest perceived leadership style, and to explore the relationship between EI and the predominant leadership style among them. In this study, 82 senior male managers from the OAI based in the Colombo district were assessed using self-administered Trait Emotional Intelligence Questionnaire and Multifactor Leadership Questionnaire (5X-Short Form) for EI and LS. Correlation and mean analyses were conducted using SPSS. Based on the results, 56.10% of senior managers had a higher EI level, highlighting the importance of EI in leadership. Among these high EI managers, 80.43% preferred transformational leadership, known for inspiring and motivating employees. Although 13.04% preferred transactional leadership, which focuses on task structuring, and 6.52% used a combination of both styles, none exhibited laissez-faire leadership, which is less engaging. The study found a strong positive correlation ($r = 0.777$, $P < 0.01$) between EI and transformational leadership, suggesting that high EI enhances the inspire and engage ability in leaders. Organizations should invest in EI development to boost leadership effectiveness and encourage transformational leadership. The study is limited by its sample size and focuses on one district. Future research should incorporate local languages, diverse samples, and government settings to better understand EI's effectiveness in leadership.

Keywords: Emotional Intelligence, Leadership Styles: Transformational, Transactional, Laissez-faire, Office Automation Industry, Senior Male Managers.

Understanding the Meaning and Role of Violence among Youth: A Qualitative Study from Sri Lanka

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Violence, a learned behaviour that occurs in a cultural context, holds diverse meanings for different people. Youth violence is a significant public health problem. A comprehensive understanding of what violence is meant for youth will facilitate effective prevention strategies. The objective of this study was to explore views and perceptions about violence among youth attending a technical college in the Central Province of Sri Lanka. This was a qualitative study and data was collected until saturation. Six focus group discussions with 54 students (31 female, 23 male) aged 20-27 years were conducted and employed the thematic analysis method. Under the theme; meaning and role of violence, four sub-themes emerged. Sub-theme I: definitions of violence- participants defined violence as *"harming anyone either physically or mentally"* and *"a way of releasing aggression, and stress".* Sub-theme II: acceptance of violence- participants accepted violence to secure social justice, and equity and solve problems. They viewed violence as a form of *"power"* to assert their rights by citing recent events against social or political injustice like the "Aragalaya" or the "struggle of people" in 2022. Participants described that violent behaviour to some extent would enhance survival and give experiences to one's life. Sub-theme III: normalisation of violence- participants normalized certain forms of violence and considered name-calling as an *"innocent form"* that did not need strict attention. Sub-theme IV: masculinity and violence- we found an association between masculinity and violence where male students viewed aggression as intrinsic to masculinity and justified its use in dating relationships. The data revealed multifaceted insights into the participants' conceptualizations of violence. The meaning and role of violence varied among students and emphasised the nuanced and complex nature of views and attitudes towards violence. Effectively addressing youth violence requires a concerted effort to challenge and redefine these underlying meanings and justifications.

Keywords: Youth, Meaning of Violence, Role of Violence, Qualitative

Usage of Generative Tools and Knowledge, Attitudes, Perceptions on Artificial Intelligence Among Dental Undergraduates – A Cross-Sectional Survey

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Artificial Intelligence (AI) has diversified its applications into healthcare and higher education, broadening into dentistry and dental education. The objective of the current study was to assess the knowledge, attitudes, perceptions on AI and usage of GenAI tools by dental undergraduates. A cross-sectional survey was conducted among a random sample of dental undergraduates (n=225). A questionnaire was developed with 10 questions (yes/no) for knowledge, 10 questions (5-point Likert's scale) for attitudes and perceptions. Level of knowledge was categorised based on the number of 'Yes' responses 10-8 good, 7-5 fair and <5 as poor. Descriptive statistics were obtained using Microsoft Excel. Of the respondents, 91.1% (205/225) had used Generative AI tools. Most common GenAI tools used was Chat GPT 88.9% (200/225), Google Bard 14.7% (33/225), and Microsoft Bing Chat 8% (18/225). From the total cohort 24.4% (55/225) were daily users, while 36.0% (81/225) used them weekly, and 25.8% (58/225) rarely. Knowledge score among AI users was rated as good in 30.7% (63/205), fair in 51.2% (105/205) and poor in 18.0% (37/205). Regarding attitudes, 61.3% (138/225) either agreed and strongly agreed that AI tools can help them study and improve their grades, while 42.2% (95/225) believed these tools can help them become better dental surgeons. However, only 39.1% (88/225) thought its acceptable to use GenAI tools for assignments and case reports. 58.7% (132/225) thought AI tools can reduce the creativity of humans and 38.2% (86/225) stated AI can surpass humans. Furthermore, 51.1% (115/225) of the cohort believed AI would become an essential tool for higher education and healthcare in future. Our results furnish important insights for educators and policymakers on students' knowledge and perspectives on AI, which are critical considerations when incorporating AI into curriculum, teaching, and assessments.

Keywords: Artificial Intelligence, Dental Undergraduates, Sri Lanka

Validation of the Sinhala Version of Quality Improvement Nursing Attitude Scale

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Ensuring patient safety and quality care are very important aspects in health and social care globally. A lack of knowledge, attitudes, and skills towards quality improvement among health professionals has been identified as one of the major barriers to improving patient safety and quality care. Despite this, a gap remains in the literature regarding attitudes related to nurses' quality improvement and safety in Sri Lanka. Furthermore, a validated Sinhala scale is not available to assess nurses' attitudes towards quality improvement. Therefore, this study aimed to translate and validate the Sinhalese version of the Quality Improvement Nursing Attitude Scale (QINAS-SL). This instrument consists of 35 items and it is a convenient, inexpensive, easy to administer, and effective tool for assessing nurses' attitudes toward quality improvement. The method described in Braccialli et al. (2019) was used in the translation process which consisted of initial and reconciled translation from English into the Sinhala language, back-translation and instrument adaptation, equivalence analysis of the instrument items, pre-test and cultural adaptation stages. The final version of Sinhala tool was administered among 400 nurses recruited with multistage cluster sampling representing various categories of hospitals in the Central province including two tertiary care and two secondary care institutions. The content validity index (CVI) was 0.98, indicating acceptable validity, and Cronbach's alpha reliability was 0.86, indicating acceptable internal consistency. Test-retest reliability was 0.86, indicating substantial reliability (ICC> 0.7). The eight-factor model explained 60.2% of the total variance. Therefore, QINAS-SL can serve as a valid, reliable, and practicable measurement tool for assessing the attitudes of nurses toward quality improvement.

Keywords: Quality Improvement, Patient Safety, Nurses' Attitudes, Sinhala Version

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Viral P32 Gene Targeting Conventional PCR For the Detection of Infectious Laryngotracheitis Virus in Commercial Broiler and Layer Farms in Kurunegala District

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Highly contagious respiratory disease of poultry called Infectious Laryngotracheitis (ILT), is caused by the Gallid herpesvirus 1, a member of the family *Herpesviridae*. It primarily affects chicken but can also infect turkeys and pheasants. Clinical signs of ILT include coughing, sneezing, nasal discharge, dyspnea, expectoration of blood and a drop in egg production. The virus is spread through direct contact with infected birds, as well as through contaminated equipment, feed, and water sources. ILT can have a significant economic impact on the poultry industry due to decreased egg production, increased mortality rates, and the cost of treatment and control measures. This study was conducted in the Kurunegala district of Sri Lanka to identify the prevalence of ILT in commercial broiler and layer farms using a conventional PCR method to detect the p32 gene of the ILT virus. Tracheal and lung samples were collected, using convenient sampling technique from 30 dead birds that showed respiratory signs, and DNA was extracted from these samples using a commercial kit and subjected to conventional PCR. The results showed that 6 out of the 30 samples tested positive for ILT, giving a prevalence rate of 20% in the district. These findings suggest that Kurunegala may be a potential hotspot for ILT, possibly due to the high poultry population in the district. Since there is currently no vaccination program for ILT in Sri Lanka, these results highlight the need for implementing a vaccination program and improving biosecurity measures in poultry farms. Future studies should focus on determining the prevalence of ILT in different districts and how the disease pattern varies according to different factors such as farm management practices and environmental conditions. This information will be crucial in developing effective control strategies to prevent and manage ILT outbreaks in poultry farms.

Keywords: Infectious Laryngotracheitis (ILT), Polymerase Chain Reaction (PCR), Poultry, Kurunegala, Vaccination

Vzv Encephalitis in an Initial Case of Covid-19 Meningo-Encephalitis: A Case Report

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Introduction: SARS-CoV-2 can cause neurological sequelae such as encephalitis, meningitis, and Guillain-Barre-syndrome in addition to primary respiratory infection. Reactivation of the varicella-zoster virus, associated with COVID-19, is notable and limited to the skin. In this case, the first example of post-COVID-19 meningoencephalitis is studied for VZV reactivation as VZV encephalitis. Case: A 48-year-old man with well-controlled diabetes and a past history of varicella infection presented with symptoms involving chills, fever, and breathing difficulties. He underwent treatment for COVID-19 pneumonia after testing positive for SARS-CoV-2. He was readmitted same day after being discharged because of severe headache, photophobia, neck pain and irritability. The suspicion of meningitis prompted additional diagnostic procedures. CSF analysis revealed elevated lymphocyte counts and protein levels, which indicated viral meningitis. Furthermore, MRI scan of brain excluded cerebral venous thrombosis. COVID-19 PCR test was positive in CSF as well as serum. Additional testing on the CSF sample confirmed positive PCR for VZV encephalitis as a co-infection and acyclovir was prescribed. Discussion: The complexity of COVID-19's impact on the neurological system, including the possibility of viral neuroinvasion, is discussed in this case study. The initial signs and symptoms pointed to COVID-19 meningoencephalitis, but were later complicated by possible VZV reactivation vs co-infection. Even though the patient's symptoms improved after receiving IV steroids, VZV encephalitis appears to be a complicating factor based on the patient's deteriorating symptoms and favourable reaction to acyclovir. The reactivation of VZV may have been contributed to by further immunosuppression brought on by COVID-19, diabetes, steroids or other factors. Conclusion: The reactivation of VZV as VZV encephalitis in an initial case of COVID-19 meningoencephalitis is the first case recorded so far. Thus, the lack of evidence for clinical decision making, the diagnosis and management of this patient was a challenge.

Keywords: VZV, Reactivation, COVID-19, VZV Encephalitis

FOOD SECURITY

AND

ENVIRONMENTAL

STEWARDSHIP

University of Peradeniya

A Comparison of Waste Management Practices between Bangladesh, Japan and Sri Lanka

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Bangladesh, Japan, and Sri Lanka are three Asian countries that face challenges in waste management due to population growth and infrastructure issues. The three nations produce 0.25-1 kg/day of waste per person and waste types vary, such as combustible, non-combustible, recyclable, and industrial waste, while organic waste is the major type of waste produced in all three countries. In Japan, waste treatment is mainly done through incineration and landfilling. Bangladesh has three systems of waste management: formal, informal, and community. The main methods of waste management in Sri Lanka are open dumping and landfilling, while incineration is practised only for hospital and industrial waste. Despite extensive policy frameworks, implementation challenges persist, including poor waste segregation, inadequate infrastructure, and limited private sector involvement. Health and environmental effects of improper waste management include respiratory illnesses, groundwater contamination with heavy metals, and effects on wildlife. Japan's active community engagement in waste management is an example of a successful intervention in comparison to the practices in Bangladesh and Sri Lanka. However, challenges remain in waste segregation, composting, and policy execution due to infrastructure issues and resource constraints. Overall, integrated approaches addressing infrastructure, governance, and public awareness are essential for sustainable waste management in these countries.

Keywords: Incineration, Policy, Solid Waste, Waste Management

A Design for Early Warning System to Minimize Wild Elephant-Train Collisions in Sri Lanka

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Wild elephant-train collision is a significant aspect of the Human-Elephant Conflict (HEC), which is on the rise in Sri Lanka. These incidents often result in the death or disfigurement of elephants. Moreover, these incidents also result in significant losses to railway services. The majority of elephant-train collisions result from drivers is due to, not having enough time to respond. This recurring problem was identified by secondary research including daily news. According to preliminary findings it has been found out that many collisions are concentrated to specific geographic "hotspots". Taking these things into account, this paper suggests a design to protect this precious biodiversity using Convolutional Neural Network (CNN). This design was created by deciding the optimal solution of each part of the setup from the knowledge obtained through secondary research. The camera that best fits, data collection, suitable algorithm and other necessary parts were done accordingly. Current advancement in CNN is used to identify elephants near recognized hotspots over the RGB/infrared spectrum using an Internet Protocol camera. Carefully selected image data of elephants collected during trips to wildlife parks in Sri Lanka can be further used to train pre-trained elephant detection model. A prototype of early warning system unit has been designed here using this vision-based detection technology as its central component to solve problem of elephant-train collisions. A warning goes to the locomotive operator, and he will be able to take a decision by watching the live footage of the incident while he is no more than 1Km distant to the hotspot. Overview of the ecosystem, flow chart of the process and the sequence diagram system have been elaborated to show the system functions and how it works. The final design was evaluated at railway stations near the "hotspot" and positive feedback were able to receive through interviews.

Keywords: Elephant-Train Collisions, Human-Elephant Conflict, Convolutional Neural Networks (CNNs), Vision-based detection.

Anti-Diabetic and Anti-Obesity Properties of Locally Available Four Duckweed Varieties in Sri Lanka

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The WHO emphasizes addressing diabetes and obesity for global health equity, highlighting plant-based traditional medicine as a low-risk, effective alternative to modern pharmaceuticals. This study aimed to evaluate the α-amylase and lipase inhibition activity (IC_{50}) of four duckweed varieties; *Spirodella polyriza* (SP), *Lemina cf. minor* (LM), *Lemna perpusilla* (LP), and *Landoltia punctata* (LaP) extracted from Water, 70% EtOH and 60% EtOH. The assessment evaluated their potential effectiveness in combating diabetes and obesity by targeting α-amylase, lipase enzymes respectively. Acarbose (anti-diabetic) and Orlistat (anti-obesity) drugs were utilized as standards. The SPSS MANOVA analysis showed significant differences ($P<0.05$) in the inhibition of α-amylase and lipase enzymes among solvent extractions and duckweed varieties. 70% EtOH extract showed the highest ($P<0.05$) α-amylase inhibition activity for both SP (0.14 ± 0.00 μg/mL) and LaP (0.14 ± 0.00 μg/mL). Water extract exhibited the greatest inhibition ($P<0.05$) for both LM (0.19 ± 0.00 μg/mL) and LP (0.54 ± 0.05 μg/mL). The study shows that four duckweed varieties demonstrated stronger α-amylase inhibitory activity ($P<0.05$) compared to the Acarbose (12.16 ± 0.10 μg/mL). The 60% EtOH extract of SP showed the highest inhibition of lipase activity ($P<0.05$), with an (IC_{50} $=1.39 \pm 0.02$ μg/mL). The 70% EtOH extracts of LM, LP and LaP also exhibited significant inhibition of lipase activity, with IC_{50} value of 1.75 ± 0.01 μg/mL, 2.86 ± 0.02 μg/mL, and 2.62 ± 0.12 μg/mL, respectively. The inhibitory effect of the 60% EtOH extract of SP on lipase activity is comparable efficacy to Orlistat, with (IC_{50} $=1.33 \pm 0.44$ μg/mL). The results reveal that all examined duckweed varieties exhibit potential for diabetes management, and the 60% ethanol extract of SP has shown promise for obesity management, indicating their possible therapeutic applications. Exploring duckweed's bioactive compounds offers a promising approach to tackling global health issues related to diabetes and obesity.

Keywords: Anti-diabetic, Anti-obesity, Duckweeds, Traditional medicine, α-amylase Inhibition, Pancreatic Lipase Inhibition

Application of N Gene Targeting Conventional RT-PCR for Detection of Infectious Bronchitis Virus in Poultry

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Infectious bronchitis (IB) caused by a gamma coronavirus in the *Coronaviridae* family is a rapidly spreading viral disease of chickens. Currently, IB has been disseminated throughout the world, with almost 100% morbidity in most affected areas. The clinical outcome of IB virus infection depends on the age of the affected birds, the virulence of the virus strain involved, and the immune status of affected flocks. Currently, there is no medication for this disease. As a result, specific efforts are warranted to detect this disease rapidly in order to minimize its adverse economic impact on the poultry industry. The objective of this study was to rapidly diagnose IB virus infected birds using a conventional RT-PCR that targets N gene of the IB virus. During postmortem examinations, layer birds with gross lesions suggestive of IB were chosen from routine diagnostic submissions received at the veterinary investigation center, Wariyapola. Trachea, kidneys, caecal tonsils, spleen, and lungs were collected from the selected birds. Between April to June 2022, 30 birds were sampled. Total RNA was extracted from approximately 40 mg of homogenized tissue samples using a commercial total RNA extraction kit according to the manufacturer's instructions. Reverse transcriptase PCR was performed using a commercial one-step RT-PCR Kit. Primers F -5' GTC TTG TCC CGC GTG TA -3' and R – 5' ACC CTT ACC AGC AAC CC -3'were used to target 435 bp segment of the N gene of IB virus. IB viral RNA was found in twelve suspected cases (40%). These finding demonstrated that IB is common in Sri Lankan chicken flocks. According to our results IB was observed in both vaccinated and unvaccinated layer flocks and the disease is more prevalent in mature birds than in younger flocks. Rapid laboratory diagnosis of IB using molecular techniques such as conventional RT-PCR will be useful in preventing severe economic losses in layer industry. Continuous detection of IB virus strains perpetuating in Sri Lanka is required to select optimal vaccine strains in order to implement successful immunization programs to control this disease.

Keywords: Infectious Bronchitis, Poultry, Gamma coronavirus, RT-PCR

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A Review on Captive Breeding and Sustainable Trade of Selected Native Freshwater Fish Species Used in the Ornamental Fish Industry in Sri Lanka

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Sri Lanka, one of the 35 global biodiversity hotspots, boasts 139 total freshwater fish species, 61 being endemic. Among various conservation initiatives targeting freshwater ichthyofauna, under the Fisheries and Aquatic Resources Act No 02 of 1996, eight fish species are export-restricted and can only be traded under strict regulations. This review study compiles information from 12 peer-reviewed sources from 1991 to 2024, with a special focus on the captive breeding of six export-restricted fish species, namely, Barred danio (*Devario Pathirana)*, Cuming's barb (*Pethia cumingii)*, Black ruby barb (*Pethia nigrofasciata)*, Cherry barb (*Rohanella titteya)*, Vateria flower rasbora (*Rasboroides vaterifloris)*, Combtail (*Belontia signata)*. Additionally, it includes three non-restricted species for exportation, namely Day's killifish (*Aplocheilus dayi)*, Stone sucker (*Garra ceylonensis)*, and Tiger loach (*Paracanthocobitis urophthalma)*. These species are currently exported as popular aquarium fish, mainly through fish caught in the wild, which is unsustainable. In captive breeding, due to the lower fecundity and increased spawning interval between two successive spawnings in some fish species, maintaining backup broodstock is important when scaling up for a commercial scale. All these species possess significant potential for sustainable aquaculture due to the ease of captive breeding, their coloration, and diverse feeding habits. This compilation provides insights into achieving conservation gains through awareness, implementation of recovery plans, habitat protection, and utilizing indigenous fishes for long-term socioeconomic advancement as a potential source of foreign revenue through selective and captive breeding. However, extensive studies on the distribution of colorful varieties and the implementation and amendment of relevant rules and regulations to control the direct trade of wild-caught fish and the collection of broodstock for breeding purposes are crucial for enhancing the sustainability of the ornamental fish trade involving indigenous species.

Keywords: Global Aquarium Trade, Export, Indigenous Fish, Sustainable Aquaculture, Ornamental Fish

Assessment of The Nutritional Profile, Glycemic Response, and Functional Attributes of Novel Basmati-Type Rice Varieties in Sri Lanka

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This study aimed to investigate the nutritional composition, glycemic index (GI), and functional properties of three newly developed Basmati-type rice varieties: CIC-Super-Kernel, CIC-Red-Fragrant, and CIC-Ceylon-Purple-Rice. The methodology assessed proximate composition, GI, total phenolic content (TPC), antioxidant activity (AOA), and physical properties such as cooking time, water uptake ratio, gruel solid loss, and kernel dimensions. Results showed no significant differences ($P<0.05$) in proximate composition among rice varieties. Protein levels were consistent with the typical range (4-14%) observed in Asian rice varieties. CIC-Super-Kernel had significantly lower ($P<0.05$) saturated fat content, while CIC-Red-Fragrant exhibited significantly higher levels ($P<0.05$) of mono- and polyunsaturated fats, suggesting a healthier fat profile. Mineral analysis revealed variations, with CIC-Super-Kernel showing significantly higher ($P<0.05$) potassium, phosphorus, sodium, and zinc levels, and CIC-Red-Fragrant having significantly higher ($P<0.05$) iron and magnesium contents. All varieties had intermediate amylose content (20-25%). Dietary fibre content ranged from 5.2-6.4%, with minor variations. All exhibited low GI characteristics, with GI values ranging from 49±9.4% to 51±7.3%. Despite variations in amylose and dietary fibre content, GI values did not significantly differ ($P<0.05$), suggesting other factors contributing to glycemic effects. CIC-Super-Kernel (20.3±2.9 mg GAE/g) showed significantly lower ($P<0.05$) TPC, while CIC-Red-Fragrant (91.95±0.37%) exhibited significantly higher ($P<0.05$) AOA. Physical properties assessment revealed differences in cooking time, water uptake ratio, gruel solid loss, and kernel dimensions among the varieties. Evaluation of the relationship between the physico-chemical properties showed that properties such as TPC and AOA ($r=0.99$; $P<0.05$), amylose and length-breadth ratio ($r=0.99$; $P<0.05$), were strongly correlated, while properties such as amylose and GI ($r=-0.92$; $P<0.05$), amylose and water uptake ratio ($r=-0.77$; $P<0.05$), were negatively strongly correlated. In conclusion, these findings affect dietary recommendations and health-conscious consumer choices. Further research is warranted to explore additional factors influencing GI and elucidate the complex relationships among various rice properties and glycemic responses.

Keywords: Antioxidant, Basmati, Glycemic Response, Nutrition, Total Phenolic Content

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A Study on Self-Care Strategies and Related Factors among Hypertensive Patients Attending a Tertiary Care Hospital in Sri Lanka

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Self-care strategies are important in controlling high blood pressure levels and reducing and preventing complications associated with hypertension. Poor adherence to self-care strategies leads to uncontrolled high blood pressure levels and serious complications. This study aimed to assess self-care strategies and associated factors among hypertensive patients attending follow-up clinics at Teaching Hospital Peradeniya, Sri Lanka. A descriptive cross-sectional study was conducted among conveniently selected 338 hypertensive patients who were attending follow-up clinics at Teaching Hospital Peradeniya Sri Lanka from October to November 2023. Data were collected using a pre-tested interviewer-administered questionnaire which consisted of three parts; demographic data, clinical and anthropometric characteristics, and H-SCALE to assess the self-care strategies of hypertensive patients. Medication adherence, adherence to a low-salt diet, physical activity, weight management, non-smoking and alcohol consumption were the six types of self-care strategies assessed in H-SCALE. Data were analyzed using SPSS version 25.0 and $p \leq 0.05$ was considered as the level of significance. Out of 338 study participants, 199 (58.9%) were females and 139 (41.1%) were males. The mean BMI of the sample was 24.35±2.73kg/m². The levels of adherence to recommended anti-hypertensive medications, low-salt diet, physical activities, non-smoking, weight management and alcohol consumption were 95%, 29.6%, 13.3%, 92.9%, 98.2% and 100% respectively. According to bi-variate analysis, gender showed a significant association with smoking ($p<0.0001$) and ethnicity showed a significant association with adhering to a low-salt diet ($p=0.005$). None of the factors observed in this study were significantly associated with the overall self-care practice of the hypertensive patients. Proper actions should be implemented to improve adherence to low-salt diet and physical activities of hypertensive patients as the levels of adherence to those self-care strategies were very poor according to the findings of this study.

Keywords: Hypertension, Hypertensive Patients, Level of Adherence, Self-Care Strategies

We would like to thank all the participants for their invaluable participation in the study.
This study has not been published in any journal.

Attractiveness and Bait Longevity of Food Bait Traps for Female Melon Fly, Zeugodacus cucurbitae (Coquillett)

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The melon fly (*Zeugodacus cucurbitae*) poses a significant threat to cucurbit and tomato crops worldwide, with larvae damaging fruit interiors, making surface insecticide management challenging. Current control methods focus on pheromone traps for males and protein-based pesticide baits for females. This study aimed to develop an environmentally friendly food bait trap for female melon flies. Three treatment schedules were tested, incorporating varying proportions of cucumber, water, sugar, and vinegar. Based on the preliminary study, three treatment combinations were selected and were scheduled in a luffa field as T1-cucumber+water (1:1)+vinegar 2%, T2-cucumber+water (1:1)+sugar 2%, T3-cucumber+water (1:1)+ sugar 2% + vinegar 2% and T4-cucumber+water (1:1) (Control). Each treatment was replicated three times, with the average number of female flies counted over 12 days, and the pH value and evaporation rate of the solutions recorded. The results indicated that T3 attracted the highest number of female flies (107.5 ± 15.5), followed by T2 (42.5 ± 14.3), T1 (38.3 ± 14.5), and the control (24.1 ± 11.5). Over 50% of the total female flies were trapped by T3. More than 60% of the total flies were captured within the first six days, after which the attractiveness of the traps significantly declined. The pH values of the solutions changed from a minimum of 4.5 to a maximum of 7.2, and 60% of the solutions evaporated. This research underscores the potential of food-based baits in melon fly management, providing insights into effective bait formulations and trap durability in agricultural settings.

Keywords: Melon Fly, Food Bait Traps, Trap Longevity

The authors would like to acknowledge the Division of Entomology, Horticultural Crop Research and Development Institute, Gannoruwa for providing all the resources to the success of this research.

Avian Biological and Functional Diversity across Different Habitats at the University of Peradeniya, Sri Lanka

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The Hanthana forest is surrounded by urban and suburban areas, including the University of Peradeniya where there is high bird diversity due to the heterogeneity in habitat types. This study aimed to assess and compare avian biological and functional diversity in four land use types in the University of Peradeniya premises including grassland, riparian vegetation, village (home gardens), and the Hanthana secondary forest. All birds observed or heard within each land use type were recorded along a monthly route transect from September 2021 to September 2022. The sampling effort was consistent across all habitats. The species diversity was analyzed using the Type I diversity index (Shannon-Wiener diversity index), Type II diversity index (Simpson's diversity index), Pielou's evenness, and beta diversity indices (Sorensen index, and Jaccard index). All observed species were categorized into six feeding guilds based on the available literature and the observations made during the field visits. A one-way ANOVA was calculated separately for each feeding guild to determine whether the relative abundance or species richness of each feeding guild is significantly affected by the land use type. The Shannon-Wiener diversity index was highest in the forest (3.530), whereas the Simpson's diversity index was highest in the riparian habitat (0.9619). This explains the presence of rare species in the secondary forest. Grassland and riparian habitats had the highest similarity (Sorensen = 0.667, Jaccard = 0.500) while grassland and forest habitats had the lowest similarity (Sorensen = 0.531, Jaccard = 0.361). Insectivores were the dominant feeding guild of the study area. According to ANOVA, avian functional diversities varied among habitat types ($p<<0.01$), suggesting that different feeding guilds prefer different habitat types. This study concludes that there are differences in the species richness and feeding guilds in the four distinct habitats at the University of Peradeniya.

Keywords: Birds, Diversity Indices, Functional Diversity, Habitat Heterogeneity

Bioconcentration of Microplastics in Mangrove-Associated Lagoon Cockle, Corbicula Fluminea in Batticaloa Lagoon, Sri Lanka

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Microplastics (MP) enter lagoons and mangrove forests in many ways, interfering with the environment and organisms' health. This study assessed the levels of MPs in lagoon water and tissues of mangrove clams, and their ability of bioaccumulation. The filter-feeding edible cockles, *Corbicula fluminiea* (n=21) were collected and the water samples (50 L) were filtered along a 100 m line transect along the bank of Navatkudah, Batticaloa Lagoon. The entire tissue mass of the clam and water samples were screened for MPs following wet peroxidase oxidation (30% H_2O_2) and saturated NaCl density separation. Shape, size and colour of the extracted MPs were recorded with a widefield stereomicroscope and an ocular micrometer. The mean MP concentration in water was 4,722.22±1,448.22 items/m^3 (0.75±0.48 items/g) whereas that in tissues was 1.31±0.23 items/g for the clam mean tissue wet weight 1.479±0.243 g. The bioconcentration factor (BCF) was 2.78 items/L. Thus, the clams have a high concentration of tissue MPs compared to water. MPs were in the form of threads, fragments, and pellets. Maximum size of water-borne MPs was 4 mm while in clams it was 50 µm. Red, Orange, black, blue and white were the detected MP colours in both samples, with purple in tissues only. A negative correlation was observed in tissue MPs to their tissue WW ($r=-0.684$, $p<0.05$) affirming an allometric relationship depending on the animals' surface area to volume ratio, suggesting smaller animals have a higher tendency for MP accumulation. No correlation was observed between MP in tissue and water ($r=0.416$, $p>0.05$). Since, the BCF is greater than 1, it is apprehensive to predict that the clams have come in contact with MPs mainly by means of water. MPs in these edible clams reveal a potential risk of entering food web and reaching the organisms in higher trophic levels including humans.

Keywords: Batticaloa, Bioconcentration Clams, Correlation, Microplastic

Biocontrol Ability of Tomato Indigenous Microflora against Multiple Tomato Postharvest Pathogens

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Postharvest diseases play a major role in food losses worldwide. Therefore, strategies for postharvest disease management are essential for sustainable food production. The use of biocontrol agents is one of the strategies presently used. This study focused on the isolation and characterization of (tomato) *Solanum lycopersicum* indigenous microflora from tomato fruit exocarp and screening their biocontrol ability against common postharvest pathogens isolated from tomatoes. Tomatoes were obtained from the Kandy market and the preferred variety was Roma variety. Potential biocontrol agents were isolated from healthy tomatoes using standard microbiological procedures. Pathogens were isolated using standard triple sterilization procedure and their pathogenicity on tomato epidermis was confirmed through Koch's postulate. Dual culture assay, and *in vitro* assay (spore germination assay) were performed to screen the degree of pathogenicity and biocontrol ability. Equal volumes of spores of each biocontrol agent and pathogen spore suspension (equivalent to $1x10^5$) were inoculated onto the middle side of the tomato exocarp with each pathogen and biocontrol agent spore suspension individually inoculated as control. Healthy tomatoes yielded four fungal species, *Yeast* sp., *Trichoderma* spp., and two unidentified isolates as indigenous microflora, while *Rhizopus* sp., *Botrytis* sp., and *Geotrichum* sp. (*Rhizopus* rot, Gray mold disease, and sour rot disease respectively) were isolated as pathogens. Inhibition percentages by *Trichoderma* spp. against pathogens *in vitro* study were 39.06%, 27.84%, and 74.97% against *Rhizopus* sp., *Botrytis* sp., and *Geotrichum* sp. respectively. *Trichoderma* spp. and pathogen interaction revealed coil formation by *Trichoderma* spp. suggesting mycoparasitism as its mechanism of action. *Trichoderma* sp. caused a 90%, 100%, and 100% reduction in disease incidence compared to the control for each of the three pathogens tested in the tomato epidermis. This study revealed the potential of using indigenous microflora of tomato epidermis to control postharvest diseases.

Keywords: Antagonistic, Indigenous Microflora, Postharvest, Tomato, *Trichoderma* sp.

Can the Agronomic Efficiency of Biochar Based Urea Fertilizers Applied in Maize Cultivation be Improved by Incorporating Urease Inhibitors?

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Urea (U) has less than 50% of Nitrogen (N) Use Efficiency (NUE) in most Maize (*Zea mays)* growing environments. Unutilized N in U can be lost to environment as reactive N causing number of environmental issues. This research was conducted to develop a new enhanced efficiency N fertilizer using U, a urease inhibitor (Limus®) and rice husk biochar (BC). Urea and Limus® (I) were intercalated into BC and pelletized to produce the novel fertilizer (EEU-I). Effect of EEU-I on changes in pore water NO_3^--N and NH_4^+ - N contents with time in an Alfisol was studied in leaching column experiment. Three treatments with same N rates: U, efficiency enhanced urea fertilizer without inhibitors (EEU), and U+I was used with no N (0U) control treatment. A field experiment was conducted with Maize plants using 0%, 50%, 75% and 100% of recommended N as U (0U, 50U, 75U and 100U, respectively), 50% and 75% N as EEU-I (50EEU-I and 75EEU-I, respectively), and 75% N as EEU (75EEU). In the leaching column experiment, rate of NH_4^+-N release during 20 to 30 days after incubation was significantly higher in EEU-I, suggesting better slow-release properties. In the field experiment, SPAD meter readings at V12 stage in EEU treatments were statistically not different ($P>0.05$) from 100U. But at R1 stage 50EEU-I resulted significantly lower ($P<0.1$) SPAD meter reading than that of 100U while other EEU treatments were not statistically different ($P>0.1$) from 100U. Yield and dry matter contents were not statistically different ($P>0.1$) among N added treatments. While agronomic efficiency was significantly high in 50% N added treatments, there was no significant difference between the novel EEU-I and U or EEU. Results suggest that there is no added advantage from incorporating Limus® under the experimental conditions used in this study.

Keywords: Agronomic Efficiency, Maize, Nitrogen Dynamics, Efficiency Enhanced Fertilizer, Urease Inhibitors

We acknowledge Dimo Agribusiness for their immense support for the field experiment.

Colonization of Zoonotic Bacterial Pathogens in Village Chickens in Sri Lanka

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In Sri Lanka, village chickens play a significant role in the rural agricultural landscape. The traditional practices of raising these indigenous chickens contribute to the preservation of local poultry genetic diversity and offer sustainable alternatives for resource-poor farmers. Unlike commercial poultry breeds, village chickens exhibit resilience to diseases but the available literature to prove this fact is sparse. The occurrence of zoonotic foodborne bacterial pathogens related to village chickens has not been studied in Sri Lanka. Nevertheless, there is a growing demand for meat and eggs of village chickens. Hence, this study aims to identify the presence of *Campylobacter*, *E. coli* and non-typhoidal *Salmonella* in village chickens. According to Department of Animal Production and Health statistical bulletin 2022, more than 17000 registered family poultry farms are situated in the Western Province. Therefore, Western Province was selected and random sampling was done in thirty family poultry farms; ten from each district (Colombo, Kalutara, and Gampaha). Those farms were visited to collect samples and demographic data. From each farm, randomly picked one village chicken was slaughtered to collect caeca and cloacal swabs for the isolation of *Campylobacter* and *E. coli* respectively. To detect non-typhoidal *Salmonella* environmental faecal samples were collected from the pens. Organisms were isolated and identified using standard protocols. Twenty-four out of thirty (80%) cloacal swabs were positive for *E. coli*. The *Campylobacter* colonization was 13.33% (4/30). Out of those four farms, in one farm both environmental samples and caecal swab were positive for *Campylobacter*, in two farms, only the environmental swab was positive for *Campylobacter* and in one farm, only the caecal swab was positive for *Campylobacter*. Six farms out of thirty (20%) were positive for non-typhoidal *Salmonella*. These findings revealed a notable prevalence of *Campylobacter*, *Salmonella* and *E. coli* in the sampled backyard poultry populations in Western Province.

Keywords: Village Chicken, *Campylobacter*, *E. Coli*, Non-Typhoidal *Salmonella*, Food

Community Participation in Sea Turtle Conservation – A Case Study in Kosgoda Coastal Area, Sri Lanka

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Conservation of sea turtles requires an adequate scientific understanding of the status and dynamics of the population and consideration of the coastal communities' attitudes towards the conservation of this species. Among the seven species of marine turtles, living in the world, five come ashore to nest in Sri Lanka. Sea turtles in the South and Southwestern coastline comprise the largest sea turtle rookeries. The conservation of sea turtles requires greater community participation. This study aims to explore the issues related to sea turtle conservation and map the role of community participation in conservation efforts in the Kosgoda coastal area. Data for the study was collected through primary data collection methods, namely direct field observations, key informant interviews, and a questionnaire survey. The respondents were selected using purposive sampling techniques. A survey was conducted with 50 selected coastal community villagers to determine their attitudes and knowledge about conserving sea turtles and their level of participation. The study found that hatchery-based *ex-situ* conservation is the most important strategy for conserving sea turtles in this area. Accordingly, five hatcheries were visited and the primary aim in maintaining these hatcheries in the study area is mostly profit-oriented ventures, and poor practices were employed at most of these hatcheries. This was highly confirmed during the field observations. As a result of this study, local villagers are well aware of the importance of conserving sea turtles. Also, there is a significant association between familiarity and knowledge about sea turtles, the prevalence of consumptive use of sea turtles, and the level of interest in participatory turtle conservation among respondents. This highlights the need to enhance the role of the community to improve the protection of sea turtles. Therefore, this study provides reliable results to enhance the role of the community in conserving sea turtles and the sustainable conservation of sea turtles in the Kosgoda coastal area, Sri Lanka.

Keywords: Sea Turtles, Nesting Habitats, Conservation, Community

Comprehensive Analysis of Composite Flour Blends Incorporating Jackfruit (Artocarpus heterophyllus) Bulb and Seed, and Characterization of Quality Attributes of Developed Crackers

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Jackfruit (*Artocarpus heterophyllus*) is one of the largest fruit-bearing crops in the world and is an underutilized crop in Sri Lanka. This study focused on developing composite flour blends of jackfruit seeds and bulbs, assessing the physicochemical properties of flour blends, developing jackfruit flour-based crackers, and assessing the nutritional, physical, functional, and sensory qualities of the developed crackers. Four different flour ratios were prepared using wheat flour (WF), jackfruit bulb flour (JBF), and jackfruit seed flour (JSF): F1 (Control) = 100% WF, F2 = 50% WF + 25% JBF + 25% JSF, F3 = 50% WF + 37.5% JBF + 12.5% JSF, and F4 = 50% WF + 12.5% JBF + 37.5% JSF. The water absorption capacity, solubility, and swelling capacity of the flour blends increased with higher incorporation of JBF. There were no significant ($P>0.05$) differences between each composite flour blend and the control sample in terms of oil absorption capacity. The highest crude fat (26.13a ±0.58%), crude fiber (2.73a ±0.06%), and ash content (3.17a ±0.25%) were in the F4 crackers. The significantly ($P<0.05$) lowest crude protein content (11.41%) was in the cracker which contained more JBF. The cracker containing more JBF showed significantly ($P<0.05$) higher antioxidant activity which was determined using the DPPH assay. According to the result obtained from a 9-point hedonic scale to evaluate the likeliness of sensory attributes using 30 untrained panelists, the F2 sample was not significantly different ($P>0.05$) from the control sample in terms of aroma, texture, and overall acceptability. There was no significance ($P>0.05$) each developed sample in terms of taste. This study provides evidence of successful incorporation of jackfruit bulb and seed flour in cracker production which could increase the utilization of jackfruit in the food industry.

Keywords: Jackfruit, Composite Flours, Crackers, Crude Fiber, Antioxidant

The support received from the Assistant Director of Agriculture (Research), Food Technology Division, Fruit Research and Development Institute, Kananwila, Horana in collecting samples greatly acknowledged.

Costs of the Commonly used Packaging Methods in Tomato Supply Chain in Sri Lanka

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Packaging demands special attention in the fresh produce supply chain in Sri Lanka, particularly for delicate food crops like tomatoes. Traditionally, in Sri Lanka, smallholder farmers and collectors use polypropylene mesh sacks or gunny (hessian) bags and wooden boxes to transport fruits and vegetables. Despite the rigidity and durability of wooden boxes, those used in the fruit and vegetable trade often lack standard size and quality; they vary in weight, lack ventilation vents, and have abrasive edges. Consequently, these methods usually lead to damage and accelerated decay due to overfilling and poor ventilation. Despite regulations mandating the use of plastic crates or rigid containers for transporting, handling, and storing tomatoes, stakeholders are hesitant to adopt these practices due to cost and logistical concerns. This study assesses the costs associated with three common packaging methods within the tomato supply chain in Sri Lanka: polypropylene mesh sacks, wooden boxes, and plastic crates. Mesh sacks appear financially attractive for small-scale farmers and collectors, costing LKR 21.55 per kilogram of tomatoes delivered, compared to LKR 32.63 for wooden boxes and LKR 42.79-44.57 for plastic crates. However, while mesh sacks offer lower immediate costs and thus appear attractive they result in higher food losses, leading to greater financial costs totaling LKR 210 per kilogram compared to LKR 175 for wooden boxes and LKR 91 for plastic crates. Including environmental costs, the total costs are LKR 248.24 per kilogram for mesh sacks, LKR 223.79 for wooden boxes, and LKR 148.73 for plastic crates. Plastic crates, although the most expensive upfront at LKR 42.79-44.57 per kilogram, provide better protection and ventilation, which results in lower food losses. There the financial cost per kilogram consigned is LKR 91, with total costs amounting to LKR 148.73 per kilogram. Thus, Plastic crates reveal their viability as a better packaging option in terms of both financial and environmental benefits. It is imperative that stakeholders weigh factors such as upfront investment, ongoing depreciation, salvage value, and environmental impact to determine the most favorable approach for tomato transportation. The finding suggests that while wooden boxes can minimize losses, they must adhere to proper standards for optimal results. Stakeholders should consider both direct costs and the potential for minimizing losses and maximizing efficiency when selecting packaging options for tomato transportation.

Keywords: Environmental Cost, Financial Cost, Packaging, Plastic Crates, Tomato

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Cultivation of Oyster Mushroom (Pleurotus Ostreatus) Using Biowastes

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Sawdust is one of the main ingredients used as a carbon source in mushroom cultivation in Sri Lanka. Nowadays, sawdust is getting scarce because of its limited availability. Farmers are dumping agricultural waste in the environment without proper usage, which causes environmental pollution and health hazards. Mushroom cultivation has the potential to significantly reduce harmful environmental effects by transforming biowastes into valuable food. The study was focused on evaluating the effect of different biowastes on the cultivation of oyster mushrooms as an alternative for sawdust. Cultivation of mushrooms was conducted in the mushroom hut under growth conditions of a temperature of 20-30 ^{o}C and a humidity of 80-90%. The experiment was carried out in a complete randomized design (CRD) with 10 treatments, *viz*., sawdust and rice bran (10:1) (T1-standard), coir dust and rice bran (10:1) (T2) sawdust, coir dust, and rice bran (5:5:1) (T3), sawdust, coir dust, and rice bran (6:3:2) (T4), banana pseudo-stem and rice brane (10:1) (T5) sawdust, banana pseudo-stem, and rice bran (5:5:1) (T6), sawdust, banana pseudo-stem, and rice bran (6:3:2) (T7), water hyacinth and rice brane (10:1) (T8) sawdust, water hyacinth, and rice bran (5:5:1) (T9), sawdust, water hyacinth, and rice bran (6:3:2) (T10), and each treatment had five replicates. The treatments contained different combinations of biowastes on the dry-weight basis. The means were compared for mycelium invasion, pin head formation, fruiting body formation, stipe length, pileus diameter, fresh weight, and biological efficiency using Duncan's Multiple Range Test (DMRT) using SPSS 26. The study showed that the time required for the growth phase and cost were less, and biological efficiency and benefits were statistically high in T4 in the substrate combination of sawdust, coir dust, and rice brane in a 6:3:2 ratio compared to all other treatments. Even though the treatment containing sawdust, banana pseudo-stem, and rice brane in 6:3:2 (T7) showed similar results, it has taken two more weeks for mycelium invasion compared to T4. Further, the results showed that coir dust and banana pseudo-stem can be mixed with sawdust instead of the standard practice followed by farmers. The study concludes that there is a potential for using biowastes such as coir dust and banana pseudo-stem in oyster mushroom cultivation, which may be an alternative to sawdust with better utilization of biowastes and a low cost of mushroom production.

Keywords: Biological Efficiency, Biowastes, Complete Randomized Design, Duncan's Multiple Range Test, Mushroom Cultivation

Detection of Infectious Spleen and Kidney Necrosis Virus (ISKNV) Species inthe Genus Megalocytivirus in Guppy (Poecilia reticulata) in the Western, North-Western and Central Provinces of Sri Lanka

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Megalocytiviruses are considered as emerging viral pathogens of fish. Heavymortalities associated with megalocytiviral infections have caused seriouseconomic losses to the ornamental fish industry in South-East Asia. The objective of this study was to detect the presence of *Megalocytivirus* in guppy fish (*Poeciliareticulata*) collected from major ornamental fish producing areas of the country and to find out the phylogenetic relationship among viral isolates. A total of 57 samples of guppy (10 fish per sample, one sample per variety from each farm) were collected by visiting thirty ornamental fish farms located in the Western (WP), North-Western (NWP) and Central (CP) provinces. From each fish sample (n=10), a pooled gill tissue sample was prepared by obtaining gill clips from each fish. Total DNA was extracted using a commercial DNA extraction kit. The presence of *Megalocytivirus* was detected by a nested polymerase chain reaction (PCR) that amplifies the major capsid gene of the virus. A total of 13 [31.8% (7/22)-WP; 19% (4/21)-NWP; 14.3% (2/14)-CP] guppy samples were found to be positive for *Megalocytivirus* by PCR, with a positive rate of 22.8%. The highest occurrence of the virus was observed in guppy collected from the WP. To further evaluate the genetic variation, the nucleotide sequences of major capsid protein (MCP) gene from 8 selected isolates were compared. Sequencing analysis showedthat all MCP gene sequences of the present study had 98.4%~100% nucleotide sequence similarity to the MCP gene sequence of ISKNV species, irrespective of the geographical region confirming that ISKNV is the predominant species of *Megalocytivirus* prevalent in guppies sampled. Phylogenetic analysis also showed that the strains in this study were strongly associated with ISKNV species. This study confirms the presence of *Megalocytivirus* among apparently healthy guppiescultured in Sri Lanka. Free movement of *Megalocytivirus*-infected fish within the country could lead to the introduction of the virus to *Megalocytivirus* free areas. Further studies are required to elucidate the local epidemiology of*Megalocytivirus* infection in guppy, a species with a high economic significance in ornamental fish farming in Sri Lanka.

Keywords: Guppy (*Poecilia reticulata)*, *Megalocytivirus*, Ornamental fish, ISKNV

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Determinants of Farmers' Plastic Use Behavior in Agriculture: A Cross-Country Study

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Plastic use in agriculture has gained momentum since the middle of the twentieth century. However, the consequences of this is relatively unknown. This study investigates farmers' plastic use behavior in poly-tunnels, net houses, and mulch usage across Sri Lanka, India, China, Egypt, and Vietnam. It addresses the knowledge gap on plastic adoption across countries and promotes sustainable use. A questionnaire survey with 6 sections was conducted targeting farmers who use net houses, mulch, or poly-tunnels. The sections included questions on demographics, plastic use types, perception of benefits, problems and information acquisition, plastic waste disposal techniques, perception of micro-plastic risks, and intention to adopt biodegradable mulch. Three-stage sampling was done which used purposive random sampling to select districts and villages, proportionate random sampling, and systematic random sampling to select households from villages. Altogether 1,500 households were selected with 300 households per country. Graphical analysis identified changes in plastic usage over five years, while Tobit and fractional regressions analyzed factors influencing plastic use concerning the area proportion cultivated with plastic. Graphical analysis shows Sri Lanka's increasing plastic usage in agriculture, while India, China, Vietnam, and Egypt have constant usage. However, India shows an increasing plastic mulch usage. Regressions indicate a significant positive effect of gender and perception of disposal barriers on the proportion of areas cultivated with plastic ($P<0.05$). While membership in a farmer society, family size, farming experience, education, and opinion on recycling motivations show negative effects ($P<0.05$). China, Egypt, and Vietnam positively influence plastic usage, while India negatively affects it compared to Sri Lanka ($P<0.05$). Therefore, demographics and personal attitudes impact plastic use in agriculture. Given Sri Lanka's rising plastic usage, enhancing awareness of recycling and sustainable practices is crucial. Policymakers should introduce incentives for recycling, environmentally friendly disposal techniques, and technologies like biodegradable mulch that do not require recycling.

Keywords: Agricultural Plastics, Farmers' Behavior, Farmers' Perception, Recycling Practices, Plastic Disposal

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Determination of Phytochemical, Antioxidant and Antibacterial Potential of Selected Leafy Spices in Sri Lanka

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In Sri Lankan culture, leafy spices are valued for their culinary and therapeutic benefits, including flavor enhancement, color, and food preservation. While bioactive compounds from these spices have been studied individually, comparative research is lacking. This study aims to compare the phytochemical composition, total phenol and flavonoid content, and antioxidant and antibacterial activities of four commonly used leafy spices in dry powder form :*Murraya koenigii*, (Curry leaves*), Pandanus amaryllifolius* (Pandan), *Cymbopogon citrates* (Lemongrass), *Mentha Piperita* (Mint) .The total phenolic content (TPC) was quantified using the Folin-Ciocalteu method, total flavonoid content (TFC) was assessed through the Aluminum chloride colorimetric assay, in vitro antioxidant capacity was evaluated via the DPPH radical scavenging assay and the phytochemical composition was qualitatively analyzed. The evaluation of antibacterial activity was conducted against three bacterial strains, *Escherichia coli* (ATCC 11229), *Staphylococcus aureus* (ATCC 6538), and *Pseudomonas aeruginosa* (ATCC 15442), utilizing minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) tests. *Murraya koenigii*, the variety with the highest phenolic content (335.13 ± 0.13 mgGAE/g) *and* the highest flavonoid content (25.05 ± 0.10 mg RE/g), also demonstrated the highest DPPH radical scavenging activity (87.26%± 0.15, indicating a significant correlation between these compounds and antioxidant properties. Additionally, this variety recorded the lowest MIC and MBC values, suggesting that higher phenolic and flavonoid content is linked to enhanced antimicrobial effectiveness. These findings highlight the important relationship between the bioactive compound content and the overall bioactivity of *Murraya koenigii* compared to other varieties. Qualitative phytochemical analysis revealed that all four varieties are rich in phytochemicals. *Murraya koenigii*, was tested negative for saponins, Mentha *piperita* and *Pandanus amaryllifolius* were negative for steroids. The study indicated that *Murraya koenigii* possessed a significantly high TPC, TFC, higher antibacterial and antioxidant activity than other three leafy spices investigated. Further analysis conducted using with other available varieties can give a clearer image on the bioactive potential of the selected leafy spices.

Keywords: Antimicrobial Properties, *Murraya Koenigii*, Phytochemical Composition, Total Phenol Content, Total Flavonoid Content

Developing Eco-Friendly Fire Ant Bait Killer (Solenopsis geminata) Management Strategies Through Plant Extracts

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The tropical fire ant, *Solenopsis geminata* (Fabricius,1804), is a well-known pest in many parts of the world. Its powerful stings can cause pain, allergies, and other complications for humans. This study aimed to develop an organic ant killer bait using natural plant extracts of *Crysanthemum* sp, *Citrus aurantifolia* (Citrus), *Cymbopogon citratus* (Lemmon grass), *Azadirachta indica* (Neem) and *Derris trifoliate*. Neem, citrus, and lemongrass leaf powders were extracted with ethanol in a Soxhlet extractor, refluxed at 68 °C–90 °C for 2–3 hours, and concentrated using a rotary evaporator at 40 °C and 50 rpm. Ten grams of powdered Common Derris roots were macerated with 95 % ethanol, and then agitated with water. The precipitate was separated and air-dried. Dried Chrysanthemum petals were soaked in 100 % petroleum ether for three days, mixed with 80 % methanol, shaken, and left to settle. The yellow layer was isolated and evaporated using a rotary evaporator. The bait was prepared by mixing 0.5 g each of soybean oil, honey, corn, and 5 % of each plant extracts (0.01 ml). After an overnight starvation, 20 worker ants were placed in escape-proof containers with the bait mixture (0.05 g). After 36 hours, the number of dead ants was counted and the Median Lethal Dose (LD50) of insecticide was calculated. This process was repeated five times and a bait containing food attractants but no plant extracts was used as a control. Five dead ants were recorded over 36 hours following 12 ants were dead within 72 hours. The median lethal dose calculated by the Karber-Behrens method after 72 hours of exposure was 1.09 mg/kg. This suggests some level of tolerance in *Solenopsis geminata* to these particular organic insecticides. To reveal the impactful active ingredients of that prepared bait killer should be identified in future studies.

Keywords: Fire Ant, Fire Ant Management, Eco–Friendly Method, Utilizing Plant Extract, Median Lethal Dose

Development of a Biodegradable Alternative to Single Use Sachets using Agar Extracted from Gracilaria Edulis

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This study aims to address the urgent issue of plastic pollution by creating sustainable alternatives, focusing on biodegradable films made from agar extracted from the seaweed *Gracilaria edulis*, specifically targeting single-use sachets. The study involved extracting agar, creating normal agar film (NAF) and composite films using corn starch (CSC) and beeswax (BC). Mechanical and physical properties including thickness, density, opacity, water vapor permeability, moisture content, and XRD patterns were assessed. Chemical properties were analyzed through FTIR tests, while antimicrobial properties were assessed using the CFU method. A three-week shelf-life assessment was conducted, involving chemical parameters, microbial testing, and sensory evaluation using milk powder samples packed in each film. Highest thickness (0.19 ± 0.09 mm g-1) and highest apparent density (1.39 ± 0.05 g mm-3) were reported in CSC film. BC film demonstrated increased opacity (4.86 ± 0.07 Am-1), decreased water vapor permeability (7.34 x 10-3 ± 0.11 gm-1s-1Pa-1) and decreased moisture content (17.83 ± 0.07 %). In XRD patterns, a significant ordered semi-crystalline structure, and in FTIR spectrum, a notable ester peak (1740 cm-1) was observed in BC film. Results from mechanical, physical, chemical, and antimicrobial analyses suggest that incorporating beeswax into agar could enhance crystalline structures, potentially influencing rigidity and barrier properties, thereby extending the shelf life of food products. The study observed efficient antimicrobial properties in the corn starch (CSC) film, while beeswax (BC) was found to preserve milk powder better than other films during shelf-life studies. This offers a promising sustainable alternative for food preservation. Analyzing the storage stability of BC for various food samples will provide deeper insights for future studies.

Keywords: Beeswax, Biodegradable Packaging, Corn Starch, Single-Use Packaging, Seaweed

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Development of a Fermented Whey Dairy Beverage Fortified with Bovine Collagen as a Functional Food Commodity

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Value addition to whey can be considered one of the maxzimize resource utilizations fromindustrial by-products. The main purposes of this study were to develop a fermented whey-based collagen incorporated dairy beverage and evaluate physicochemical, compositional, and microbial properties to determine the shelf life of the final product. In the current study, the preparation of five treatment combinations with different concentrations of whey (0%, 80%, 70%, 60%, and 50% w/w) and collagen (0%, 1.25%, 1.5%, 1.75%, and 2% w/w) were carried out. The best ratio of whey and collagen preparation was selected by conducting a nine-point hedonic scale sensory evaluation for sensory attributes (colour, aroma, flavour, texture, and overall acceptability). The final selected whey and collagen treatment combination was further evaluated for physicochemical properties (pH, colour, titratable acidity, total soluble solid content, and viscosity) and microbiological properties.The product was subjected to different physicochemical analyses at 0 days, 3 days, 7 days, 11 days and 14 days of storage at 5±1°C. Data from sensory evaluation was analyzed using the Friedman nonparametric test, and the data of the compositional analysis, physicochemical analysis, and microbial properties analysis of the final product were analyzed using one-way ANOVA in the MINITAB software package with a 95% confidence interval. The compositional analyses revealed that 70% whey and 1.5% collagen incorporated beverage had 18.67±0.21% dry matter, 0.01±0.00% crude fat, 2.59±0.08% crude protein, and 15.42±0.32% nitrogen free extract. Dairy beverage also had 301.96 ± 6.74 KJ per 100g of gross energy. The total lactic acid bacterial counts (7.06±0.39 log CFU/mL) were not less than the minimum acceptable limits (7 log CFU/mL) up to thedate of expiry stated by the SLSI at 9 days storage at 5±1°C. Yeast and mold counts were reached to an unacceptable level after the 11th day of storage (>2 log CFU/mL). The viscosity and titratable acidity were the highest and pH and colour were the lowest at the 14th day of storage period ($P<0.05$). Total soluble content of the final product on the 7th dayof storage period was lower than the initial °Brix value of the product on day 1. Therefore, shelf life of the final dairy beverage was estimated as 9-11 days under 5±1°C without added preservatives. The results of this study revealed that 70% (w/w) whey and 1.5% (w/w) collagen incorporated fermented value-added dairy beverage can serve as an innovative andnewly emerged functional drink.

Keywords: Whey, Collagen, Physiochemical properties, Proximate composition, Sensory evaluation

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Development of Low-Cost Automatic Rainwater Sample Collector for Assessing Air Pollution

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Air pollution is a considerable issue in urban atmosphere as heavy traffic congestion, emits toxic pollutants that are harmful to human health and ecosystems. Clean air is an essential prerequisite for sustaining life on Earth. But presence of toxic contaminants in air has characterized air pollution by affecting human health. The scavenging of air pollutants affects the removal of air pollutants in the atmosphere. For evaluating scavenging of air pollutants, ambient rainwater sample collection was challenging as available instruments were highly expensive. Therefore, a sensor based automatic sample collector was developed specifically for the collection of ambient rainwater in first 10 min period of a rain. The sample collector has advantages to minimizing cost as the sensor-based system facilitates simple mechanism and low space requirement. It also facilitates the collection of rainwater sample on a required time and avoid collecting extra water until sample colletor is reached from a distance. Further, the sesnsor based system can control lid opening angle and detect signals according to the intensity of rain. Although, handling of the machine is simple, battery replacement in correct time should be considered. Different dry periods are considered when collecting the samples and the accuracy of the machine was checked by using parallel samples which are manualy collected. Therefore, samples which collects using auto sampler are useful in analyzing scavenging efficiency of air pollutants in different dry periods.

Keywords: Atmospheric Pollution, Wet Scavenging, Build-Up Air, Ambient Rainwater, Traffic Related Emission

Development of Predictive Microbiology-Based Test Method to Validate the Log Reduction of Escherichia Coli in Spray Drying of Coconut Milk

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Aqueous extract of coconut endosperm (coconut milk) in its native liquid form has short shelf-life due to the growth of spoilage-inducing microorganisms and chemical deterioration caused by lipid autoxidation, lipolysis, and oxidation of unsaturated fatty acids. Spray drying is a commercially viable option for extending its shelf-life with no major loss of the nutrients. Thermal treatment supplied during the spray drying of coconut milk should ensure its microbial safety. Main objective of this study was to develop a test method to validate the efficacy of the spray drying technology of coconut milk using surrogate microorganism *Escherichia coli* (Migula) Castellani and Chalmers ATCC® BAA-1427 ™. *Escherichia coli* is one of the most potential microbial contaminants associated with coconut milk spray drying process. *Escherichia coli* ATCC® BAA-1427 was purchased from the American Type Culture Collection, retrieved as per the manufacturers' instructions. Coconut milk was extracted, mixed with additives and inoculated with pre-determined concentration (1.5×10^8 CFU/ml) of *Escherichia coli.* Inoculated coconut milk was spray dried in a centrifugal atomizer type spray drier at 165 ^oC at a feeding rate of 4 liters/hr. Inlet and outlet temperatures were maintained 29 ^oC and 78 ^oC, respectively throughout the drying. Pressure maintained was near atmospheric. Resulting coconut milk powder was evaluated for the log reduction of inoculum using Tryptone soy agar. Log reduction was calculated by comparing the viable colony counts of the control samples (before the heat treatment) with the colony count of the spray dried samples (n=9). Three log reductions of *Escherichia coli* ATCC® BAA-1427 indicated the efficacy of temperature – time combination of the spray drying process to ensure a safe, shelf-stable coconut milk powder. Results revealed that developed test method can be applied to verify the microbial safety in coconut milk spray drying in commercial applications. Development of the predictive microbiological tools using surrogate of target pathogens can be utilize to verify the efficacy of thermal process of food operations.

Keywords: Coconut Milk Powder, Surrogate, *Escherichia Coli*, Spray Drying

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Diversity of Amphibians in Pallethalawinna and Lower Hanthana, Sri Lanka

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Amphibians are recognised as bioindicators due to their sensitivity to environmental changes. Therefore, assessing amphibian diversity can be used to evaluate the overall health of the ecosystem. Hence, this study compared amphibian diversity in two different habitats: a home garden in Pallethalawinna (disturbed habitat) and a secondary forest in lower Hanthana (undisturbed habitat) in the wet zone of Sri Lanka. Equivalent efforts were made in both localities (80 human hours in each) to observe amphibians using direct visual encounters from early July to late December 2022, with observation from 19.00–23.00 h. Alpha diversity metrics, including Shannon-Wiener, Margalef's Richness, and Simpson's Indices, were calculated. Beta diversity was assessed using pairwise comparison of amphibian diversity in the two habitats. *Pseudophilautus popularis* was the most abundant species (21%), while *Hylarana gracilis* and *Ichthyophis glutinosus* were identified as the rarest (0.3%). Shared species across both localities included *Pseudophilautus popularis, Pseudophilautus rus,* and *Duttaphrynus melanostictus.* Lower Hanthana exhibited the highest number of species (S = 12), indicating the presence of more microhabitats compared to Pallethalawinna (S = 5). The highest diversity was observed in Lower Hanthana (H' = 2.186, D_{Mg} = 2.048, 1/D = 7.977), compared to Pallethalawinna (H' = 1.479, D_{Mg} = 0.843, 1/D = 4.051). Species were more evenly distributed in Pallethalawinna (J = 0.919) than in Lower Hanthana (J = 0.880). Bray-Curtis cluster analysis revealed a 35% similarity in amphibian composition between the two sites. Lower Hanthana contained ten endemic species, two of them are critically endangered (*Pseudophilautus rus* and *Pseudophilautus zorro*) and five were vulnerable, emphasising its conservation significance. Pallethalawinna harboured two endemic species, one of which is critically endangered (*Pseudophilautus rus*). The findings of this study underline the importance of minimising encroachment of natural habitats for agricultural lands and human settlements to uphold the distribution and diversity of amphibians.

Keywords: Amphibian Diversity, Alpha Diversity, Beta Diversity, Habitat Conservation

Diversity of Ant Fauna in Selected Crops and Ornamental Plants in Mathavuvaitha Kulam, Vavuniya District, Sri Lanka

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Exploration of ants in Vavuniya District in Northern Province of Sri Lanka is very important, due to the lack of previous records of ants in this region. The objectives of the study were investigation of the diversity of ants associated with selected plant species in selected home gardens of Mathavuwaitha Kulam in Vavuniya District and to present a list of the ant fauna from the region for the first time. Mathavuvaitha Kulam is located approximately 15 km Southwest of Vavuniya town, between 8º43'41.6" N, 80º29'06.7" E and 8º43'48" N, 80º29'07.4" E. The survey was conducted between July and September, 2022. Ants crawling on each of the 10 plants of papaya, guava, banana, brinjal, tomato, chilli, cayenne pepper plant, cassava, okra and "rose of Sharon" plants in ten home gardens were observed and two individuals in each species were collected using a wet paint-brush and preserved in 80 % ethanol. Collected ants were identified to the possible taxonomic levels using a low-power-stereo microscope and appropriate taxonomic keys. 90 % frequency of occurrence out of ten home gardens was observed for *Technomyrmex albipes* (Smith, 1861) and *Tapinoma melanocephalum* (Fabricius, 1793), which is significantly higher than that of other species, and the lowest occurrence, 10%, was observed for *Camponotus oblongus* (Smith, 1858). Only *T. albipes* was common to all plant species and *T. melanocephalum* was observed in all species except banana and rose of Sharon. Fourteen species belonging to twelve genera in three subfamilies, Dolichoderinae, Formicinae and Myrmicinae are presented in this first list of ants but further surveys on the ant diversity are recommended in the various habitats in Vavuniya District.

Keywords: Ant Diversity, Diversity in Vavuniya, Crop Plants, Ant Inventory

Effects of Eight Soilborne Fungi on Seed Germination and Early Seedling Development in Selected Vegetable Crops

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Soilborne fungi play dual roles in plant growth; facilitating plant growth or posing threats through pathogenesis. The main objective of the research was to study the effect of soilborne mycoflora on seed germination and early seedling development of Tomato (*Thilak*), Chilli (*MI2*), and Eggplant (*Lenairi*). Soil samples were collected from an organic farm located in Yatihelapalla, Rambukkana, Sri Lanka. Eight fungal species were isolated using the dilution method and identified using Commonwealth Mycological Institute descriptions. A germination assay was conducted with fungal spore suspensions (10^5 CFU/mL) from each species as treatments and sterile distilled water as a control. Germination percentages, root & shoot lengths were recorded after 14 days. Germination percentage and root-shoot length values were analyzed using Kruskal-Wallis test and one-way ANOVA, respectively. Dunnett's multiple comparisons with a control were performed to identify significant differences between treatments and the control. Eight species: *Aspergillus* sp.1, *Aspergillus* sp.2, *Aspergillus* sp.3, *Aspergillus* sp.4, *Penicillium* sp.1, *Penicillium* sp.2, *Trichoderma* sp.1, and *Trichoderma* sp.2 were isolated from the soil samples. None of the fungal species isolated significantly enhanced seed germination of tomato ($P>0.05$). *Aspergillus* sp.4, *Trichoderma* sp.1 and *Trichoderma* sp.2 significantly reduced seed germination of eggplant by 8-18% ($P<0.05$). *Aspergillus* sp.3 significantly reduced seed germination of chili by 6% ($P<0.05$). All the fungal species except *Penicillium* sp.1, significantly reduced the shoot lengths of eggplant by 25-40% ($P<0.05$). All the fungal species except *Trichoderma* sp.1 significantly reduced the root lengths of eggplant by 56-87% ($P<0.05$). *Aspergillus* sp.3 and *Trichoderma* sp.1 significantly increased the shoot lengths of tomato by 20-28%, while *Aspergillus* sp.1 and *Aspergillus* sp.4 significantly reduced the shoot lengths by 7-55% ($P<0.05$). *Aspergillus* sp.3 significantly increased the root lengths of chili and tomato by 74% and 79%, respectively ($P<0.05$). The positive and negative effects of the soilborne fungal isolates on seed germination and seedling growth were species-specific. Further studies on the effects of beneficial fungi on the early development of crop seedlings would be of substantial scientific importance.

Key words: Organic Farming, Seed Germination, Seedling Development, Soilborne Fungi

Effects of Immune Activation Through Bacterial Lipopolysaccharides and Food Deprivation on the Behaviour and Standard Metabolic Rate of Western Pygmy Perch (Nannoperca vittata)

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Western pygmy perch (*Nannoperca vittata*; an endemic freshwater fish of south-western Australia) infected with *Photobacterium damselae* subsp. *damselae* (Pdd) exhibit increased standard metabolic rate (SMR), activity, and boldness in a previous study. However, it is unclear whether these changes in metabolic rate and behavior were caused by direct manipulation by the parasite, the host immune response, a side effect of infection (e.g., nutritional stress), or a combination of all of these variables. To investigate the causal relationships between infection, metabolic rate, and fish behaviour, uninfected fish were exposed to a one-week immunological challenge (to provoke an immune response) with bacterial lipopolysaccharides (LPS) and food deprivation using a fully factorial experimental design. SMR, activity trait track length (TL), boldness trait emergence time (ET), and time spent in the risky zone (RZ) of the same individual fish were measured weekly for three weeks before and after immune challenge/food deprivation using intermittent flow respirometer and standard behavioural tests (open field test, emergence test). The impact of immunological challenge and food deprivation on metabolic and behavioral aspects of *N. vittata* were assessed using generalized linear mixed models. Food deprivation led to an increase in activity trait, TL, and in SMR, but had no effect on the boldness traits RZ and ET. Injection with LPS had no effect on any traits, with no evidence for any additive or synergistic effects when in combination with food deprivation. Food-deprived fish displayed an increase in activity immediately following treatment, while SMR rose three weeks later. These findings indicate that nutritional stress, rather than parasite manipulation or host immunological response, is a significant driver of the alterations in metabolic rate and behavior observed when *N. vittata* is challenged with Pdd. In food-deprived fish, an increase in activity may be linked to hyperphagia, which is associated with compensatory growth after a period of weight loss. This increase in activity is followed by an increase in SMR.

Keywords: Behavior, Food deprivation, Immune activation, *Photobacterium damselae* subsp. *damselae*, Standard metabolic rate

Effects of Selected Disinfecting Agents on the Microbial Quality and Physical Characteristics of Fresh-Cut Carrots (Daucus Carota)

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The microbial contamination of fresh-cut vegetables presents a significant public health concern, as it can lead to foodborne diseases such as listeriosis and salmonellosis. As consumer surveys indicate consumers preference for organic acids/natural disinfecting agents in fresh-cut vegetables, the current study investigated the effect of such disinfectants on microbial quality, colour, and pH of fresh-cut carrots. The disinfecting solutions of H_2O_2 (0.25 and 0.5%), NaCl (5.0 and 10.0%), citric acid (1.0, 1.5 and 2.0%), and acetic acid (1.0, 1.5 and 2.0%) was prepared. For each treatment, 10 g of washed, topped, peeled, and sliced carrots were dipped in the solution for 5, 10, or 15 minutes resulting in 33 treatments. The treated carrot samples were analyzed in duplicates for total plate count (TPC), total coliform count (TCC), yeast and mold count (YMC), color (L*, a*, b*, hue and chroma), and pH. A factorial ANOVA evaluated the effect of concentration and dipping time (DP) of each disinfectant on the above parameters (α=0.05). Both the concentration and DP of NaCl significantly affected the colour of carrots while higher concentration ($1.9x10^4$ vs. $5.5x10^3$ CFU/g) and DP ($1.9x10^4$ vs. $7.0x10^3$ CFU/g) resulted in a significantly lower YMC. There was a significant effect of both concentration and DP of citric acid as well as acetic acid on colour, and pH of carrots. Increasing concentration and/or DP in citric acid resulted in a significantly lower TPC compared to lower concentration or DP. Similar relationship was observed with acetic acid as the disinfectant. Disinfecting with H_2O_2 significantly affected the color of carrots while higher concentration ($1.6x10^4$ vs. $1.3x10^4$ CFU/g) and DP ($1.7x10^4$ vs. $1.3x10^4$ CFU/g) of H_2O_2 resulted in a significantly lower TCC. Thus, it can be concluded that the microbial quality, color and pH of fresh cut carrots depends on the concentration the disinfectant and DP.

Keywords: Acetic Acid, Citric Acid, Hydrogen Peroxide, Safety, Sodium Chloride
This work was supported by the University Research Council, University of Peradeniya, Sri Lanka (Multidisciplinary Research Grant Number 342).

Efficiency of Sugarcane Bagasse-Derived Biosorbents to treat Grey Water in terms of Organics Removal

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Water scarcity is a pressing issue exacerbated by population growth. However, leveraging greywater as a supplementary water source for non-potable purposes. Sugarcane bagasse, a lignocellulosic biomass, generally a low-cost and eco-friendly product, has gained attention as a potential biosorbent for greywater treatment. However, the application of this adsorbent to the grey water treatment in this region is lacking. The porous nature and surface structure of sugarcane bagasse make it a possible biosorbent for treating wastewater. This study emphasizes the use of sugarcane bagasse-derived biosorbent to treat the grey water produced from a student hostel. The sugarcane bagasse was collected from a local market, then it was thoroughly washed and dried under shade. The bagasse was cut into small pieces to enhance the surface area. Batch adsorption experiments were conducted through adsorption isotherms (for varying doses of 1–12 g/L) and kinetics (for contact times of 30 min–24 hours). This was conducted to determine the optimum dosage and the optimum contact time of the biosorbent, respectively, for the removal of COD, EC, and turbidity. Results revealed the 5 g/L dosage of sugarcane bagasse exhibited maximum reduction in COD (63%), turbidity (94%), and EC (37%), at a contact time of 360 mins from raw wastewater (COD 449 mg/L; turbidity 172 NTU; EC 4.16 mS/cm). The adsorption capacity (q_e) of bagasse was 64.0 mg/g in terms of COD reduction. Optimum dosage (5 g/L) and optimum contact time (360 mins) were determined based on the adsorption capacity of the adsorbents for the COD removal. The adsorption capacity (q_e) of bagasse was 64.0 mg/g in terms of COD reduction. Optimum dosage (5 g/L) and optimum contact time (360 min) were determined based on the adsorption capacity of the adsorbents to the respective dosage and time. The pseudo-second-order kinetic model and Elovich isotherm model explain the experimental data on adsorption equilibrium with R^2 values of 0.995 and 0.764, respectively, for COD removal. According to the models, the removal phenomenon is based on a chemisorption kinematic principle in heterogenous surfaces. The wasted sugarcane bagasse could be potentially incorporated into sand filters, constructed wetlands, or other alternative treatment systems, enhancing their ability to effectively remove, especially organics, from greywater.

Keywords: Adsorption, Chemical Oxygen Demand, Greywater, Reuse, Sugarcane Bagasse

Enhanced Removal of Nitrate from Water using Amine-grafted Corncob

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Increasing level of nitrates poses threat to human health and the aquatic environment. Among the nitrate removal technologies, adsorption is an attractive method because of its cost-effectiveness. The objective of the study is to investigate the nitrate removal from representative synthetic water containing nitrate using low-cost amine grafted (AG) corncob (particle size of 300-600 µm). Synthetic water was used as feed with the nitrate concentration (as N) in the of 20 mg N/L. Modified corn cobs were packed in adsorption columns and the filtration velocity was maintained at 5 m/h. The corn cobs were found to adsorb nitrate content from feedwater. It was confirmed by the Energy Dispersive X-ray Spectrometry data which showed an increased N content in the corn cobs from 94 to 141 mg/g after amine modification. The unmodified corn cob and had a zero point of charge (ZPC) of a pH 3.0 whereas it had ZPC greater than pH 8.5 after AG. The breakthrough curves for the unmodified adsorbent reached the adsorption saturation faster (2 h for the corn cob) than the those of AG adsorbent (12 h for AG corn cob). The regeneration of the adsorbent was carried out by leaching the adsorbed nitrate from the bed using 1 M KCl solution to desorb the nitrate from the adsorbents and determine whether the adsorbents can be reused. Four adsorption-desorption cycles confirmed that the 94-100% of the adsorbed nitrate was desorbed. Therefore, it can be concluded that the AG adsorbent was effective for removing nitrate from representative synthetic water containing nitrate. The exhausted adsorbent can be used as fertilizer and the nitrate in the desorbed solution which can be used in fertigation to supply nitrogen to plants. The potassium in the desorbed solution will also benefit plants.

Keywords: Nitrate, Agricultural Waste, Adsorption, Reuse

Establishment of a Trained Sensory Panel for Processed Vegetable Products

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Establishing a trained sensory panel in the food industry ensures product quality, consistency, and consumer satisfaction. It aids in detecting defects, guiding product development, aligning with consumer preferences and meeting regulatory standards. Ultimately, it enhances brand loyalty and supports efficient and innovative R&D processes. A trained sensory panel was established in HJS Condiments Ltd for analyse their products' sensory qualities and innovative product developments. The panel was established using the initial screening stage up to the trained panel stage in the sequence of training for processed vegetable products such as fermented vegetables, retorted canned, bottled products and filled-in pouches for exportation. The panellists were carefully chosen through a structured process focusing on consistency and reliability, ensuring a diverse range of sensory expertise and a genuine passion for sensory perception. Various screening tests including basic taste, odour, colour ranking, texture description and taste intensity were used to select the most suitable candidates. From the tests, fifteen panellists were chosen, all exceptional performance in duo-trio tests and paired comparison tests. To equip the panellists with necessary skills, training sessions were conducted, covering descriptive analysis techniques, standardized terminology, and evaluation procedures. Proficiency tests, including ratio, interval, and category scale tests, were administered to gauge the panellists' effectiveness. Notably, the probability values from scale tests surpassed those of other assessments ($p>0.05$), indicating a high level of proficiency. The results underscored the panellists' ability to evaluate precisely and consistently through sensory evaluations, thereby elevating the quality and dependability of sensory analysis data in food product development and quality control. The procedures and criteria used in this study has consisted of advanced sensory science, thus recommending to apply in establishment of an in-house trained sensory panel for the food industry targeting the interested product categories for the evaluation of sensory attributes subjectively.

Keywords: Sensory Panel, Screening, Consistency, Descriptive Tests

Evaluating Amphibian Diversity as a Measure of Ecosystem Development in Five Seral Stages of Belipola Analog Forest, Sri Lanka

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Amphibians serve as vital bioindicators of environmental health due to their sensitivity to habitat changes. Forest degradation threatens their habitats, but analog forestry an ecosystem restoration method can both restore habitats and provide economic benefits while conserving amphibians and other biodiversity. This study explores amphibian diversity across five seral stages in the Belipola Arboretum, the first analog forest in Sri Lanka's Central Highlands. The seral stages, based on stratification and cover, include early, mid, and late stages of ecological succession. Using the Visual Encounter Survey method, 120 amphibians from 13 species across four families were recorded. Data analysis with SAS tools showed that 85% of species were endemic, and 46% were threatened (Critically Endangered, Endangered, or Vulnerable). Statistical analysis revealed no significant differences in biodiversity between the early stages (p-values: first vs. second = 0.1478, second vs. third = 0.0678, third vs. fourth = 0.2055, fourth vs. fifth = 0.0609). However, significant differences were found between other stages. The highest Shannon-Wiener index, indicating greater biodiversity, was in the fifth seral stage (1.82), followed by the fourth (1.31), third (0.98), second (0.49), and first (0.11) stages. These results show that amphibian biodiversity increases significantly after the second seral stage, with habitat quality improving as succession progresses. This suggests that analog forestry, which mimics natural forest structures, enhances habitat quality and supports biodiversity conservation. As ecological succession advances, habitat quality for threatened amphibians improves, highlighting the value of maintaining and restoring diverse ecosystems. The study supports analog forestry as an effective approach for promoting ecological health and biodiversity in forested landscapes.

Keywords: Amphibian Biodiversity, Biodiversity Assessment, Conservation Management, Habitat Restoration

We gratefully acknowledge the invaluable contributions of Earth Restoration Pvt Ltd and AQUAE Lab Company to this research.

Evaluating Plant-Based Compounds and a Chemical Disinfectant to Control Abundantly-Colonizing Fungi on the Mirror- Wall, Sigiriya Sri Lanka

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Fungal colonization threatens to the archaeological value of the mirror-wall, Sigiriya, Sri Lanka. This study aimed to evaluate the effectiveness of several plant-based compounds and a chemical-disinfectant against fungi, comparing them to the present recommended synthetic fungicide, mancozeb. Commercial grade neem oil (NO), cinnamon bark oil (CBO), clove oil (CO), NO + CBO + CO mixture (1:1:1 ratio at v/v), Dorana oil (DO), *Hal* bark extract (HBE) and a mixture of DO and *Hal* resin (2:1 ratio at v/v) were tested at five concentrations (v/v). Benzalkonium chloride (BKC), a commercial-disinfect, was tested at the same concentrations and the recommended dosage of Mancozeb (2g/l) served as the reference. Five fungi (i.e. *Acromonium* isolates 1 and 2, *Aspergillus niger, Penicillium* isolates 1 and 2 and two unidentified fungal isolates) which are highly abundant on the mirror-wall surface were used for the study. Colony growth inhibitions by each concentration of the treatments were tested by poison food technique according to a complete randomized design with three replicates. Percentage colony growth inhibition was quantified in comparison to untreated control treatment. Except for the two *Penicillium* isolates, the other three fungal isolates were completely inhibited by NO +CBO + CO (1:1:1). One *Penicillium* isolate was fully inhibited at 0.5% concentration of the NO + CBO + CO mixture, while the other was inhibited at 1%. Colony growth of all five fungal isolates was completely suppressed by 0.1% BKC. None of the DO concentrations fully inhibited *Acromonium* isolate 1; *A. niger* and *Penicillium* isolate 2, while other fungal isolates showed a slight growth suppression. Mancozeb recommended dosage could not inhibit the colony growth of *Acromonium* isolate 1, *A. niger* and *Penicillium* isolates 1 and 2 completely. The results indicate BKC and NO +CBO + CO (1:1:1) as safer and more effective alternatives for currently used fungicide.

Keywords: *Vateria Copallifera*, Traditional Medicinal Trees, Benzalkonium Chloride

Evaluating the Economic Feasibility and Social Acceptance of Inhibitor Technologies in Sri Lankan Paddy Cultivation

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Nitrogen loss inhibitor technologies are the most emerging advancement in the global fertilizer sector. Although Sri Lanka continues to rely on conventional nitrogen sources, the Nutrient Use Efficiency (NUE) in the agriculture sector remains approximately 30%, leading to significant environmental pollution. Therefore, this study focuses on usage of nitrogen loss inhibitor technologies in the paddy sector, evaluating two main application techniques which are application of urease inhibitor treated urea (LIMUS) and direct application of inhibitors (NBPT and DCD) with conventional urea. A cost benefit analysis was carried out to evaluate the financial benefits of these two techniques compared to conventional urea application. Results revealed that, LIMUS decreased profit by 0.7% and direct application of inhibitors increased the profit by 9% when compared to conventional urea. Also, nitrogen lost was calculated using NUE of each technique and there it was identified that, 79% and 56% reduction was observed when using LIMUS and direct application of inhibitors respectively. After considering shadow cost of nitrogen surplus, the study revealed that, social benefit increases 12% and 9% respectively in direct application and LIMUS, when compared to practicing conventional method. Key informant interviews with stakeholders revealed that social acceptance towards inhibitor technologies among farmers and Agricultural Production and Research Assistants was low while it was identified to be high for fertilizer importers. The primary reasons for this disparity were lack of knowledge about these technologies and market challenges such as low demand for novel fertilizers due to negative past experiences, quality concerns and high initial investment. According to this study inhibitor technologies can be introduced to Sri Lanka as environmentally and socially viable solutions. Therefore, it is necessary conduct further scientific research studies and followed by an effective extension service and provide a slightly relaxed quarantine regulatory background when introducing new fertilizers to the country.

Keywords: Nitrogen, Fertilizer, Nutrient Use Efficiency, Inhibitor, social profit, paddy

Evaluation of Functional Properties and Sensory Attributes of Selected Curry Leaf (Bergera Koenigii) Ecotypes Thriving across Sri Lanka

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Different ecotypes of curry leaves (*Bergera koenigii*) are thriving across all agroecological zones of Sri Lanka. The current study aimed to find the differences in functional properties and sensory attributes among ecotypes collected from selected localities in wet, dry and intermediate zones. Samples were collected from natural populations in Kurunegala, Kegalle, Rikillagaskada, Ritigala, Mahailuppallama, Dambulla and Mahiyanganaya areas. Physical properties such as moisture content, bulk density, water holding capacity, water solubility, swelling power of curry leaf powder and functional properties including DPPH radical scavenging activity and total phenolic content which affects the antioxidant capacity of curry leaf as well as sensory attributes including color, aroma, taste, aftertaste, astringency, and overall preference of the aqueous extract of curry leaf powder were evaluated and compared among all the selected ecotypes. When considering the physical properties, the highest water holding capacity, water solubility, and swelling power were observed in the Kurunegala sample, which were recorded as 3.72±0.02%, 19.56±0.21%, and 8.21±0.13%, respectively ($p<0.05$), followed by the Rikillagaskada sample, which had the water holding capacity of 3.63±0.09% and the swelling power of 7.76±0.24% ($p<0.05$). The Rikillagaskada sample exhibited the greatest total phenolic content at 44.12±4.06 mg GAE/g ($p<0.05$). The highest antioxidant capacity in terms of DPPH radical scavenging activity was recorded from the Ritigala ecotype at 64.83±0.09 mg GAE/g, followed by the Rikillagaskada ecotype at 64.26±0.89 mg AAE/g ($p<0.05$). In terms of sensory attributes, tea extracts of the Rikillagaskada and Kurunegala ecotypes exhibited the highest scores for overall preference ($p<0.05$). In conclusion, the Rikillagaskada and Kurunegala ecotypes exhibited promising qualities in terms of total phenolic content, sensory attributes and physical characteristics. These findings manifest the potential of utilizing different ecotypes of curry leaves with enhanced functional and sensory profiles for various applications in culinary and medicinal contexts.

Keywords: Curry Leaves, Ecotype, Functional Properties, Phenolic Content, Antioxidant Activity, Sensory Attributes

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Exploring Ant Diversity: Updated Inventory of Eastern University Premises in Sri Lanka

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Ant diversity in the Eastern part of Sri Lanka remains a significant yet underexplored research area. This study aimed to examine the ant diversity through repeated sampling at the Eastern University of Sri Lanka from March to December 2023. Based on habitat diversity, A, B, and C Women's hostels back yard, front yard and inside, New wing canteen, ICCA, ICC B Woman's hostels, Backyard of the library, Front yard of the A, B, and C Wing's hostels, Grassy area near the Kovil, Backyard of the Zoology department, Left and right sides near the main gate selected where three 60-meter transects were demarcated in each. Along each transect, twelve quadrats were laid at 5-meter intervals and three using a wet paintbrush, three worker ants of each species within the quadrats were collected. Twelve mixed bait with honey, eggs, fish, and peanuts, were set up at 5-meter intervals along new transects, spaced 5 meters apart from each other. After one hour, attracted ants were collected. Leaf litter sifting was conducted at 5-meter intervals along each transect, with ants that fell onto a white tray being collected. All collected ants were preserved in 80% ethanol and identified to the furthest possible taxonomic levels with reference to related morphological keys. A nineteen ant species belonging to fifteen genera and four subfamilies, Dolichoderinae, Formicinae, Myrmicinae, and Ponerinae, were recorded. Eleven of these species, *Crematogaster* sp. 1, *Crematogaster* sp. 2, *Meranoplus bicolor*, *Pheidole* sp. 1, *Solenopsis 203otmail203*, *Trichomyrmex destructor*, *Tetramorium smithi*, *Tetramorium* sp. 1, *Camponotus reticulatus*, *Camponotus sericeus*, *Camponotus* sp. 1, *Monomorium 203otmail203z*, *Nylanderia yerburyi*, *Nylanderia* sp. 1, *Oecophylla smaragdina*, *Paratrechina longicornis*, *Anochetus longifossatus* and *Tapinoma melanocephalum*, were recorded for the first time within the university premises. Documented Eight species were reported in 2008. Represents 19 ant species an updated assessment for the Eastern University Premises.

Keywords: Ant Diversity, Ant Inventory, Biodiversity, Eastern University, Sri Lankan Ant Fauna

Exploring the Effectiveness of Phenolic Antioxidants Extracted from Annona muricata L. Fruit Seeds and Peel Using Ultrasound-Assisted Extraction

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Utilizing antioxidants from fruit by-products promote sustainability in food industry by reducing waste. This study investigated the effectiveness of ultrasound-assisted extraction in extracting phenolic antioxidants from *Annona muricata* L. fruit seeds (ASE) and peel (APE), determining the total phenolic content (TPC), total flavonoid content (TFC), phytochemical composition, antioxidant activity, and antibacterial activity. Phenolic antioxidants were extracted using 100% ethyl acetate using both vortex-mixed and ultrasound-assisted extractions. TPC and TFC were determined using Folin-Ciocalteu's method and Aluminium Chloride colorimetric method respectively. Gas chromatography-mass spectrometry (GC–MS) analysis was performed to identify the phytochemicals present in extracts. Antioxidant activity of the extracts was evaluated using $ABTS^+$ radical scavenging assay and compared with synthetic antioxidants; butylated hydroxytoluene (BHT) and butylated hydroxyl anisole (BHA). Antibacterial activity against food-borne pathogens *Staphylococcus aureus* and *Salmonella typhi* was assessed by measuring the inhibition zone diameter via the disc diffusion method. Results indicated that ultrasound-assisted extracts resulted significant (p<0.05) increase of TPC of ASE in 41% and APE in 48%, and TFC by 8% for both ASE and APE than vortex-mixed extracts. GC-MS analysis identified 1,2,3-Propanetriol, 9-Octadecenoic acid, n-Hexadecanoic acid in ASE and 1,2,3-Propanetriol, Oleic Acid, n-Hexadecanoic acid in APE as major phytochemicals. Half-maximal inhibitory concentration (IC_{50} µg/mL) of ultrasound-assisted extracts of ASE and APE was 29±0 and 42±1 respectively compared to BHT (63±1) and BHA (97±1) while vortex-mixed extracts resulted 49±0, 55±0 respectively. Ultrasound-assisted extracts of ASE (9±1, 8±0mm) and APE (7±1, 7±0mm) showed higher inhibition against *Staphylococcus aureus* and *Salmonella typhi*. Respectively than vortex-mixed extracts of ASE and APE (8±0, 0±0 and 6±0, 6±0 mm respectively), while synthetic antioxidants showed zero inhibitory effect and therefore, they lack antibacterial activity. Ultrasound-assisted method is a potential extraction technique, and the tested natural sources could be promising alternatives to synthetic antioxidants due to their increased antioxidant and antibacterial activities.

Keywords: *Annona Muricata* L., Antimicrobial Activity, Antioxidant Activity, Phenolic Antioxidants, Ultrasonic-Assisted Extraction, Vortex-Mixed Extraction

Financial assistance from the University of Sri Jayewardenepura (Grant No ASP/01/RE/TEC/2022/76) is acknowledged.

Factors Influencing Satisfaction with Food among University Students: Evidence from the Faculty of Arts, University of Peradeniya

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Health manifests as a multifaceted phenomenon, involving optimal physical, mental, social, and spiritual well-being. The youth, as the prospective architects of a nation's future, underscores the critical importance of understanding their well-being and its diverse dimensions for national development. Consequently, a thorough exploration of the dietary habits within this demographic becomes imperative. This research is driven by the primary objective of examining in-depth the factors that determine satisfaction with food among students enrolled in the Faculty of Arts at the University of Peradeniya. In 2023, a cross-sectional survey was undertaken within the Faculty of Arts, involving a stratified random sample of 400 students. While maintaining ethical considerations, quantitative data collection utilized e-surveys with a pre-tested questionnaire. Subsequently, STATA (Version 12.0) was employed for data analysis, specifically through logistic regression analysis. Analysis revealed that factors such as perceived food quality, quantity, affordability (price fairness), and perceived healthiness of food show statistically significant effects on students' food satisfaction. Food quality showed a significant positive relationship at the 0.01 level, with a coefficient of 1.021. Food quantity was significant at the 0.1 level, increasing satisfaction by 0.498 units. Food affordability and healthiness were significant at the 0.05 and 0.01 levels, respectively, with coefficients of 0.739 and 0.781, indicating that better affordability and healthiness of food enhance satisfaction. These findings suggest that students tend to be more satisfied with food, when they have higher perceived quality, quantity, affordability, and healthiness of food options available to them. However, factors such as gender, academic year, and residential status did not exhibit significant associations with food satisfaction. Understanding the factors influencing students' level of food satisfaction is crucial for health, lifelong well-being, and societal development. Improving standards, variety, and availability of food options in academic settings is key to enhancing overall food satisfaction and well-being.

Keywords: Food Behavior, Food Satisfaction, Logistic Regression, Undergraduates, Well-Being

Herbaceous Vine, Mikania micrantha as a Bioindicator of Urban Air Pollution

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Plants undergo different physiological, morphological and chemical changes in response to the air pollution and act as bioindicators. Several herbs, trees and lichens have been identified as such bioindicators. This study aims to determine the potential of herbaceous vine; *Mikania micrantha*, commonly known as Wathupalu in Sinhala and Tuni-kodi in Tamil as a bioindicator to monitor air pollution at urban environments. Kandy city (7.2908° N, 80.6335° E), located in the central province of Sri Lanka which is known to have a high degree of air pollution was selected as the study location. The study area of 12.51 km^2 within 2 km radius from the city center was selected. Sampling locations (n=20) were identified by purposive random sampling using ArcGIS and classified into four land use classes; urban (n=9), suburban (n=4), homestead (n=4), forest (n=3). Fresh leaf samples were collected and leaf extracts were analyzed for total chlorophylls, ascorbic acid, pH, and relative water content. Air pollution tolerance index (APTI) was determined based on the plant parameters. The secondary air pollution data (particulate matter and Air Quality Index) at each sampling location indicated significantly ($p<0.05$) higher air pollution in urban areas followed by suburban, homestead and forest areas. The total chlorophyll content was significantly ($p<0.05$) lowest in urban areas (0.32±0.01 mg/g) with high vehicular air pollution and highest in forest areas (0.89±0.46 mg/g). Similarly, ascorbic acid content was significantly ($p<0.05$) lowest in urban areas (0.53±0.06 mg/g) with high vehicular air pollution and highest in forest areas (1.97±0.08 mg/g). APTI was significantly varied from highest in forest areas with low vehicular pollution to lowest in urban areas with high vehicular air pollution. Hence, *Mikania micrantha* found as a sensitive plant species to indicate urban air pollution. Thus, it can be recommended as an effective bioindicator to monitor urban air pollution.

Keywords: APTI, Biomonitoring, Kandy, *Mikania Micrantha*, Urban Air Pollutants

Identifying Market Determinants for Fresh-Cut Vegetables by Exploring Consumer Perceptions and Preferences

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Fruits and vegetables are integral to a healthy diet and play a significant role in achieving Sustainable Development Goals (SDGs) by addressing malnutrition (SDG 2) and enhancing health and well-being (SDG 3). Fresh-cut vegetables (FCVs) have become popular in developed countries due to increasing demand for convenience. However, in Sri Lanka, adoption has been limited due to a lack of research on processing technology, food safety issues, pricing, and other factors. This study aimed to identify the factors influencing consumer perceptions and purchasing behavior toward FCVs in Sri Lanka, focusing primarily on the Colombo and Kandy regions, where users and potential users are highly representative A cross-sectional survey from May to October 2023 collected responses from 1,722 participants, both users and potential users of FCVs. The majority of respondents were women (75%), with an average age of 38 years, mainly from urban areas. Logistic regression analysis revealed several factors influencing purchasing frequency. Family size was positively correlated with buying behavior. Information on preservative techniques positively impacted buying frequency, while information on disinfection agents and perceived low nutritional values decreased it. Using FCVs as cooking ingredients increased buying frequency, while issues like discoloration and browning had a negative impact. Ordinary Least Squares Regression analysis indicated that gender significantly affects consumer perception, with women more likely to purchase FCVs. Preservation techniques reduced satisfaction with increased usage, while quality assurance logos and awareness of organic production improved perception. Labeling information, such as expiry dates, preservatives used and their concentration, nutritional value, and quality certification, positively impacted perception, while high concentrations of disinfection agents and discoloration had a negative effect. These findings offer valuable insights for stakeholders to improve FCV production and marketing strategies, thereby increasing consumer satisfaction.

Keywords: Fresh-Cut Vegetables, Market Drivers, Consumer Perception, Preferences

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Impact of Climate Change on Agriculture in Vadamaradchy South-West Divisional Secretariat Area in Jaffna District

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Climate change has had a significant impact on agriculture in the Vadamaradchy South-West Divisional Secretariat area of Jaffna District. This region has experienced a noticeable shift in temperature and precipitation patterns over recent years, profoundly affecting agricultural practices and productivity. This study mainly relies on both quantitative and qualitative methodologies. Primary data was collected through three focus group discussions with farming communities, including details of changes in rainfall patterns, temperature variations, impacts on crop yields, and the adaptive strategies being employed by farmers. Secondary data, such as annual rainfall and temperature patterns, was obtained from divisional secretariat annual reports. One of the most notable impacts of climate change in this area is the alteration of rainfall patterns. The traditionally reliable monsoon rains, crucial for crop cultivation, have become increasingly erratic. This unpredictability has led to challenges in timing planting and irrigation, affecting crop yields and quality. Farmers, who rely heavily on rainfed agriculture, now face heightened uncertainty and the risk of crop failure. Rising temperatures are another critical concern. Increased heat stress during critical growth stages can adversely affect crop development. Crops such as rice, a staple in the region, are particularly vulnerable to temperature extremes, impacting both yield and quality. In response to these challenges, local farmers are gradually adopting climate-resilient agricultural practices. Techniques such as rainwater harvesting, improved irrigation systems, and the cultivation of drought-resistant crop varieties are being promoted. Government and non-governmental organizations should provide support through training, access to weather information, and financial assistance for adaptation measures. Climate change poses significant threats to agriculture in this region. Addressing these challenges requires concerted efforts at local, national, and international levels to enhance resilience, ensure sustainable agricultural practices, and safeguard the livelihoods of farmers in this vulnerable region.

Key words: Climate Change, Water Scarcity, Rainfall Patterns, Rainfed Agriculture

Impact of Inexpensive Tillage and Seeding Methods on Yield and Nutritional Quality of Fodder and Silage of Sugargraze

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Suggested agronomic practices for cultivating hybrid fodder sorghum (*Sorghum bicolor* cv. Sugargraze) in paddy fields of the low-country dry zone during the *Yala* season in Sri Lanka entail high plant density (45x15 cm^2), minimal fertilizer usage (urea – TSP – MOP at 338-47-28 kg/ha), and extended irrigation intervals. This experiment aimed to explore the impact of tillage (Zero, Minimum, Optimum) and seeding (Broadcasting, Row seeding, Planting at identified spacing) methods, alongside suggested practices, on the yield and quality of Sugargraze cultivated in paddy fields of the low-country dry zone during the *Yala* season, and their silage. Sugargraze seeds were sown at the onset of the season. Broadcasting resulted 296,148 plants/ha, while row seeding (45 cm row spacing) and planting at identified spacing (45x15 cm^2) resulted 148,074 plants/ha. Sugargraze was harvested at the dough-grain stage, ensiled and silage quality was determined. The dry matter (DM) yield, crude protein (CP), acid detergent fiber (ADF), neutral detergent fiber (NDF), acid detergent lignin (ADL), organic matter digestibility (OMD) and metabolizable energy (ME) of fodder remained unaffected ($P>0.05$) by tillage and seeding methods, resulting computed mean values across the treatments. The DM yield of Sugargraze was 14.31±0.84 MT/ha. The organic matter (OM), CP, NDF, ADF, and ADL percentages of fodder were at 83.30±0.62, 3.28±0.15, 65.93±1.35, 41.78±0.91, and 7.46±0.36, respectively. Despite low CP percentage, the fodder exhibited great OMD, (62.62±1.23%) and ME (9.41±0.19 MJ/kg). Consistency in fodder composition across agronomic practices ($P>0.05$) resulted in steady ($P>0.05$) pH, lactic acid, soluble carbohydrates, OMD, and ME in their silage, measured at 3.21±0.02, 6.45±0.07%, 2.42±0.05%, 48.13±1.20%, and 7.18±0.18 MJ/kg, respectively. Low silage pH indicated great potential for preservation of Sugargraze fodder as silage. The study recommends zero tillage and broadcasting for cultivating fodder sorghum in paddy fields of the low-country dry zone during the *Yala* season for conservation as silage.

Keywords: Composition, Metabolizable energy, Organic matter digestibility, pH.

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Impact of Long-Term Fisher Awareness Programs on Sea Turtle Conservation in Kalpitiya, Sri Lanka

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Fishery bycatch is one of the most significant yet possibly least understood threats to the sea turtle populations in Sri Lanka. During the past 10 years, the Bio Conservation Society (BCS), Sri Lanka has conducted over 50 awareness programs in the Kalpitiya Divisional Secretariat Division (DSD) with a primary objective of promoting awareness of sea turtle biology and conservation, legislation, and law enforcement among coastal populations. This study assessed the impact of these long-term fisher awareness programs on sea turtle conservation in Kalpitiya DSD. A questionnaire survey was conducted in 12 fishing villages in Kalpitiya, involving 100 fishers, both participants and non-participants of the awareness programs between May to September 2023. During the survey, the participants were asked a series of questions covered their demographic information, fishing activities, and knowledge, attitudes, and practices regarding sea turtle bycatch. According to the results of the Pearson Chi-square test awareness programs had a significant positive influence on the knowledge ($p < 0.001$) and attitudes ($p < 0.001$) towards sea turtle conservation among the participants. Participants were more knowledgeable about the turtle species, their biology,210otmains for bycatch and about the legal framework for their conservation and had more positive attitudes on the importance on reducing turtle bycatch and conserving them than the non-participants. Fisher's Exact test indicated that awareness programs did not result in significant changes in the fishing practices ($p > 0.001$) such as changing the gear type or the fishing strategies to reduce sea turtle bycatch. Fishermen's reluctance to adopt new methods stemmed partly from poverty concerns and fear of decreased harvests. To enhance the efficacy of future awareness programs, it can be recommended to integrate practical conservation techniques that align with fishermen's economic interests, such as demonstrating cost-effective, sustainable fishing methods that protect sea turtles without compromising their livelihoods.

Keywords: Sea Turtle Bycatch, Questionnaire Survey, Sea Turtle Conservation, Knowledge, Attitudes, Fishing Practices

Impact of Plastic Mulches on Soil Physicochemical Properties in Maize and Chili Fields in Wet Zone Sri Lanka

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Plastic mulching is used in agriculture but its influence on soil remains a topic of significant scrutiny, especially in environmentally delicate locations like the Wet Zone (WZ) in Sri Lanka. This research examines how different plastic mulching affects soil physicochemical properties in maize and chili fields within the WZ. Three seasons of Pacific F1 maize and one season of MICH 1 chili were cultivated with varying mulching treatments: Imported polyethylene UK mulch (PEUK), polyethylene local mulch (PESL), biodegradable mulch (BD), and control (no mulching). The experiment design was completely randomized design. Four replicates for each treatment and 6 for the control were used. Soil temperature and gravimetric moisture content (GMC) were monitored in-field using sensors while soil pH and EC were measured in the laboratory using the 1:2.5 soil: water extraction method biweekly. In chili, the highest soil temperature ($p<0.05$) was in the PEUK (32.34 °C), PESL (31.85 °C), and BD (31.80 °C) mulch treatments while the GMC was significantly higher ($p<0.05$) in the PEUK (17.96%), PESL (15.94%), and BD (17.79%) treatments than the control. Also, the soil EC and pH were significantly higher than the control ($p<0.05$) in PEUK (100.10 µS cm^{-1}, 5.56), PESL (98.24 µS cm^{-1}, 5.53), and BD (94.81 µS cm^{-1}, 5.46) treatments respectively. For maize, the highest soil GMC was observed in the PEUK (16.72%), PESL (16.40%), and BD (15.38%) treatments than the control ($p<0.05$), and the highest pH was observed in BD (6.04) and control (5.89). Mulching helped to conserve soil moisture and increase soil alkalinity by optimizing the pH for chili while maintaining the optimum range for maize.

Keywords: Soil Properties, Plastic Mulching, Bulk Density, Soil Ph, Soil Temperature

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Impacts of Seasonal In-Migration on Local Fishers' Livelihoods in Mamunai Village, Jaffna

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Small-scale fishers have experienced various threats to their livelihoods in Sri Lanka. The fishers from the West Coast migrate to the Northeast and East Coast to access the rich northern fishing grounds. However, the seasonal migration of the outside fishers for fishing already created a competition for fish resources among local and outside fishers, creating a conflicting environment. Thus, this research aims to explore the impacts of seasonal in-migration of outside fishers on the livelihoods of small-scale fishers in Mamunai, which is an old fishing village in Jaffna. A qualitative method was used to collect data for this study namely, observation, key informant interview (01) and semi-structured in-depth interviews (10 with local fishers while 06 with outside fishers). The findings revealed the majority of the local fishers were negatively affected by the migration of the outside fishers. Due to the seasonal in-migration and their fishing practices have created a vulnerable situation for single boat owners, and crew members of beach seine, to continue their resource-based livelihood especially since they experienced income reduction and reduction of fishing practices, damages to the fishing gears, fish resource depletion, and lack of employment opportunities. However, a small proportion of the multi-boat owners have gained positive livelihood outcomes due to the seasonal migration as they could rent out their boats and related fishing equipment to the migrant fishers. As the findings of the research confirm, migration of outside fishers has created both negative and positive impacts, it is essential to develop an understanding of the complicated nature of conflict arising from out-migration and to address the issue through proper policies namely restricting open access policy to most fisheries excluding the beach seine and stake net.

Keywords: Small-Scale Fishers, Seasonal In-Migration, Local Fishers' Livelihoods, Fish Resource

Impact of Social Comparative Nudging and Educational Interventions on Tomato Loss Reduction at Retail Environment

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Tomato, a soft natured vegetable, faces a high post-harvest loss compared to many other vegetables produced in Sri Lanka. Despite adopting various strategies to reduce these losses, the reduction has not reached a satisfactory range, especially at retail level. Therefore, this study aims to identify why these attempts have failed and what factors actually motivate retailers to reduce the losses, using a social experiment with two treatments: social comparative nudging and information provision. This experiment was conducted with 27 retailers, including roadside vendors, grocery cum vegetable retailers and exclusively vegetable-focused retailers in the Kandy district of Sri Lanka for 14 days. The data were analyzed using mean comparison tests, and DID regression analysis. The results indicate a significant decrease in percentage losses for both treatment groups, with nudging through comparing their monetary loss to a benchmark proving to be more effective in the short run. The differential responses among retailer types highlighted that roadside vendors and exclusively vegetable-focused retailers responded better to providing information on loss reduction strategies, while grocery store owners were more responsive to nudging. Furthermore, factors such as prioritization of monetary losses over food losses, customer retention strategies, and opportunistic behavior of upstream supply chain actors hindered the adoption of the introduced loss mitigating practices during the experiment. These findings underscore the importance of understanding that retailers' business objectives are not centered on minimizing their food losses, but rather on monetary losses and that grocery cum vegetable store owners are relatively more unaware of their monetary losses as they do not give importance to vegetables. Therefore, tailoring interventions to emphasize the economic impact of food losses while customizing educational programs to address the factors that affect different types of retailers' decisions in adopting loss reduction strategies, is crucial to reduce tomato losses at the retail level.

Keywords: Information Provision, Monetary Loss, Supply Chain Actors, Social Experiment

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Insoluble Fiber Sources in Mash Diets for Broiler Starters (D1-21): The Impact on Growth Performance, Foregut Development, and the Utilization of Nutrients and Energy

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Even though insoluble fiber (IF) is considered a nutrient diluent in poultry diets, the potential of IF to improve gut health by developing the chicken foregut has been recognized. A 21-day experiment evaluated the effect of IF on growth performance, nutrient, and energy utilization, and foregut organ development of broiler starters fed mash diets. Four dietary treatments were developed with a control (a commercial broiler starter diet) and three experimental diets by diluting the control diet (60 g/kg [w/w]) with three IF sources (rice hulls [RH], lentil hulls [LH], and wood shavings [WS]). A total of 120, one-day-old broilers (6 birds/cage; 5 cages/treatment) were used in a completely randomized design. No difference ($P>0.05$) in growth performance parameters was observed up to d7. At d14, however, birds fed control and RH diets showed the lowest ($P<0.05$) feed conversion ratio (FCR; 1.079 and 1.129, respectively). Overall, birds fed the control diet had the highest body weight gain and lowest feed intake and, consequently, the lowest FCR ($P<0.05$; d1-21). Nevertheless, when corrected for the IF inclusion to consider the feed intake only, FCR was not affected by dietary treatments ($P>0.05$). Feeding RH and WS improved the crop weight (g/kg of body weight; $P<0.05$) compared to the control. By incorporating RH with the diet, the highest (19.2%; $P<0.05$) gizzard growth compared to the control (14.58 vs 12.23 g/kg of body weight) was achieved. Birds fed RH and LH had lower ($P<0.05$) gizzard pH (2.97 and 2.99, respectively) compared to those fed WS. Despite being considered a nutrient diluent, tested IF did not impair ($P>0.05$) the apparent metabolizable energy and apparent ileal protein and fat digestibility. With the highest improvement in gizzard growth and consequent low gizzard pH, 60 g RH/kg diet suggested the possible manipulation of RH as a functional ingredient in broiler starter diets.

Keywords: Broilers, Foregut, Gizzard, Insoluble Fiber, Rice Hulls

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Inter-Populational Variations in Salt Tolerance of Vigna Marina Seedlings

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Global climate change is the most significant problem for the future of agriculture. Soil salinity would be one of the major problems caused by climate change. Development of salinity-tolerant crops is one of the solutions for increased salinity. *Vigna marina*, a high salinity tolerant crop-wild relative, is an important genetic resource for improvement of *Vigna* crops. Studying inter-populational variation in *V. marina* is imperative for their conservation and utilization for crop improvement. In this study, inter-populational variation in salinity tolerance of seedlings of four different *V. marina* populations (Unawatuna, Mahamodara, Negombo, and Thalpe) was studied. Seedlings developed from seeds collected from above-mentioned populations (3 replicates with 4 seedlings) were grown under 100, 1000, 2000, 10000, and 20000 ppm NaCl concentrations and with distilled water (0 ppm NaCl), following standard salinity tolerance test procedures. The growth performances: leaf, stem, and root dry mass and seedling height of the seedlings were compared with the two commercialized varieties of *Vigna radiata.* The Leaf dry mass of *V. marina* at 100 ppm salinity was higher compared to that of distilled water treatment in each population and dry masses at each saline condition and in each population were significantly different (Leaf; $P<0.001$, stem; $P<0.001$, root; $P<0.001$). Negombo population showed the highest total dry mass in 20000 ppm and seedlings from each population survived at 20000 ppm salt concentration except those from Mahamodara population. It was shown that *V. marina* has inter-populational variation and different populations showed different levels of salinity tolerance. Thus, it is recommended to conserve many populations of *Vigna marina* to conserve the genetic variability. Furthermore, it can be concluded that *V. Marina* survived in high salinity levels better than the salt-tolerant variety of *V. radiata*, which gives evidence for the halophytic nature of *Vigna marina* and shows the potential of this species to be utilized for improvement of *Vigna* crop varieties.

Keywords: Climate Change, Crop Wild Relative, Food Security, Inter-Populational Variation, Salinity, *Vigna Marina*

Intraspecific Diversity of Elaeocarpus Montanus Thwaites in Sri Lanka, Based on Molecular Data

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Elaeocarpus montanus Thwaites (family Elaeocarpaceae) is a medium-sized tree with nearly globular, tinged red brown colour fruits confined to the montane forests of Sri Lanka. A recent morphometric study carried out on the genus *Elaeocarpus* in Sri Lanka, based on field collected samples, revealed morphological variations among populations within the species, recognizing three phenetic groups. Given its status as an endemic species classified as vulnerable on the IUCN Red List 2020, a comprehensive taxonomic study is imperative for the conservation of *E. montanus* in Sri Lanka. Hence, the current study was aimed to reassess the phenetic groups identified through morphometric analysis and to establish a phylogenetic framework for confirming the monophyly of *E. montanus*, employing molecular sequence data. Three specimens were collected from each population, representing the three phenetic groups. The genomic DNA extractions of fresh leaf samples were carried out using the modified CTAB method with an addition step of sorbitol pre-washing. The *trn*L-*trn*F, ITS, *matK* and *trnH-psbA* regions were PCR amplified and sequenced. Phylogenetic trees were constructed based on Maximum Parsimony method, along with model-based methods, Maximum Likelihood and Bayesian Analysis. *Elaeocarpus angustifolius* was used as the out group. Although the *E. montanus* was supported as a monophyletic taxon in all analyses, the populations within the species representing the three phenetic groups, even though resolved as separate clades, were weakly supported (Posterior Probability less than 0.005) and unresolved. The sequence diversity in the selected barcoding regions was not adequate (genetic distances less than 0.002) to support the phenetic grouping. Therefore, a detailed molecular analysis of populations is necessary to reveal the levels of population diversity, isolation and the taxonomic position of *E. montanus*.

Keywords: Conservation, Molecular Data, Phylogenetics, Population Level Sub-Structuring

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Mango in Sri Lankan Homegardens: How Predominant are they?

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Mango (*Mangifera indica* L.), is a fruit tree with significant importance in Sri Lanka, is cultivated both in orchards and homegardens. These homegardens, similar to secondary forests, host mango trees through natural regeneration or household interventions. Demanding minimal management, mango provides nutritional support and a valuable income source to households. They also contribute in carbon storing and offer various ecosystem services. The study was conducted through a survey which encompassed 435 homegardens across four districts in Sri Lanka representing 16 agro-ecological-regions. Mango tree diversity was assessed in terms of abundance, dominance, density and similarity to evaluate the prominence level of mango trees in the homegardens. Mango trees were observed in 85%, 59%, 87% and 60% of the homegardens respectively, in Hambantota, Jaffna, Matale, and Ratnapura districts accounting a total of 965 mango trees in 313 homegardens. This represents 25% of fruit trees recorded in homegardens. Average number of mango trees/homegarden ranged from two to five, where Hambantota district exhibiting the highest average. Mango trees were found as the second most prevalent plant species in homegardens in both Hambantota and Jaffna, while ranking at fourth and fifth prevalence levels in Matale and Ratnapura, respectively. The majority of mango trees (64%) were dominating the understory of homegardens. Compared to the other tree crops, mango demonstrated a higher density, occurrence, dominance, and similarity in Jaffna, attributed to lower species-richness and tree-abundance. Furthermore, above-ground biomass (AGB), diameter-breast-height, and basal-area of mango trees varied across the districts, thus contributing differently to total AGB. Overall, homegardens in Sri Lanka play a crucial role as vital reserves for population and diversity of mango trees, potentially preserving unique genotypes through the efforts of custodian farmers. Providing guidance on proper care and effective management practices for mango trees in homegardens can yield a range of economic and environmental benefits.

Keywords: Diversity, Dominance, Fruit, Homegarden, Mango
Acknowledgement: This research was funded by the Australian Center for International Research (ACIAR) project titled 'Developing food loss reduction pathways through smart business practices in mango and tomato value chains in Pakistan and Sri Lanka' in collaboration with University of Peradeniya and, National Science Foundation, Sri Lanka (NTRP/217/CC&ND/TA-04/P-02/01).

Microbiological Quality Assessment of the Poultry Broiler Starter Feed

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The poultry feed industry has grown as a large-scale industry in Sri Lanka. Amidst the growth in the industry, producing high quality and safety feed is important. Biological contaminants; bacteria and fungi are the key causes for feed deterioration, and diseases in poultry. Thus, this study aimed to investigate the microbiological quality of 32 broiler starter feed samples, considered to one feed brand, collected from eight feed distributors and their 24 feed-supplying farms in Kurunegala district. The samples were processed for detection of Enterobacteriaceae (ENT) count, aerobic plate count (APC), and *Salmonella spp* as per the ISO and SLS guidelines. Lacto Phenol Cotton Blue (LPCP) staining was performed to identify the fungi species. According to the EU safety levels, the ENT, APC, and moulds of poultry feed should be present below 300 cfu/g, 1.0×10^6 cfu/g, and 1.0×10^6 CFU/g respectively, and *Salmonella* should be absent as per both EU and ISO standards. The ENT of one sample at the distributor stage exceeded 300 CFU/g. None of the samples were positive for *Salmonella*. The APC varied between 4.3×10^3 and 1.9×10^5 CFU/g, giving the mean APC of 6.4×10^4 CFU/g and 1.3×10^5 CFU/g at distributor and farm levels. *Aspergillus spp*, *Penicillium spp*, and *Rhizopus spp* were identified from the cultured feed at the distributor stage and the count varied between 1.0×10^2 and $3.0\text{x}10^2$ CFU/g whereas *Mucor*, *Cladosporium spp*, and *Scopulariopsis spp*, were additionally identified from farm level feed samples, and count varied between 1.0×10^2 and 2.1×10^3 CFU/g. The TBC and the fungi count were significantly different ($P< 0.0001$ and $P=0.01$) at the farm stage. Although the TBC and the fungi count at the farm stage are within the safety levels, there is suggestive biological contamination. Further, the diversity of the moulds present in the feed samples indicates the environmental contamination of the processed feed.

Keywords: Poultry Broiler Starter Feed, *Salmonell*a, Enterobacteriaceae, Aerobic Plate Count (APC), Moulds

Modified Low-Cost Growth Medium for Spirulina Platensis using Cow Dung Tea

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Spirulina platensis, a filamentous cyanobacterium, has garnered attention for its nutritional and potential health benefits. It has been utilized in the food, pharmaceutical, and cosmetic industries as well as in high-value products. While Zarrouk's medium is commonly used as the standard medium for *Spirulina* cultivation, its large-scale adoption is hindered by higher procurement expenses. This study aimed to develop a low-cost medium using cow dung tea for cultivating *S. platensis* biomass, derived from the anaerobic digestion of cow dung which comprises essential nutrients for *S. platensis* growth. *Spirulina platensis* was cultivated in 20 g/1L cow dung tea medium with sodium bicarbonate, sodium chloride, and urea in four different concentrations, prepared by adjusting the nitrogen sources, with three replicates (medium B, D, E, F). The algae were grown 24 hrs under illumination (3000 lux CFL bulb), and the temperature was maintained at 25±2°C inside the culture unit, with continuous shaking using an orbital shaker. Growth was monitored for 20 days, with optical density readings taken every three days at 680 nm, and chlorophyll concentration and dry weight measured every five days. Nutrient uptake (nitrogen, phosphorus) and physicochemical parameters (pH, conductivity) were also recorded to track *S. platensis* growth. Normally distributed growth data were analyzed using one-way ANOVA. After a 15-day culture period, it was found that a 50 ml jar containing 20 g/1L cow dung tea medium supplemented with 0.4 g sodium bicarbonate, 0.25 g sodium chloride, 0.01 g urea fertilizer, and 0.05 ml micronutrients (medium E) was the best low-cost alternative medium out of the four tested mediums for *Spirulina platensis*, exhibiting maximum specific growth rate (μ=4.5774 ± 0.5813), dry weight (5.036±0.405g/L), total biomass (316.307mg/L), and chlorophyll 'a' content (5.441 ± 0.26µg/ml), respectively, under laboratory conditions. It is 4.8 times more profitable and yields higher compared to Zarrouk's medium.

Keywords: Spirulina Platensis, Anaerobic Digestion, Cow Dung Tea Medium, Zarrouk's Medium

Acknowledgement, We are grateful for the invaluable support of NIFS, Kandy, including access to their laboratory facilities and the assistance of the NIFS staff.

Molecular Characterization of Neopestalotiopsis Species Associated with Camellia Sinensis from Selected Tea Plantations in Sri Lanka

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Tea [*Camellia sinensis* (L.) O. Kuntze] is an important commercial crop cultivated in many countries such as China, India, Sri Lanka and Kenya to produce the renowned beverage called "tea". Immature leaves and buds are utilized in the production of tea and hence it is vital to maintain health of the tea foliage to maintain optimal quality and quantity of tea yield. "Gray blight" is a destructive fungal disease caused by *Pestalotiopsis*-like taxa, affecting tea leaves. In this study, several *Pestalotiopsis*-like taxa were isolated from tea leaves exhibiting gray blight symptoms from the major tea cultivation zones of Sri Lanka including Southern, Uva, Central and Sabaragamuwa provinces. The genetic diversity of the isolates initially identified as *Neopestalotiopsis* spp., based on morphology and internal transcribed spacer 1, 5.8S and the internal transcribed spacer 2 of the ribosomal RNA gene cluster (ITS) sequence data were assessed by multigene phylogenetic analysis of the specific gene regions ITS, partial sequences of β-tubulin (*TUB2*) and translation elongation factor 1-α (*TEF1-α*). Results revealed that *Neopestalotiopsis clavispora, N. petila, N. saprophytica, N. hydeana* and *N. surinamensis* distributed over eight tea plantation sites in Sri Lanka. However, phylogenetic identification of some fungal isolates remained ambiguous due to unstable topology of the multigene phylogram of this genus. In pathogenicity assays, all of these species induced typical gray blight lesions on artificially inoculated tea leaves confirming Koch's postulate. Among the identified isolates, only *N. clavispora* has been recorded previously as a gray blight associated fungal pathogen in *C. sinensis* globally, yet not within Sri Lanka. Also, this study confirmed that the cause of gray blight disease is not confined to a single pathogenic fungal species, but rather a complex of fungi.

Keywords: Gray Blight, Pathogenicity Testing, Pestaloid Fungi, Sporocadaceae

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Molecular Detection of Mycoplasma Gallisepticum and Mycoplasma Synoviae using SYBR Green based Quantitative PCR Assay in Selected Live Bird Markets Located in Western, Central and North Western Province in Sri Lanka

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Mycoplasma gallisepticum (MG) and *Mycoplasma synoviae* (MS) are one of the key avian pathogens that exclusively infect the poultry industry globally. Infected chickens exhibit a wide range of respiratory symptoms and lead to considerable economic losses due to poor productivity, reduced egg production, carcass condemnation and decreased feed efficiently, all of which increase production cost. Rapid and accurate diagnostic methods are essential for preventing and controlling Mycoplasmosis more effectively. This study aimed to develop and optimize a convenient and rapid SYBR Green-based quantitative PCR (qPCR) assay for accurate and efficient detection of MG and MS in poultry. Previously published primers targeting the *16s rRNA* gene were utilized to detect the presence of *Mycoplasma* spp. Additionally, species specific primers targeting the *mgc2* gene and *vlhA* gene were used to detect MG and MS, respectively. Melt curve analysis were deployed to assess the specificity and accuracy of the developed assays. The melting temperatures of the amplicons for *Mycoplasma*, MG and MS were determined to be 82°C, 77.5°C and 79 °C, respectively and detected as a single melt peak without cross reaction with other non-targeted pathogenic agents. Developed assays were used to detect the prevalence of DNA originated from MG, and MS in selected poultry live markets located at the Central, Western, and Northwestern provinces in Sri Lanka. Out of 300 tracheal swabs collected from live bird markets, revealed 36.66% (110/300) *Mycoplasma* spp. Prevalence level across the study areas. Out of the positive samples, MG was present in 81.81% (90/110) whilst MS present only in 18.18% (20/110) indicating MG infections were common in selected live bird markets. The developed assays can be utilized for rapid detection of Mycoplasmosis in poultry that could assist controlling the disease at early stages. Further, reported prevalence of Mycoplasmosis in selected live bird markets in Sri Lanka warrant further studies and regulations to control the disease.

Keywords: *Mycoplasma Gallisepticum* (MG), *Mycoplasma Synoviae* (MS), Quantitative PCR, SYBR Green, Prevalence

Newly Developed Leaves of Two Pioneer Seedling Species; Macaranga Peltata and Neolitsea Cassia Exhibit Thermal Acclimation of Photosynthesis to Increased Average Growth Temperature

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Photosynthesis is amongst the plant physiological processes that is highly sensitive to temperature. Hence understanding the photosynthetic potential to acclimate to rising temperatures is crucial for determining the fitness of a plant species to a given environment. Pioneer tree seedlings commonly used for the restoration of degraded lands often experience high temperature conditions; however, their ability to acclimate photosynthesis to rising temperatures remains poorly understood. Thus, in this study two pioneer seedling species, namely, *Macaranga 222otmail* (*Kenda*) and *Neolitsea cassia* (*Dawul Kurundu*), were established in two thermal environments: 24.5±0.1 °C and 28.0±0.2 °C, at field capacity (FC) for 6 months and newly developed fully expanded leaves were used to determine temperature response of light saturated net photosynthesis (A_{sat}) at 20-35 °C leaf temperature range. Then using A_{sat}-T curves, through a model fitting procedure optimum temperature (T_{opt}) for photosynthesis under the two thermal environments was determined for each species. The results revealed a significant increase ($p<0.05$) in the optimal temperature for photosynthesis (T_{opt}) when the average growth temperature was increased from 24.5±0.1 °C to 28.0±0.2 °C in both species. Further, A_{sat} of *M. 222otmail* at T_{opt} significantly increased ($p<0.05$), with rising average temperature in the growth environment, while it remained unchanged in *N. cassia*. Furthermore, the Leaf Mass per Area (LMA) of both species did not show a significant increase under the rising growth temperature. These findings demonstrate that seedlings of both *N. cassia* and *M. 222otmail* can successfully acclimate their leaf photosynthesis to increased average growth temperatures hence using both these species with high temperature optima can increase the success rate of reforestation and habitat restoration efforts.

Keywords: Photosynthesis, Temperature, Thermal Acclimation, Pioneer Species

Phenolic Content and Antioxidant Activities of Underutilized Dioscorea Yams in Sri Lanka

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Many populations around the world consider yams as a component of the staple diet but, in Sri Lanka, yams especially those of the *Dioscorea* species are underutilized. Yams offer variety to the diet in addition to nutrients and non-nutrient bioactive components. They provide enormous health benefits such as antioxidative, hypoglycemic, hypocholesterolemic, antimicrobial and immunomodulatory activities attributed to bioactive constituents like phenolic compounds, and saponins among others. The aim of the present study was to investigate soluble phenolic contents and their antioxidant activities of fifteen yams belonging to *Dioscorea alata, Dioscorea esculenta* and *Dioscorea bulbifera* that are locally available in Sri Lanka. The soluble phenolic extracts were analyzed for their total phenolic content (TPC), 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging activity (DRSA), Trolox equivalent antioxidant capacity (TEAC), Reducing power (RP) and Ferrous ion chelating activity (FICA). Among the yams studied, *Ledhantha (Dioscorea alata)* showed the highest TPC (9.00±0.23 mg/g GAE) ($p=0.001$) whereas *Hingurala (Dioscorea alata)* (0.22±0.03 mg/g GAE) and *Angiliala (Dioscorea alata)* (0.37±0.02 mg/g GAE) ($p=0.449$) showed the least. *Ledhantha (Dioscorea alata)* showed the highest antioxidant activities as per DRSA (26.23±0.58 mg/g TE), TEAC (11.33±4.27 mg/g TE) and RP (19.06±0.08 mg/g AAE) whereas *Jamburala (Dioscorea alata)* showed the highest FICA (6.83±0.23 mg/g EE). Recognizing the health-promoting effects of these yams, as evidenced by their phenolic content and antioxidant activities, is crucial for advocating the optimal utilization of these currently underutilized yams varieties.

Keywords: *Dioscorea* species, DPPH, RP, Soluble phenolics, TEAC

Phylogenetic Associations of Virulence and Antibiotic Resistance of Uropathogenic Escherichia coli from Humans and Dogs

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Urinary tract infections (UTIs) caused by multi-drug resistant (MDR) uropathogenic *Escherichia coli* (UPEC) is a significant health concern. The pathogenicity of UPEC is mediated through plasmid mediated virulence factors which coexist with antimicrobial resistant genes. The association of virulence factors and antimicrobial resistance with the phylogenetic background of *E. coli* isolated from humans and dogs was evaluated in this study. A total of 65 isolates confirmed *as E. coli by* PCR (human=55, canine=10) were included in the study. Antibiotic susceptibility to 12 antibiotics was determined following EUCAST guidelines. Virulence properties (haemolytic activity, serum resistance, curli fimbriae expression) were assessed using standard procedures, and phylogroups and presence of plasmid-mediated virulence genes, (*traT*, *cvaC*, and *cdtB*) were determined by PCR. Phylogenetic analysis revealed 57% of isolates in phylogroup B2, 22% in group E, 12% in group A, and 9.2% in group B1. Phylogroups A, B1, and B2 exhibited over 50% MDR, while only 36% in group E were MDR. Phylogroup-specific antibiotic resistance patterns were observed, with notable resistance rates in phylogroup B1 to clavulanate amoxicillin (83%), B2 to quinolones (86%), and A to trimethoprim-sulfamethoxazole (75%). Serum resistance varied among phylogroups (100%-67%), with all phylogroup A isolates being serum resistant. Hemolysin ability was seen in 26% of isolates, notably higher in phylogroup A. Curli fimbriae expression was prevalent in B2 (89%), B1 (83%), E (71%), and A (69%). The dominant gene was *traT*, present in over 86% of B2, E, and B1 isolates. *CvaC* was detected in 4.6% of isolates, while *cdtB* was absent in all isolates. Antibiotic resistance showed a link to phylogroups and virulence-related factors; serum resistance, curli fimbriae, and *traT* gene were common in all isolates but high among B2. Further studies with more isolates and other virulent factors are needed to depict the association.

Keywords: *E. coli*, virulence, antibiotic resistance, phylogeny, UPEC

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Phylogenetics Assessment of Two Unidentified Species of Capparis L. in Sri Lanka

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Capparis L. is a highly diverse genus that has spread across the Old World and belongs to the family Capparaceae. The genus is notable for its nutritional and medicinal values. However, the phylogenetic relationships of most *Capparis* species remain questionable. According to the Revised Handbook to the Flora of Ceylon (1980), ten *Capparis* species are recorded in Sri Lanka. They are locally known as *Kaluwellangiriya*, *Wellangiriya*, *Waldehi* (Sinhala), *Adonai* (Tamil), and Capper (English). Encountering of different morph groups questions the proper identification of the Sri Lankan species. The present study was initiated to address this gap. Morphological and molecular analyses were performed for five *Capparis* samples found in Sri Lanka, including *C. zeylanica, C. brevispina, Kaluwellangiriya 2* (from Royal Botanical Gardens-Peradeniya), *C. moonii* (from Ritigala), and *Kaluwellangiriya 1* (from Kiribathkumbura). The chloroplast gene, *mat*K, was used for molecular phylogenetic analysis. Maximum likelihood and Bayesian inference were performed with IQTree and MrBayes, respectively along with five sequences from NCBI nucleotide database. Nineteen vegetative characters were used in a morphometric analysis where a Cluster Analysis (CA) and Principal Component Analysis (PCA) were performed, using PAST4.03. Both CA and PCA analyses gave consistent results. Morphological and molecular clustering were congruent for *C. zeylanica*, and *C. brevispina*. The dendrogram clustered *C. moonii* with *Kaluwellangiriya 2* while *Kaluwellangiriya 1* stood apart. In contrast, in the molecular analysis, *C. moonii* and *Kaluwellangiriya 1* formed a clade. Inconsistencies were observed in the *mat*K sequences of *C. moonii* generated for this study from Ritigala, Sri Lanka and the NCBI nucleotide database. This may be due to false identification of the locally collected specimen. In conclusion, the results of this study suggest that *Kaluwellangiriya 1* and *Kaluwellangiriya 2* may represent new or previously undocumented species in Sri Lanka. Further studies are recommended for the precise identification of these species.

Keywords: *Capparis* Spp., DNA Barcoding, *Mat*k, Phylogenetics

Preliminary Study on Presence of Cyanotoxins in Relation to the Annual Variation of Water Quality Parameters in Natural Water Resources in Padaviya, Sri Lanka

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Microcystins (MCs) are toxins produced by freshwater cyanobacteria that cause liver and kidney damage. They are suspected causative agents of chronic kidney disease of unknown etiology (CKDu) which is highly prevalent in the North Central Province of Sri Lanka, including Padaviya. We studied the influence of water quality parameters on levels of (MCs). We measured levels of MCs using indirect competitive ELISA and water quality parameters (Ammonium (NH_4^+), pH, Chloride (Cl^-), Nitrate (NO_3^-), Conductivity, and Dissolved Oxygen (DO)) using ion selective electrodes in three reservoirs and 13 dug-wells across six Grama-niladhari divisions in Padaviya during the two main agricultural seasons: Yala (May–August) and Maha (September–March) in 2022-2023. Sampling was conducted in the months of December, March (Maha) and June, August, (Yala). All MCs levels were under the WHO limit of 1 ppb. Most water sources had MCs concentration below our detection limit of 0.35 ppb, except in certain location during March (Padaviya reservoir 0.64 ppb; six wells, 0.40 to 0.46 ppb). Mean NH_4^+ levels were higher during Maha (1.96 ± 2.13 mg/L) than Yala (0.82 ± 1.79 mg/L) only three wells showed NH_4^+ levels below the WHO limit of 0.2 mg/L during Maha. NH_4^+ levels showed a broad range in both Maha (0.08 to 6.8 mg/L) and Yala (0.15 to 7.25 mg/L). The pH values were well within the WHO standard (6.5 – 8.5 pH) except in Padaviya reservoir (9.04 ± 0.23 pH) during August. Cl^- (2 to 166 mg/L) and NO_3^- (0.9 to 32 mg/L) levels were below WHO limits of 250 mg/L and 50 mg/L, respectively. Conductivity was higher during Yala (88 to 605 µS/cm) than in Maha (179 to 894 µS/cm), exceeding the WHO limit of 750 µS/cm in some wells. DO levels ranged from 4.6 to 9.7 mg/L. High levels of NH_4^+ may promote growth of cyanobacteria resulting in the higher levels of MCs seen during March. Quantifying cyanobacteria and studying ecological factors will help in determining the factors that cause cyanobacteria blooms.

Key words: Microcystins, Water Quality Parameters, Padaviya, Yala and Maha
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Prevalence and Predictors of Food Insecurity among Undergraduate Students Residing on Campus: A Case Study at University of Peradeniya, Sri Lanka

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The current study aimed to assess the prevalence and predictors of food insecurity and to determine the association between dietary and nutritional factors with food security among undergraduate students residing on campus at the University of Peradeniya. The study sample consists of 600 undergraduates representing the nine faculties of the University. Socio-demographic data, food security (8-item Food Insecurity Experience Scale Survey Module), and dietary diversity (developed by the FAO/Nutrition and Consumer Protection Division -May 2007 version) were assessed using an interviewer-guided questionnaire. Height and weight measurements were obtained through calibrated scales to calculate BMI, and body fat percentage was assessed using a bioelectrical impedance analyzer. Covariate-adjusted multivariate linear regression was employed to identify significant predictors of food security, while Pearson's correlation analyses explored the association of food security with dietary diversity and nutritional status. The overall prevalence of food insecurity was 44.1%, with 29.8% experiencing moderate food insecurity and 14.3% facing severe food insecurity. The mean food insecurity score, dietary diversity score, and fat% were 3.23 ± 2.58, 7.07 ± 1.71, and 23.43 ± 7.99%, respectively. The mean BMI of the sample was 20.92 ± 3.7 with 27% underweight students. The faculty of study, ethnicity, frequency of home visits, and alcohol consumption were identified as significant ($p<0.05$) predictors of food insecurity. There is a significant negative correlation (coefficient = -0.212, $p<0.05$) between the total food insecurity score and participants' dietary diversity. Further, a significant negative correlation (coefficient = -0.089, $p<0.05$) was identified between food insecurity total score and participants' BMI. However, there was no significant association ($p>0.05$) between the total food insecurity score and the fat percentages of the undergraduates. This study underscores the vulnerability of university undergraduates as a group to food insecurity, emphasizing the need for corrective actions to enhance food security in this population.

Keywords: Food insecurity, Dietary diversity, Nutritional status, University of Peradeniya

This work was funded by the University Research Grant Year 2023, University of Peradeniya (URG/2023/02/Ag).

Simulation of Rice Yield Response for Nitrogen Fertilizer Application across Diverse Agro-Climatic Zones in Sri Lanka: An Analysis using Agricultural Production System sIMulator (APSIM)

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Rice yields vary significantly across agro-climatic zones (ACZs) in Sri Lanka. Understanding rice yield response to nitrogen (N) across ACZs is crucial for optimizing fertilizer application. This study employs APSIM-ORYZA 7.9 as the crop model to simulate rice yields for varying N applications and uses Mitscherlich-Baule yield response functions in the form of y = a+ b[1- exp (k*N)]. Weather data for 1992-2022, soil characteristics, crop management data, genetic coefficients of widely cultivated rice variety, *Bg* 356, and urea as the N source were used for modelling. APSIM model was already validated in Sri Lanka. The model accuracy was further evaluated with Department of Census and Statistics yield data, using Relative Root Mean Square Error (RRMSE). Rice yields for varying N levels were generated for Dry zone Low country (DL), Intermediate zone Low country (IL), Intermediate zone Mid country (IM), Intermediate zone Up country (IU), Wet zone Low country (WL), Wet zone Mid country (WM), and Wet zone Up country (WU). Since DL exhibits a significant variability in rice yields it was sub-divided into three separate zones namely DL1 (for areas with yield <3600 kg/ha), DL2 (areas with a rice yield of 3600-4300 kg/ha), and DL3 (areas with yield > 4300 kg/ha) Statistical evaluation for model accuracy resulted in RRMSE of 16% and R^2 of 98%. The estimated coefficients of the production function are statistically significant ($P \leq 0.05$). The order of regions concerning the highest to lowest yield response to N application is DL3> DL1> IM> DL2> IL> IU> WL> WM> WU. It Ranges 37.27-21.31 kg of rice per kg of urea. During drought conditions, the order of regions shifted to DL3> IM> DL1> IL> DL2> IU> WL> WM> WU emphasizing the importance of tailored interventions in fertilizer application in Sri Lanka based on its yield response to N.

Keywords: Urea, Modelling, Production Function, Rice

Sustainable Urban Development through Zfarming: Exploring Opportunities and Challenges in Sri Lanka

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The integration of green urban architecture with food production, termed Zfarming, presents a promising strategy for addressing food security and sustainability challenges within Sri Lankan urban agriculture. This study examines the potential role of Zfarming by assessing its advantages and drawbacks. Through the analysis of 32 international documents, it becomes apparent that Zfarming performs multiple functions, producing both food and non-food items that exert positive impacts on urban environments. Notably, Zfarming contributes to environmental conservation by preserving resources, reducing waste, and minimizing food transportation distances, thereby aligning with Sri Lanka's environmental preservation objectives. From a social perspective, Zfarming enhances community food security, offers educational opportunities, and strengthens connections between consumers and food production, which is particularly pertinent to Sri Lanka's close-knit communities. Economically, Zfarming offers benefits by potentially generating public advantages, such as job creation and increased local economic activity, and producing marketable products that are vital for Sri Lanka's economic development. However, the implementation of Zfarming in Sri Lanka encounters several challenges. Although certain technologies are available, adapting them to local contexts and integrating them into existing infrastructure remains problematic. Additionally, high initial investment costs and concerns regarding exclusivity and social acceptance necessitate careful consideration. Despite these obstacles, evidence from international case studies indicates that Zfarming can address specific issues relevant to Sri Lanka, such as urban food production and the need for sustainable water and waste management practices. Effective management, tailored to the local context, is crucial for the successful implementation of ZFarming. Ultimately, while ZFarming shows significant promise for enhancing food production and urban sustainability in Sri Lanka, its successful implementation requires meticulous management and contextual adaptation to achieve its full potential.

Keywords: Food security, Sri Lanka, Sustainability, Urban Architecture, Zfarming

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The Effect of Improved Ration on Body Condition, Metabolic Profile, and Reproductive Performance in Severely Emaciated Crossbred Dairy Cows

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Severely emaciated dairy cows typically fall at 1 on a 1 to 5 body condition score (BCS) scale. Malnutrition leads to emaciation in dairy cows, resulting in poor reproductive performance. This study assessed the effect of feeding a nutritious ration on the BCS, serum non-esterified fatty acids (NEFA), and reproductive performance of dairy cows. Twenty severely emaciated crossbred (Friesian x Jersey) dairy cows, between 150 to 180 days post-partum, were fed *ad-libitum* with a mixed ration containing 13.79% crude protein (CP) and 4.79 MJ/kg metabolizable energy (ME). The ration included guinea grass (*Megathyrsus maximus*), commercial concentrates, bypass fat, and a vitamin and mineral pre-mixture (50 g/d). Body weight (BW), BCS, and ovary size, measured by per rectal examination, were recorded at the start of the experiment (day 1) and on days 14, 30, 60, and 90, until pregnancy was confirmed. Blood samples collected on the same days were analyzed for NEFA levels. When cows reached a BCS of 2.5 and ovary diameter exceeded 2.5 cm, they were synchronized using the Ovsynch protocol. Pregnancy status was diagnosed by ultrasound scanning on the 40th day post-insemination. At day 1, the BW, BCS, and NEFA levels were 392 kg, 1.05, and 0.57 mmol/L, respectively. Data were analyzed by analysis of variance and Duncan's Multiple Range Test. In response to the mixed ration, the BW and BCS improved ($P<0.05$), reaching 451 kg and 2.50 at day 60. The NEFA levels, ranging from 0.38 to 0.20 mmol/L from 14 to 90 days, indicated that the cows achieved a positive energy balance as early as 14 days after starting the mixed ration. Additionally, the ovarian thickness of both ovaries gradually increased during this period. The conception rate was 60% after the first AI, and 95% of cows were pregnant by 125 days after the third AI. The results indicate that severely emaciated dairy cows suffering from negative energy balance can achieve a positive energy balance and conceive by feeding a ration containing 13.79% CP and 4.79 MJ/kg ME.

Keywords: Conception Rate, NEFA, Ovsynch Protocol, Ovary Diameter
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The Impact of Green Supply Chain Management Practices on Sustainability Performance of Retail Firms in Sri Lanka

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This study investigates the impact of green supply chain management (GSCM) practices on the sustainable performance of retail firms in Sri Lanka addressing the dearth of empirical evidence in the context of the retail sector compared to the manufacturing sector of Sri Lanka. This study aims to explore the impact of six dimensions of GSCM practices on sustainability performance in the retail firms of Sri Lanka. The literature review was done through the systematic literature review process. This relationship between GSCM practices and sustainability performance is tested using the deductive approach of positivism philosophy under the quantitative methodology. The population of the study is all the retail organizations that have already implemented and considered the possibilities of implementing GSCM practices in the retail sector of Sri Lanka. The absence of retail industry statistics in Sri Lanka resulted in an unknown population. Therefore, the sample was identified as 170 based on the Sample-to-item ratio. The sample of the study was selected using the random sample technique. The collected data, from the managers and above personalities in supply chain management of retail organizations in Sri Lanka, was analyzed using multiple regression analysis with the aid of SPSS 21. The findings show that green production, green marketing, green logistics, customer cooperation, and investment recovery are directly affecting to the improvement of sustainability performance of retail firms in Sri Lanka while green purchasing is not making an impact on sustainability performance. Findings suggests that GSCM practices enhance operational performance while also minimizing environmental emissions, waste, and accidents. Further, the critical insights of the findings lead the managers to prioritize the GSCM practices with the re-evaluation of their purchasing strategies and provide a roadmap for the UN's SDGs. The findings of the study contribute to the literature on ESG practices and the Triple Bottom Line.

Keywords: Green practices, Green Supply chain management, Retail Firms, Sustainability performance

The Poultry Industry in Crisis: Effect of COVID-19 and Economic Downturn on the Broiler Sector in Western and North Western Provinces in Sri Lanka

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The poultry industry in Sri Lanka is composed of broiler, layer, and backyard sectors. The broiler sector takes precedence because it provides nutritional and economic security to people as an affordable protein source and a provider of employment opportunities. However, the sector faced a severe crisis due to the COVID-19 pandemic and the subsequent economic downturn in the country. Therefore, this study aims to analyse how the above crises affected the operation of the boiler sector from March 2020 to December 2023. The study was qualitative, thus semi-structured interviews were used to gather data. The sample comprised forty-two participants including farmers, veterinarians and consumers engaged in broiler farming selected through convenience sampling from Western and North Western provinces where poultry density is the highest. There were no regional differences in the broiler operations of the above two provinces. The responses were audio-recorded, transcribed, and analysed using critical content analysis. The findings revealed disruptions in the broiler supply chain, characterized by supply shortages in feed, medicine and labour, fluctuating demand for broiler meat, and logistical constraints. Lockdown measures and travel restrictions hindered the transportation of feed, chicks, and meat, exacerbating production challenges and causing significant losses for farmers. In addition, the closure of restaurants and hotels had shrunk the demand for broiler meat, further exacerbating the crisis. The economic downturn aggravated these challenges, with rising feed costs, currency depreciation, and reduced purchasing power among consumers. Small and medium-scale producers who were deprived of financial reserves and access to credit faced the threat of bankruptcy and loss of livelihood. The study highlights the need for policy interventions to mitigate the crisis and improve the resilience of broiler farmers as a means of recovery from the impacts of the pandemic and the economic downturn to ensure the sustainability of the poultry industry.

Keywords: Poultry, Broiler, COVID-19, Economic Downturn

Utilization of Eggshell Waste as a Calcium Source and Investigation of Its Physicochemical Properties

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The food industry generates a large amount of eggshell waste, offering an opportunity for converting eggshells to eggshell powder. It helps to minimize the generated waste and increase the effective utilization of eggshell powder as an alternative source for commercially available food-grade calcium carbonate (CACC). This study aims to investigate the physicochemical properties of two types of eggshell powder samples: eggshell powder with eggshell membrane (WM) and eggshell powder without eggshell membrane (NM) and to select the most significant sample for CACC. A sieve analysis was conducted for WM and NM samples separately. Based on the sieve size, three samples from both WM and NM samples (WM-40 µm, WM-100 µm, WM-150 µm, NM-40 µm, NM-100 µm, and NM-150 µm) were taken and compared with the CACC for purity and particle size. The physicochemical properties of the most significant sample were analyzed. Based on the cumulative passing percentages, 50% of the particles of WM were less than 150 µm, while it was less than 100 µm in NM. The percentage of particles passed through the 40 µm sieve size was higher in NM than in WM resulting in a 14% over 11.2%. Purities of WM-40 µm, WM-100 µm, WM-150 µm, NM-40 µm, NM-100 µm, and NM-150 µm in terms of calcium carbonate were 97.67±1.53%, 97.33±0.58%, 96.33±0.58%, 98.67±0.58%, 98.00±1.00%, and 97.67±1.15% respectively. NM-40 µm was selected as the most significant sample based on the purity, particle size, and yield. The moisture content, bulk density, whiteness index, and mean particle size of NM-40 µm were 1.56±0.04%, 0.80±0.02 g/ml, 95.48±0.76, and 16.8 µm respectively which were not significantly different (p>0.05) from CACC. Based on physicochemical properties, NM-40 µm can be used as an alternative to CACC.

Keywords: Eggshells, Calcium Carbonate, Purity, Particle Size

Variation of Avifaunal Composition along an Urbanization Gradient in the Kandy Region, Sri Lanka

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Analysing fauna in ecosystems along urbanization gradients to investigate its effects on biodiversity is a fundamental pursuit of conservation research. The present study was carried out in three closely located, however, environmentally different sites, *viz.* Udawattakele Forest, Talwatta suburb and Kandy downtown, aiming to understand the impact of urbanization on local avifauna through quantitative investigation of its variation in selected ecosystems representing an urbanization gradient. These sites contained 2, 613, and 15,092 buildings per 1 km^2 respectively, harbouring 62, 2,981, and 324,074 people daily, indicating an increase in urbanization level from Udawattakele to Talwatta to Kandy. Sampling was carried out weekly from May to December 2023 using encounter transect method along two-kilometre transects in each ecosystem. The highest species richness was recorded from Udawattakele (S=69; Simpson 1-D=0.89), suggestive of the possession of the highest number of niches. Talwatta recorded the highest diversity (S=58; 1-D=0.94) with a rich, evenly abundant bird community, indicative of gaining of benefits from both natural and artificial resources. Kandy downtown showed the least diverse community with the lowest species richness, however, with the highest number of individuals (S=14; 1-D=0.67). Based on Bray-Curtis Dissimilarity, Udawattakele and Talwatta were 72.92% dissimilar in avifaunal composition, while Kandy downtown was 94.84% dissimilar to them. Udawattakele and Talwatta housed four endangered (EN) species each, and three and one vulnerable (VU) species respectively, showing 67.63% dissimilarity in threatened species composition. Among these, one EN and three VU species from Udawattakele were endemic, while one EN species from Talwatta was endemic. Udawattakele showed a percentage endemism of 38.2% while Talwatta showed 26.5%, indicating 65.29% dissimilarity. Udawattekele and Talwatta attracted nine and seven migratory species respectively (73.00% dissimilarity), while Kandy downtown attracted one (89.33% dissimilarity). The study showed the importance of planning developmental activities sustainably in conserving local avifaunal diversity.

Keywords: Birds, Diversity, Endemic, Migratory, Threatened, Udawattakele

Virulent and Avirulent Ralstonia solanacearum Population Density in a Potato Grown Field, Applied with Five Types of Soil Amendments for Three Consecutive Growth Seasons

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Bacterial wilt caused by *Ralstonia solanacearum*, poses a significant threat to potato cultivation; hence reducing pathogenic soil bacterial density is a strategic management approach. This study evaluated the effect of five locally-available soil amendments on reducing the density of *R. solanacearum* in a potato-growing field subjected to the application of the amendments for three consecutive seasons. Half-burn paddy husk, rice husk biochar, and radish and mustard plant residues were used as soil amendments and each was applied at a rate of 2 kg/m^2 on fresh weight basis. A previously identified effective soil amendment comprised of fresh wild sunflower leaves *(Tithonia diversifolia)* at 2 kg/m^2, urea (20 g/m^2) and CaO (200 g/m^2) and soil without any amendment (untreated control) were used for comparison. Potato (var. Granola) was planted two weeks after the incorporation of soil amendments. The treatments were laid out as a randomized block design with three replicates. Soil samples were collected five times over the cultivation season (i.e., before incorporation of the amendments, at the time of planting, and one, two- and three-months post-planting). Samples were cultured on TZC medium by the dilution plate technique and the density (cfu/g of soil) of the virulent and avirulent *R. Solanacearum* was quantified based on colony morphology. Over the growth period, virulent *R. solanacearum* population density was significantly reduced ($P<0.0001$) by rice husk biochar, *Thithonia* + Urea + CaO and radish and mustard plant residue treatments compared to the soil not treated with any amendment, exhibiting no significant difference among the four treatments. Percentage avirulent *R. Solanacearum* count was significantly ($P<0.0001$) higher in soil treated with radish and mustard residues (i.e. 86.5% and 81.2%, respectively) and *Thithonia* + Urea + CaO (i.e. 73.3%) treatments. Results revealed the potential of reducing pathogenic soil *R. solanacearum* density by repeated application of above three treatments.

Keywords: Bacterial Wilt, Half-Burn Paddy Husk, Mustard Residues, Radish Residues, Rice Husk Bio Char

Water Smart Climate Change Strategies are the Need of the Hour: A Policy Brief

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Water scarcity resides at the forefront of climate change. Paris Agreement acknowledges a clear trade-off between climate change and water conservation. Climate policies should be developed to address the rise in water scarcity and the deterioration of water quality due to climate change. A participatory approach is vital for promoting water retention in forests and farm fields, harvesting rainwater, protection of water catchments, erosion control, pollution control, and reduction of runoff which are integral parts of a systems approach. Nature-based resilient vegetation will be an ideal solution for smallholder farmers living where there is adequate rain but insufficient surface water bodies; in addition to rooftop rainwater harvesting systems already in the country. Hence climate policies that promote the conservation of water resources through human activities should be given the utmost priority. The approach of directing excess water through rainwater harvesting to infiltration pits surrounded by natural vegetative ecosystems is a nature-based human-mediated solution for increasing soil moisture retention, maximizing infiltration, and minimizing surface run-off. Arjun (*Kumbuk* – local name) tree (*Terminalia arjuna*) can be introduced as a nature-based resilient vegetation as it protects water catchment areas. This nature-based solution is unique to ecosystems, limiting its replicability. Therefore, countries should apply nature-based solutions with native plants available in their ecosystems. Plant type and structural characteristics, hydrological significance, root strength characteristics, ecological significance, and economic value, are considered in selecting respective species for the region. The synergy between water conservation and climate change mitigation and adaptation has been a neglected topic in climate change policymaking. Most of the policies leave space for a trade-off between water and climate change rather than considering the synergy between these two vital areas that will determine our future. A strong message must be conveyed to Sri Lankan policymakers and practitioners to take cognizance of this reality when formulating climate change policies and implementing them.

Keywords: Arjun Tree, Nature-Based Resilient, Vegetation, Water Scarcity

Zircon-Modified Polyaniline Composite for Aluminium Removal in Water

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Aluminium contamination in water can occur through various pathways including water treatment processes such as alum treatment and electrocoagulation techniques, significantly impacting both the environment and human health. This study introduces the novel composite, Zircon-Polyaniline ($ZrSiO_4$/PANI) for effective adsorption of aluminum ions. $ZrSiO_4$/PANI, synthesized through oxidative polymerization method, involves coating polyaniline onto the $ZrSiO_4$ surface. Characterization via Scanning Electron Microscopy (SEM), Fourier Transform Infrared (FTIR), and Cyclic Voltammetry (CV) revealed the composite's structural and electrochemical properties. Adsorption of aluminium onto the composite surface was confirmed through 6.6% of aluminium in SEM elemental analysis. Two characteristic peaks were obtained for cyclic voltammetry of polyaniline. Redox peaks of iron impurity were observed in cyclic voltammetry of zircon. Zr-O and Si-O stretch peaks were apparent around $600cm^{-1}$ and $900cm^{-1}$ in the FTIR spectrum. The C=C stretch at $1506cm^{-1}$ verifies polyaniline coating while intensified Al-O-H stretch at $3416cm^{-1}$ signifies the adsorption of aluminium. Batch experiments explored the adsorption dynamics, examining contact time, Initial pH levels, and kinetics. Thermodynamic parameters ΔH, ΔS and ΔG were calculated. ΔH value 450.33 $kJmol^{-1}$ indicates an endothermic process. Negative ΔG values (-5.75 $kJmol^{-1}$ at 15°C, -7.46 $kJmol^{-1}$ at 25°C, and -8.67 $kJmol^{-1}$ at 35°C) confirm adsorption spontaneity. The Aluminon colorimetric method, utilizing a UV-visible spectrometer, feasibly quantified aluminum ions. Statistical analysis using Response Surface Methodology (RSM) optimizes the process. Adsorbate removal was confirmed through Inductively Coupled Plasma Mass Spectrometry (ICPMS) analysis. In a 100 ppm Al^{3+} solution, the $ZrSiO_4$/PANI composite exhibited a removal efficiency of 98.9% within 30 minutes at an optimal pH of 5. The pseudo-second-order model describes the adsorption kinetics well, with Freundlich and Temkin isotherm models fitting the data. This research not only introduces an efficient and reusable method for aluminum removal but also provides valuable insights into the adsorption mechanism.

Keywords: Aluminium, Polyaniline, Zircon, Adsorption, Composite, Aluminon

WEAVING TECHNOLOGY FOR SUSTAINABILITY AND WELLBEING

University of Peradeniya

AcciTracker: A Predictive Model for Road Accident Forecasting

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The importance of leveraging predictive analysis to enhance road safety is increasingly recognised as societies grapple with the growing issue of traffic accidents. "AcciTracker" is a novel method for predicting traffic accidents to improve preventive measures and support public safety. This study conducted an in-depth analysis of the intricate dynamics of accident prediction using a large-scale dataset from the United Kingdom (UK) Road Accidents and Safety Statistics, provided by the Department for Transport UK, spanning from 2005 to 2017. The dataset encompasses various features, including accident locations, time, weather conditions, and road surface conditions. The prediction model employs state-of-the-art machine learning algorithms, including Random Forest, Logistic Regression, and Density-Based Spatial Clustering of Applications with Noise (DBSCAN). Underpinning this approach is a robust framework for data gathering and preparation, ensuring the accuracy and applicability of the data fed into the machine learning models. Using these models, remarkable precision was achieved in forecasting accident counts for specific hours on particular days of the week, predicting accident hotspots, evaluating accident severity, and identifying road surface types susceptible to accidents. The accident count prediction model, utilizing the Random Forest algorithm, performs with 91% accuracy, while DBSCAN effectively predicts accident-prone areas. The accident severity model achieves 85% precision using both Logistic Regression and Random Forest algorithms, and the road surface prediction model performs with 74% validity using the Random Forest algorithm. One million data records were utilized for training and testing the models. "AcciTracker" integrates these models to assist road users, representing a significant advancement in road and public safety. This comprehensive approach to accident prediction and prevention has the potential to impact traffic management and safety policies greatly.

Keywords: Multivariate Model, Predictive Analysis, Road Accident Forecasting, Hotspot Prediction, Machine Learning.

Analyzing and Forecasting of Land Prices in Colombo District

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Land prices are an important indicator of the economic and social development of a country. However, forecasting land prices is a challenging task due to the complexity of the factors that influence them. This study investigates the application of machine learning techniques along with the geospatial analysis for forecasting land prices around 50 main cities within the Colombo district of Sri Lanka. Utilizing the data submitted by the customers as advertisements to sell their land in "Lanka Property Web" website in the period of 2018 to 2023. Spatial network analysis was done using shape files obtained from the Survey Department of Sri Lanka. Those shape files allowed creation of new variables based on the nearest actual distances from specific locations such as hospital, national school, railway station, main road and bus stop to selected land plots. Comprehensive model fitting was conducted to evaluate the performance of various Machine Learning algorithms, including Linear Regression, Gradient Boosting, XGBoosting, Random Forest and Artificial Neural Network with two hidden layers and an output layer consist with 'relu' output function. XG boosting with learning rate of '0.1' and number of estimators of '50', emerged as the most accurate model with an accuracy of 62.23%, significantly exceeding the accuracy of linear regression (8.29%), GradientBoosting (60.01%), Random Forest (58.54%) and Artificial Neural Network (48.01%). The results showed that the distance from 'Colombo 1' to other cities affects the current land prices. When the distance from Colombo 1 increases, average land price per perch and the standard deviation of per perch price decreases gradually. Colombo 1-15 areas were the highest demanding cities in Colombo District. These results suggest to improve infrastructure and connectivity in outer regions to add value to the land in those areas. In conclusion, people who are willing to sell their land can use the web app developed from the research above, to have an idea about the selling price of their land.

Keywords: Land Price Forecasting, Machine Learning, Spatial Analysis, Sri Lanka, Colombo District, Real Estate

Acknowledgement: The study was conducted in collaboration with the company 'Lanka Property Web (Pvt) Ltd, Sri Lanka', utilizing the data provided by them.

Antifungal Effects of Soluble silica on Several Postharvest Pathogens of Papaya in-vitro

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Papaya (*Carica papaya* L.) is a popular fruit grown worldwide in tropical and sub-tropical climates. The shelf life of papaya is comparatively short due to its climacteric nature and postharvest fungal diseases. This study aimed investigating the effects of a GRAS (Generally-Regarded-As-Safe) compound, soluble silica (potassium silicate; K_2SiO_3), on the *in vitro* growth of several postharvest fungal pathogenic species from papaya fruit. Their pathogenicity was confirmed through Koch's postulates. Through colony morphology and micromorphology, the fungal pathogens were identified as two *Aspergillus* spp. (sp. 1, and sp. 2), *Cladosporium* sp., *Fusarium* sp., *Lasiodiplodia* sp., *Penicillium* sp., *Pestalotia* sp. And *Rhizopus* sp. Effects of soluble silica on fungal growth were tested by assessing radial growth on 7500 ppm silica- amended potato dextrose agar (PDA), mycelial dry mass in potato dextrose broth (PDB) and spore germination percentage in 7500 ppm silica-amended sterilized distilled water (SDW). Silica-free PDA, PDB and SDW served as the controls in those experiments, respectively. Silica effect on the dimensions of fungal structures was measured using light microscope. Silica treatment significantly ($P < 0.05$) inhibited the radial growth of *Aspergillus* sp. 1 and 2, *Fusarium* sp., *Lasiodiplodia* sp., *Pestalotia* sp. And *Rhizopus* sp. On PDA, as well as the mycelial dry weights of *Aspergillus* sp. 2, *Cladosporium* sp., *Fusarium* sp., *Lasiodiplodia* sp., *Penicillium* sp., *Pestalotia* sp. And *Rhizopus* sp. In PDB. Spore germination percentages of *Fusarium* sp., *Lasiodiplodia* sp., *Pestalotia* sp., and *Rhizopus* sp. Were also significantly inhibited by silica treatment. A reduction of the mycelial width, conidial length and width of all fungal spp. Was observed upon silica treatment. This study indicates a direct inhibitory effect of soluble silica on papaya postharvest fungal pathogens *in vitro* and warrants further investigation of its applicability on fruit, as a safer alternative to conventional fungicides in managing postharvest fungal diseases.

Keywords: Papaya, Postharvest Fungal Pathogens, Soluble Silica, Direct Inhibitory Effects

A Preliminary Study on Prevalence, Morphological and Molecular Identification of Microfilaria Spp. Among Dogs in Homagama Divisional Secretariat – Colombo District of Sri Lanka

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Canine Dirofilarisis is an important mosquito borne zoonotic disease which is prominent among dogs in Sri Lanka. Despite its common occurrence, documentation is rarely evident unlike for human filariasis due to lack of a constant surveillance system. The most common canine filarial species reported in Sri Lanka are *Dirofilaria repens*, *Brugia Malayi* and *Brugia pahangi*. *Dirofilaria immitis*, the cause of heartworm disease, has not been reported. This study was designed to determine the prevalence of zoonotic dirofilariasis among canids in Homagama divisional secretariat. In total, 150 canine blood samples were randomly collected from dogs >1 years of age that were presented to pet animal clinics for different clinical cases over a period of 3 months (Nov 2023 -Jan 2024). All blood samples were screened with modified knots technique followed by thick blood smear examination. Important morphological parameters like total length of the parasite, length from tip of the tail to the most posterior nuclei, length from tip of the head to the most anterior nuclei, thickness and the shape of the anterior end, mid body width were measured using the microscopic images. Morphological identification revealed the presence of *Dirofilaria repens* and *Brugia spp*. In the study. DNA was extracted from 39 filaria positive samples with "BioFlux" extraction kit. The prevalence of microfilaria in dogs in Homagama Divisional Secretariat was 26%. PCR was performed using pan-filarial primers (F-AGTGCGAATTGCAGACGCATTGAG, R-AGCGGGTAATCACGACTGAGTTGA) followed by the visualization of bands with 2% agarose gel electrophoresis. PCR product visualization revealed bands at 484,615,130 base pair sizes suggesting the presence of *Dirofilaria repens, Brugia Spp.* And an unknown species. To identify the unknown product and to verify the identified species, PCR products were subjected to sanger sequencing. The constant surveillance for Filarial spp. Among dogs in the country will provide essential data to control possible zoonotic infections.

Keywords: Dirofilarisis, Zoonotic, PCR, Gel Electrophoresis, Sequencing

A Review on Synthesizing Data for Virtual Patient Simulators in Dentistry

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It is often observed that students in dentistry have limited opportunities to enhance clinical skills during their academic programs due to limitations in human resources and facilities. Alternatively, Virtual Patient Simulators (VPS) have been investigated to train on investigations and procedures. Thus, designing precise patient cases for simulation, and ensuring realism for users is vital in dentistry. Hence, this review investigates data synthesis methods for VPS systems. The literature and the existing databases were reviewed using PubMed from 2000 to 2023 for the studies reporting VP creation for dentistry. Full manuscripts were included, and data were abstracted based on methods used to collect input data, 3D models created, simulator feed format, and the type of skill/s training achieved. Out of the 287 titles retrieved, 40 full articles were selected. In the process of VP development, 3D models of anatomical structures such as teeth, mouth, jaw, mandible, face, skull, etc., were constructed using software packages including 3Dslicer software, Mimics Medical software 24.0, etc. These models were generated from radiological images (CBCT, CT, or panoramic images) or scanned images of actual patients or dental models. The 3D data from these models were typically converted to STL (Stereolithography Tessellation Language) format before input into the simulators. Usage-wise, most VPS were targeted on skills in orthognathic surgeries, tooth preparations, and cavity preparation in Restorative dentistry. Future studies focus on assessing the accuracy and the validity of the synthesized data depending on the steps followed during VP model creation.

Keywords: Virtual Patient Simulators, Skill Training, Dentistry, Data Synthesis, Data Format

Assessing Risk of Railway Lines in Colombo Division: Examining Train Accidents Involving People

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Rail transportation stands as a critical mode for both passenger and freight movement in Sri Lanka, playing an important role in the economy of the nation and connecting diverse regions. Train accidents cause tragic loss of life, injuries, and lead to significant economic and social disruptions. Regrettably, there has been a lack of significant studies conducted on railway accidents in Sri Lanka possibly due to the limited accessibility for such data. Therefore, it is important to prioritise research efforts and gain a deeper understanding of the causes and dynamics of train accidents in the country. This research aims to assess the risk associated with railway lines in Colombo division by analysing train accidents involving people. The Colombo division covers five railway lines and consists of 194 stations. Through segmentation of each railway line based on stations, a numerical assessment of risk is conducted for each segment. Using statistical analysing methods such as bootstrapping and k-means clustering, the numerical risk values are 244otmail244zed into three distinct groups: high, medium, and low. The accuracy of these risk intervals is validated using Kruskal-Wallis rank sum test and Dunn's test with Bonferroni correction. The results reveal that out of the total 194 segments, 165 are classified as low-risk, 10 as medium-risk, and 19 as high-risk segments. The Coastal line has the highest count of high-risk segments, totaling 11, with the Colombo Fort to Moratuwa sub-line identified as the most high-risk area within this line. Although the Northern line and Kelani Valley line exhibit no high-risk segments, Puttalam has one, while the Mainline shows 7 high-risk segments. Future research endeavors could enrich this study by incorporating analysis of train accidents involving vehicles. The outcomes of this research provide valuable insights to guide government efforts in implementing safety precautions for railway operations in Sri Lanka.

Keywords: Bonferroni Correction, Bootstrapping, Dunn's Test, K-means Clustering, Kruskal-Wallis Rank Sum Test

Assessing the Sustainability of Sugarcane Bagasse Ash Concrete Versus Traditional Concrete: A Life Cycle Approach

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The construction industry has a significant environmental footprint, prompting the exploration of sustainable alternatives to traditional building materials. This paper examines the potential of Sugarcane Bagasse Ash (SCBA) as a substitute for cement in concrete production, comparing it with traditional concrete from a life cycle assessment (LCA) perspective. This study investigates the environmental performance of mortar with 20% cement replacement by sugarcane bagasse ash (SCBA), using a life cycle assessment (LCA) approach in accordance with international ISO 14040/14044 standards. The life cycle of concrete mortar production from raw material extraction is considered using the openLCA software. Ecoinvent 3.5 regionalized database and data from a literature review were employed for the life cycle inventory, and ReCiPe 2016 methodology was used for impact assessment. The environmental impacts were analyzed across 18 midpoint categories. Findings indicate that SCBA mortar has achieved significant reduction in most environmental impact by an average of 15.21% except for water use and ozone depletion which is an increment of 1.6% and 7.4% respectively. These results underscore the potential of SCBA as a viable cement replacement in mortar production, contributing to more sustainable construction practices.

Keywords: Sugarcane Bagasse Ash, Life Cycle Assessment, Sustainable Construction, Environmental Footprint

Association between Genetic Polymorphisms of the Organic Cation Transporter-1 and Response to Metformin Therapy in Patients with Type 2 Diabetes

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The Organic Cation Transporter-1 (OCT1) plays a key role in the pharmacokinetics of metformin, a widely used antidiabetic drug. OCT1 protein is involved in transporting the drug from the gastrointestinal tract into the portal vein and subsequent uptake into the hepatocyte. The *SLC22A1* gene encodes OCT1 and its genetic variation affects the protein's function. Thus, two recognized variants of *SLC22A1*, the rs628031 and rs12208357 single nucleotide polymorphisms (SNPs) have the potential to affect the therapeutic outcomes of metformin. The objective of the study was to investigate the association of the rs628031 and rs12208357 SNPs with the efficacy and adverse effects of metformin therapy in 180 Sri Lankan type 2 diabetic patients. The associations of the 2 SNPs with diabetic control outcomes of HbA1c, Fasting Blood Sugar (FBS), and Postprandial blood Sugar (PPBS) levels, and common adverse effects of metformin were tested. The average of glycaemic control measures over 3 months when patients were on metformin monotherapy was used in the analysis. DNA extracted from whole blood was genotyped using real-time PCR to determine genotypes. The results revealed that the minor allele frequencies of rs628031 and rs12208357 SNPs were 0.41 and 0.04 respectively. The rs628031 SNP was associated with metformin adverse drug effects symptoms of nausea and/or vomiting and abdominal discomfort. Here the `A allele' carrying genotypes (AA+AG) were more prevalent in patients reporting the said adverse effects compared to those who did not. Neither of the SNPs tested was associated with the glycaemic control measures tested following adjustment for metformin dosage. The moderate sample size and other pharmacokinetic factors may have contributed to the results. The present study is the first to report on the pharmacogenomics of metformin therapy in Sri Lankans. In conclusion, the *SLC22A1* rs628031 SNP is associated with metformin adverse effects in Sri Lankans.

Keywords: Pharmacogenomics, Metformin, Diabetes, SLC22A1 Gene, Adverse Effect

Assessment of Carbon Footprint of Using Electronic Devices vs Books as Learning Modes among a Cohort of Undergraduates of the University of Peradeniya

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Global warming and climate change are major environmental challenges today. We must reduce energy consumption to lower greenhouse gas emissions. This study investigates the carbon footprint of primary leaning modes among undergraduates of the University of Peradeniya. With the increase usage of electronic devices among students, the research explores whether there are significant differences in carbon emissions among students who solely use electronic devices, those who exclusively use books, and those who employ both mediums. A Google Form questionnaire was distributed online to a diverse group of 30 students, representing various faculties and academic years across the university. The questionnaire contained questions related to demographics such as age, sex, study stream, and year of study, about the daily routine of students, their primary educational method, hours spent on those devices studying on average day, pages written on a book for an average day. Responses were tabulated on excel and mean carbon foot print value and total carbon footprints were calculated utilizing appropriate emission factors categorized under the ISO 14064 standards, particularly emphasizing Scope 2 emissions pertaining to purchased electricity consumption. Pairwise Wilcoxon tests with Benjamini-Hochberg correction were conducted to discern significant differences in carbon footprints among the three educational mode groups. Students exclusively using electronic devices exhibited the highest mean carbon footprint (0.0838488), followed by those utilizing an integrated education method (0.0573996), while students solely relying on books demonstrated the lowest carbon footprint (0.006944). There was a significant difference between students using electronic devices and those solely relying on books, emphasizing the latter's notably lower carbon emissions. (p-value < 0.001) However, no significant difference was found between students solely using electronic devices and those who employ an integrated approach utilizing both mediums. (p-value 0.88). Usage of Electronic devices for leaning leads to significantly higher carbon foot print, this finding could contribute to informed decision-making for sustainability initiatives within educational institutions.

Keywords: Primary Learning Modes, Electronic Devices, Carbon Foot Print, Integrated Education Method

Association of Dyslipidemia with Hepatic Fibrosis and Steatosis in Metabolic-Dysfunction Associated Fatty Liver Disease

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Metabolic-dysfunction-associated fatty liver disease (MAFLD) is a chronic liver disorder that has become more prevalent recently. Dyslipidemia plays a crucial role in the etiopathogenesis of MAFLD. Hence, this study aimed to determine the prevalence of dyslipidemia among MAFLD patients and to evaluate the association between dyslipidemia and hepatic steatosis, fibrosis, and liver profile. A cross-sectional study was conducted with 110 MAFLD patients referred to the Gastroenterology unit, North Colombo Teaching Hospital, Ragama. Hepatic fibrosis (Liver stiffness meter-kPa) and hepatic steatosis (controlled attenuated parameter-dB/m) were determined by FibroScan. The lipid and liver profiles were assessed. Independent t-test was performed to compare the hepatic fibrosis and steatosis scores and liver profile parameters of patients with and without dyslipidemia. The majority of MAFLD patients (n=97, 88%) were diagnosed with dyslipidemia. The prevalence of hypercholesterolemia, hypertriglyceridemia, high levels of low-density lipoproteins cholesterol (LDL-C), and low levels of high-density lipoproteins cholesterol (HDL-C) were 57%, 22%, 36%, and 39%. A total of 52 patients (49%) were under lipid-lowering therapy whereas 45 were dyslipidemic but not under therapy. The mean values of hepatic fibrosis, hepatic steatosis, total cholesterol, LDL-C, HDL-C, and triglycerides were 8.8±2.7kPa, 302.8±34.4dB/m, 190.5±43.1mg/dL, 118.3±37.8mg/dL, 47.3±7.4mg/dL, and 127.9±49.3mg/dL. The hepatic steatosis and fibrosis levels were not significantly different in MAFLD patients with hypercholesterolemia, hypertriglyceridemia, high levels of LDL-C, or low levels of HDL-C when compared to patients without lipid disorders ($p>0.05$). The gamma-glutamyl transaminase level was significantly high among the patients with hypertriglyceridemia ($p=0.002$). Significantly high levels of aspartate transaminase and alanine transaminase levels were found in patients with high LDL-C. The MAFLD patients with dyslipidemia had elevated levels of liver enzymes indicating liver injury. Therefore, the management of dyslipidemia is crucial to prevent further progression MAFLD.

Keywords: Metabolic-Associated Fatty Liver Disease, Dyslipidemia, Hepatic Steatosis, Hepatic Fibrosis

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A Study of Contemporary Utility of Buddhist Teachings Applicable to Biodiversity and Environmental Security

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The endowment from the environment is endless with Human life. Even though man has improved in terms of technology, he has not got a space to escape even for a moment from the existing relationship with its importance of the safe existence of the entire human race. Buddhist thought, well aware of the actual need and presented many important criteria to enhance Biodiversity and Environmental Security. This research focused to examine and discuss its contemporary value for benefit the society. By investigating the pointed out very important two discourses and Vinaya impositions in sutta literature, when analyzing the related information, it is possible to see a number of situations are closed to the Buddha, the Buddha's Customs and environment. On the other hand, it is known that a lot of important teachings related with securing the biodiversity in the provision of life survival equipment, rituals and monasteries and environmental management are collected in Pāli Canon. It can be also seen in some disciplinary law impositions located within the given framework. For instance, as stated *"Na haritē agilāno uccāraṃ vā passāvaṃ vā khēlaṃ vā karissāmīti sikkhā karaṇīyāti"* Spitting, defilement and excrement on the grass are considered forbidden in the discipline. In the consumption of the natural environment, the Pacittiyapāli helps to identify issues related to human behavior that do not interface with the activities of the water sphere, atmosphere, biosphere. This research conforms how much attention is paid to securing biodiversity and environmental safety in Buddhism and examine their contemporary usability.

Keywords: Rituals, Bhikkū's Life, Buddhist Customs, Concept of Charity, Pacittiyapāli

A Study on the Applicability of the Modified Apls Weight-for- Age Calculation Formula on a Selected Population of Sri Lankan Children Attending a Tertiary Care Hospital

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In Paediatric emergencies, actual weight measurement is not always feasible and drug doses are calculated using an estimated weight derived from an accepted formula. In many low- and middle-income countries, it has been proven that some of these formulas overestimate the weight leading to prescription errors. This study aims to determine the applicability of the modified advanced paediatric life support (APLS) weight-for-age formula in Sri Lanka. Such evaluation is important as the nutrition status, hormones, and genetic base of Sri Lankans differs from western populations. Our targeted population was children between 1 month to 12 years, attending paediatric wards/ clinics in Teaching Hospital Peradeniya during the period from 01/07/2023-31/08/2023. Children with prolonged illnesses affecting their weight were excluded. Weights measured with calibrated scales and documented in the BHTs were used for comparison with the estimated weights using the formula. A convenience sampling was done until the sample size of 387 children meeting the inclusion criteria was reached. A mean estimation error of 3.61kg with a mean percentage error (95% CI) of 26.9% (23.2% - 30.7%) was observed for the whole sample. The percentage of estimated weights within 20% of the measured weight (PW20 value) was 44.6% for the 1-11 months category, 20.9% for the 1-5 years category, and 10.1% for the 6-12 years category showing a significant increment in the error of estimation with the advancing age. The Mann-Whitney U test did not reveal a statistically significant difference between the two genders in the PW20 values across all ages. According to this study, the modified APLS formula significantly overestimated the actual weights with the degree of overestimation increasing with age making the formula less accurate for older children. No significant difference in the error of weight estimations was seen among boys and girls.

Keywords: Advanced Paediatric Life Support, Weight-For-Age Formula, Estimated Weight, Paediatric Emergencies

Challenges for Adopting Electronic Procurement in the Sri Lankan Public Sector: A Study on the Divisional Secretariat Offices

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Electronic Procurement (EP) has facilitated the inclusion of digital technologies to strengthen the procurement activities of an organization. Efficient procurement practices are important in the public sector for delivering social and economic commodities to the public. Although many countries have successfully adopted EP into their public sector operations, Sri Lanka's public sector (SLPS) is yet to replace the traditional manual methods. These traditional methods have significantly contributed to the inefficiency of the SLPS while providing loopholes for many fraudulent activities. Despite the availability of provisions to accommodate EP in public sector procurement guidelines since 2006, SLPS has failed to shift towards EP. Therefore, the SLPS provides a unique case to investigate the reasons behind the failure to implement EP, despite its recognized need and legal support. This qualitative study used Organizational Capability theoretical lens to explore the challenges for adopting EP at the Divisional Secretariat Offices (DSOs) in Kandy District of Sri Lanka. Five respondents from each DSO were interviewed, including the Divisional Secretary, a representative from Financial, Procurement, and ICT Departments, and a Supplier registered at the DSO. Data saturation was observed after conducting a total of 15 interviews. Thematic analysis revealed three main challenges for adopting EP: (1) inadequate technological infrastructure, (2) insufficient technical knowledge, and (3) the resistance of the experienced staff who prefer traditional methods. While acknowledging the need of more research in this specific context, this study recommends to (1) develop the required infrastructure, (2) training staff on EP practices, and (3) introduce awareness programs and employee rotation schemes to mitigate the employee resistance.

Keywords: Electronic Procurement, Public Sector, Procurement Management, Digital Inclusion

Comparison of PCR analysis with the Routine Histopathological Diagnostic Technique in Detecting Leishmania Donovani in Clinically Suspected Cutaneous Leishmaniasis Samples

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Cutaneous leishmaniasis is a rapidly emerging endemic disease in Sri Lanka that is caused by the specific strain, *Leishmania donovani* zymodeme MON-37. The condition shows a broad spectrum of clinical and histopathological manifestations making the disease discrimination hard. This study focuses on comparing the diagnostic ability of PCR based molecular analysis with the routine histopathological diagnostic technique in detecting *Leishmania donovani* in clinically suspected cutaneous leishmaniasis samples. Hematoxylin and eosin-stained tissue sections were prepared using fifty clinically suggestive patient sample wax blocks. The presence of amastigotes was recorded by observing under high power (×40) magnification. Sample DNA was extracted from the respective formalin fixed paraffin embedded biopsy wax block sections and samples with less than 20 µg/ml of DNA were re-concentrated. PCR amplification was carried out using primers specific to the *internal transcribed spacer 1* (ITS-1) of the ribosomal operon of *Leishmania* (kDNA) and analysed using 1.5% Agarose gel electrophoresis. Out of the 50 samples only 13(26%) of the samples were having amastigotes while the rest demonstrated consistent histopathological reactions. Upon DNA quantification only (24) 48% of the 50 samples had adequate amount of DNA extracted (greater than or equal to 20 µg). This included all the 13 samples that had visible amastigotes in their respective H&E-stained tissue sections. Out of the 24 samples with adequate extracted DNA, 21 samples gave positive results with PCR (87.5%) and only 03 samples gave negative results (12.5%). From the 21 PCR positive samples 10 (47.61%) had clearly visible amastigotes in their respective H&E-stained tissue sections. The samples that lacked adequate amount of DNA even after re-concentrating the extracted DNA, showed a statistically significant relationship (P-value=0.029), where the amount of extractable DNA decreased with the processed period. Samples that were processed less than one year ago had high amounts of extracted DNA (26%) and only 02% of samples that were processed three or more years ago had adequate DNA. The calculated sensitivity, specificity, positive predictive value and negative predictive values for kDNA based PCR diagnostic method compared to the routine histopathological observations were 76%, 70.30%, 47.60% and 89.65% respectively. A statistically significant difference between the two diagnostic methods were observed with calculated DF=2 and P-value of P=0.0001. A Kappa value (*k*) of 0.46 showed a moderate agreement between the two diagnostic methods. Results of the study concluded PCR as a highly sensitive diagnostic method in detecting *Leishmania donovani* in clinically suggestive cutaneous leishmaniasis patient samples when adequate amount of sample DNA is extractable.

Keywords: Cutaneous Leishmaniasis, *Leishmania Donovani,* Sri Lanka, PCR

Comparison of Dosimetry of Mono Isocentric and Dual Isocentric Techniques for the Radiotherapy Treatment of Breast Cancer

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Radiotherapy is an important treatment in breast cancer management. Based on the main basic principle of radiotherapy, it is essential to spare Organ at Risk (OAR). After surgery, these three areas; the tumor bed, whole breast or chest wall, and the regional lymph nodes needed to be covered by radiotherapy for breast cancer patients with positive axillary lymph nodes. These areas are located at different depths with respect to the OARs. This study has focused on comparing the Dual Isocentric Technique (DIT) and Mono Isocentric Technique (MIT) in terms of dosimetry. This study compares the OAR doses between DIT and MIT for breast cancer treatment. This was a retrospective, correlational, quantitative study. The patients who had undergone adjuvant left breast radiotherapy as a curative intent at the department of radiotherapy and oncology in the National Cancer Institute, Maharagama (NCIM). By using the isocenter placement of breast field and SCF field and radiation dose in both fields, patients were divided into two groups, DIT and MIT. Then compared mean heart dose and mean left lung doses of two groups for V95% coverage of Planning Target Volume analyzed by using SPSS version 29.0. 200 patients were included, those who have undergone adjuvant left breast radiotherapy. There was no significant difference in mean heart dose in the breast field between DIT and MIT ($p = 0.931$). And there was no significant difference in mean left lung dose in the breast field between two arms ($p = 0.304$). But, in the SCF field, the mean heart dose was less in MIT (0.39 versus 0.174, $p =< 0.001$), and the mean lung dose was also slightly less in MIT (9.324 versus 4.345, $p =< 0.001$). This study compares DIT and MIT in terms of dosimetry. Finally, the MIT received low radiation doses to the OARs.

Keywords: Breast Cancer, Mono Isocentric, Dual Isocentric, Dosimetry, Organ at Risk

Comparison of Sheep Blood and Human Blood Based Media for the Isolation and Identification of Pneumococcal Strains

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Although, the conventional culture using sheep blood supplementation is recommended for the identification of *Streptococcus pneumoniae*, developing countries use human blood as an alternative. Therefore, it is important to evaluate the impact of two different blood media on pneumococci isolation and identification. Twenty different strains of *S.pneumoniae* [four strains each from the five commonest serotypes found in Sri Lanka (19F, 6B, 6A, 14 and 23F)] and *S.pneumoniae* ATCC 45619 were used in this study. Proportions of colonies ≥ 1 mm, colony counts (in 0.5 McFarland, 10^{-1}, 10^{-2}, 10^{-3}, 10^{-4} dilutions) in HBA and SBA were compared. ABST (on blood-MHA), and MIC (in blood-MHB) were compared between two blood types. All the isolates demonstrated alpha hemolysis and Draughtsman appearance on sheep blood agar (SBA) but not on human blood agar (HBA). Considering all isolates together, the mean number of colonies ≥ 1 mm was 8 (±9) on HBA and 23 (±10) on SBA. In higher dilutions (10^{-3}, 10^{-4}), mean number of colonies on SBA ($1.94x10^5$, $5.36x10^4$ CFU/ml) was higher than HBA ($1.78x10^5$, $4.18x10^4$ CFU/ml). Mean ABST zone diameters of tetracycline, erythromycin, levofloxacin on human blood-MHA were 24.5, 17.5, 25.2 mm and on sheep blood-MHA were 21.2, 12.7, and 23.5 mm. MIC50 and MIC90 for penicillin were similar in both media (2 and 4 µg/ml). MIC50, MIC90 for cefotaxime in human blood-MHB was 0.5 and 2µg/ml; in sheep blood-MHB was 0.75 and 2 µg/ml. Since the typical colony characteristics were not seen, there is a possibility to misidentify pneumococci on HBA. Isolation of pneumococci on HBA is less when organisms are present in lower concentrations. Larger ABST zones on human blood-MHA may alter sensitivity interpretation. Therefore, Human blood cannot be recommended for the isolation and identification of *S.pneumoniae* and this may contribute to the under-diagnosis and improper treatment of pneumococcal infections.

Keywords: *Streptococcus Pneumoniae*, Sheep Blood Agar, Human Blood Agar, Isolation and Identification

Designizg an Effective Architecture for Exploiting Generative AI to Gather Insights and Predictions from Business Data

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From text to images, music, and beyond, Generative AI is a type of artificial intelligence that not just analyzes existing content but generates content in response to an input. The power of generative AI is vast, particularly across various aspects of business operations. For example, by leveraging businesses's past data, generative AI can analyze customer satisfaction, predict the business's future, and monitor client account health which could be strategically utilized in their favor. One of the critical concerns with this idea is the constraints encountered when feeding large volumes of data to managed AI cloud services. This is a significant concern, especially when deploying generative AI solutions that require extensive datasets to function optimally. Privacy concerns about feeding customer data directly to AI cloud services are also a hot topic when designing this type of tool. To overcome these issues a custom-designed Transformation Layer architecture was implemented. The goal of this architecture was to feed a more optimized version of data to Large Language Models (LLM) without losing its value while respecting the inherent limitations of models and privacy policies. Transformation Layers involve the strategic application of multiple transformations to the raw dataset such as cleanser, anonymizer, text-to-numeric transformer, summarizer, analyzer, etc. By leveraging this approach we were able to increase the volume of data drastically from 100 up to 1500 data records. It also enabled more effective use of generative AI without overwhelming the model to get the most out of data. An added benefit of this approach was the cost-effectiveness when leveraging Generative AI APIs due to the reduced token usage. This Transformation layers architecture will help businesses use generative AI more effectively to turn their business data into actionable insights and help drive customer satisfaction, business growth, and client retention to new heights.

Keywords: Generative AI, Large Language Models, Transformation Layers, Insights, Predictions

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Detection of Coronaviruses in Wildlife Rodents in the North Central Province, Sri Lanka

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Rodents are the largest group of mammals, widely distributed terrestrial species in the world. They act as a reservoir host for some zoonotic viruses, including coronaviruses (CoV) and are known to play an important role in their transmission. In fact, human CoV HCoV-OC43 and HCoV-HKU1 are linked to have rodent origins. Since the emergence of the SARS-CoV-2 in 2023, renowned interest have been about CoV found in reservoir host such as bats and rodents. They are of greater importance in identifying future pandemic CoVs evolving through bats. In this study, we aimed to detect the presence of CoV in wildlife rodents from selected locations in the North Central Province of Sri Lanka in July 2023. Sampling was done once in July 2023 by capture and release method. A total of 73 nasopharyngeal swabs were collected into 1.5 mL vials containing of phosphate-Buffered Saline. Viral RNA was extracted to perform a Pancoronavirus (PanCoV) nested RT-PCR, which is designed to target the RNA-dependent RNA polymerase gene, a 442 base pair fragment conserved region for the *Orthocoronavirinae* family. Randomly selected nasopharyngeal swabs were tested by PanCoV RT-PCR where CoV positive rodents were detected. Further sequencing data is required to confirm the individual CoV present in each rodent. Surveillance of reservoir host for known human pathogens is important.

Key words: Coronaviruses, Rodents, PanCoV, Sri Lanka

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Detection of Helicobacter Pylori in Saliva of Patients with Periodontitis and Periodontally Healthy Individuals in a Sri Lankan Population

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Helicobacter pylori is a highly successful human pathogen and a Class I carcinogen which resides in the gastric mucosa playing a crucial role in the development of gastrointestinal diseases ranging from gastritis to gastric adenocarcinoma. The oral cavity has been identified as the primary extra gastric reservoir for *H. pylori*. Hence, the influences of oral health status on *H. pylori* infection have been investigated in various studies. Periodontitis, an inflammatory disease affecting the teeth-supporting structures, can potentially host bacterial pathogens of significant medical concern. Even though a positive correlation between periodontitis and the presence of oral *H. pylori* has been identified in various studies, such studies are scarce in Sri Lanka. Moreover, Polymerase Chain Reaction (PCR) has not been used to detect *H. pylori* in saliva samples in Sri Lanka. Hence, this study aimed to analyse the presence of *H. pylori* in the saliva of periodontitis patients in Sri Lanka using PCR and examine its association with individuals without periodontitis. Saliva samples were obtained from 28 periodontally healthy subjects (11 males, 17 females) and 40 subjects (17 males, 23 females) with periodontitis. DNA was extracted from the samples and detection of *H. pylori* was carried out by PCR amplification of the *H. pylori* 16S rRNA gene with JW22 and JW23 primers. *H. pylori* was detected in 17.5% (7/40) of saliva samples from subjects with periodontitis. Intriguingly, none of the saliva samples from periodontally healthy subjects was positive for *H. pylori*. In this study, *H. pylori* was detected significantly more often in the saliva samples from subjects with periodontitis ($p < 0.001$) compared to periodontally healthy subjects. This suggests a possible bidirectional relationship where *H. pylori* infection may increase the risk of developing periodontitis and having periodontitis may increase the risk for *H. pylori* infection.

Keywords: *Helicobacter Pylori*, Saliva, Periodontitis, Oral Cavity, PCR

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Development and Characterization of Sodium Alginate-Based Packaging Reinforced with Sansevieria Zeylanica Fibers

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Almost all consumer products require packaging to keep them safe and protected from microorganisms and environmental conditions. Most of the packaging materials are made from plastics and other petroleum by-products. They last for a long time and cause severe problems to the environment. Packaging removal represents the large content of garbage that we throw away. Thus, finding eco-friendly alternatives is important for the conservation of the environment. The non-biodegradable nature of current packaging materials causes increased waste generation and ecological harm. This work aims to develop an eco-friendly packaging material by reinforcing biodegradable sodium alginate sheets with bleached, alkali-treated Sansevieria zeylanica fibers. The goal is to enhance the mechanical strength and water vapor transmission rate of the sheets, thereby reducing dependence on non-renewable resources. After biological retting, extracted Sansevieria zeylanica fibers were chemically treated with sodium hydroxide and hydrogen peroxide to remove lignin and hemicellulose. Fibers with the ideal mechanical strength, water content, and solubility were found through optimization using solution casting synthesis of sheets prepared using the extracted and chemically treated fibers. After that, these fibers were mixed with glycerol, water, and sodium alginate, formed into sheets using glass trays, and allowed to air dry for 48 hours (solution casting). The resulting composite sheets were evaluated for mechanical strength, thickness, and water vapor transmission rate. The removal of lignin and hemicellulose was validated by FTIR analysis. Significant parameters affecting the properties of composite sheets were identified using statistical techniques such as ANOVA and Duncan's test. FTIR ensures the removal of lignin and hemicellulose. At 10.0M, the ideal fiber concentration provides a maximum strength of 17.41 MPa. Changing fiber masses offer less water content and tailored packaging. There was the enhancement of certain properties with the increment of the applied fiber mass. Water Vapor Transmission Rate (WVTR) was decreased from 63×10^{-4} gm^{-2} s^{-1} to 45×10^{-4} gm^{-2} s^{-1}, the water content of the sheets reduced from 17% to 10%, and water solubility decreased from 100% to 45%. However, the increase in the fiber mass caused an increase in the mechanical strength from 5.53 MPa to 21 MPa.

Keywords: Sodium Alginate, Sustainable Packaging, Natural Fillers, Composites, Plant Fiber

Development of SWCNT/TiO_2 Gas Sensor for Enhanced Formaldehyde Detection in Composite Wood Material

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In industries such as wood composites, household materials, paper, and textiles, the need for efficient formaldehyde detection is paramount. Traditional methods often lack the simplicity, speed, and sensitivity required for accurate detection. This research focuses on developing a nanotechnology-based gas sensor utilizing Single-Walled Carbon Nanotubes (SWCNT) and Titanium Dioxide (TiO_2) for enhanced formaldehyde detection in wood products. The research addresses the challenge of effectively detecting formaldehyde gas in wood composites using advanced nanotechnology. By employing SWCNT/TiO_2-based gas sensors, the study aims to overcome the limitations of conventional detection methods. The objective is to create a sensor that is both highly sensitive and capable of rapid, accurate and safe formaldehyde detection in various wood products. The Interdigitated Electrode (IDE) pattern was meticulously designed using AutoCAD software, ensuring a gap of 500 µm between finger electrodes. Fabrication of the IDE was carried out using conventional lithography processes. TiO_2 nanoparticles were synthesized via the sol-gel method, and SWCNT was deposited on the TiO_2 surface to develop the gas sensor. Surface morphologies of bare TiO2/AlIDE and SWCNT/TiO_2/AlIDE were characterized using Field Emission Scanning Electron Microscopy (FESEM) and Atomic Force Microscopy (AFM). Electrical measurements including gas response characteristics and chronoamperometry were performed using a potentiostat/galvanostat. Real-time detection was validated using various composite wood products such as block board, particle board, merbau, and HDF. The sensor exhibited high sensitivity, detecting formaldehyde concentrations as low as 0.86 ppm in block board, 0.73 ppm in particle board, 0.40 ppm in merbau, and 0.4 ppm in HDF within a 10-minute timeframe. Repeated data confirmed the sensor's repeatability and effectiveness, offering a viable alternative to conventional desiccator methods for formaldehyde emission testing in composite wood products. The utilization of SWCNT/TiO_2-based gas sensors represents a significant advancement in formaldehyde detection technology for wood products. The sensor's high sensitivity and rapid response make it suitable for real-time monitoring of formaldehyde emissions. By replacing outdated methods with nanotechnology-based solutions, this research contributes to the enhancement of safety and quality standards in industries reliant on wood composites.

Keywords: Formaldehyde, IDE Sensor, SWCNT, TiO_2

Differential Serum Total Antioxidant Capacity in Acute Coronary Syndrome: A Comparative Analysis across Clinical Conditions and Gender

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Oxidative stress plays a pivotal role in the pathogenesis of Acute Coronary Syndrome (ACS). Serum Total Antioxidant Capacity (TAC) reflects the body's antioxidative defense and its evaluation can provide insights into the clinical management of ACS. In a prospective cohort study from October 2016 to January 2020 at Teaching Hospital Peradeniya, 360 ACS patients and 150 matched healthy controls were enrolled. Serum TAC was assessed using the Ferric Reducing Antioxidant Power (FRAP) assay. Statistical analyses were performed using SPSS and included independent samples T-test and one-way ANOVA. The mean serum TAC levels showed no significant difference between ACS patients (857.6 ± 194.4 µmol/L) and controls (847.7 ± 162.0 µmol/L; p=0.558). However, within the ACS group, significant variations were observed: NSTEMI patients had the highest mean TAC at 901.8 ± 202.5 µmol/L. STEMI patients had a mean TAC of 843.5 ± 182.5 µmol/L. UA patients showed the lowest mean TAC at 835.0 ± 192.3 µmol/L, significantly lower than NSTEMI (p=0.027). Gender analysis within UA revealed males had significantly higher TAC (874.1 ± 175.5 µmol/L) compared to females (798.7 ± 201.1 µmol/L; p=0.021). Correlations between TAC and BMI were not significant, contradicting findings from previous studies which suggested a positive relationship. Serum TAC varies significantly across different ACS clinical conditions and between genders but not between ACS patients and healthy controls. NSTEMI patients exhibited the highest TAC, suggesting variations in antioxidative response might be associated with the nature of myocardial injury. The lack of correlation between TAC and BMI suggests that TAC may be independently regulated by factors other than body weight. This study underscores the complexity of antioxidant responses in cardiovascular diseases and supports further investigation into the role of TAC as a potential biomarker in ACS management.

Keywords: Acute Coronary Syndrome, Total Antioxidant Capacity, FRAP Assay, Clinical Conditions, Gender Differences, Cardiovascular Biomarkers

Acknowledgement: We want to express our gratitude to all participants who consented to take part in this study.

Digital Key Performance Indicators for Corporate Decision-Making to Manage Innovation in Commercial Agriculture

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Research and development (R&D) leading to improvements in the commercial agriculture sector (CAS) is envisaged as a strategy to achieve the specific targets set forth under the second Sustainable Development Goal: 'Zero-Hunger'. Identification and understanding of the key issues of performance management in R&D and how could they be tackled sensibly to achieve those targets are of prime interest in the R&D agenda of R&D institutes. It challenges academics as well as theoreticians to look for new approaches to incorporate many performance aspects structurally in strengthening the theoretical base of performance management of R&D through KPIs. The long-awaited requirement for change in the decision-making model was substantiated by the findings discovered in this qualitative study conducted through Thematic analysis. The study involved an in-depth analysis of the perceptions and attitudinal statements regarding the utilization of KPIs from 32 senior administrators across 24 research institutes in Sri Lanka. It was found that digital systems could be utilized to streamline the disorganized, disconnected, and unresponsive nature of the current performance management systems (PMSs) in R&D institutes. Second, real-time decision-making based on a system of collaborative digital KPIs is anticipated to enable a flexible institutional setup that is capable of framing insights for demand-driven and socially acceptable agricultural R&D. Further, it is expected to encourage the seamless inclusion of rural communities that are largely ignored in the current practice of R&D implementation as R&D stakeholders in decision-making processes.

Keywords: Commercial Agriculture, Digital KPI, Digital Transformation, Innovation Management System, Socially Responsible Research

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Effectiveness of Calcium as a Treatment for Managing the Symptoms and Severity of Dengue - A Single Center Study

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Dengue has become a major public health concern with high rates of morbidity and mortality in Sri Lanka. Apart from careful monitoring with supportive therapies like fluid management and fluid correction, dengue has no specific antiviral treatment. Calcium is crucial for coagulation and immune system, but information of its role in dengue is limited. Dengue immunopathogenesis is linked to hypocalcemia but its clinical implications are unclear. This study aims to identify the contribution of calcium in regulating dengue clinical symptoms and incidence of critical disease among calcium treated and untreated dengue patients. This is a prospective, observational study conducted among 386 dengue patients admitted in the medical wards of Teaching Hospital, Peradeniya over two years. All patients were confirmed with dengue NS1 antigen positivity. An interview-based questionnaire was given to patients treated with calcium (n=193) and without calcium (n=193) to record the duration of symptoms. Data was analyzed using non-parametric Mann-Whitney test in SPSS 25. The study found that patients who had received oral calcium carbonate showed significant differences in the duration of symptoms compared to those who did not. Significant differences were observed in the manifestation of general symptoms, nasal stuffiness, phlegm, sore throat, wheezing, myalgia, body aches and pain in patients receiving calcium compared to those who did not ($p < 0.05$). Among the patients who received calcium, 60 (31.09%) were progressed into the DHF while it was 76 patients (39.38%) in non-calcium group ($p < 0.001$). A significant difference ($p < 0.001$) was seen in the duration of the hospital stay between patients with DHF who did not take calcium and those who did (5.33 days ± 1.39). According to these results, further research is needed to assess the effectiveness of calcium as a specific treatment option in the management of dengue.

Keywords: Dengue, DHF, Calcium Treatment, Symptoms, Sri Lanka

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Effect of Superplasticizer on the Workability of Recycled Plastic Aggregate Concrete

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Globally, the widespread accumulation of plastic waste causes serious environmental issues. Its detrimental impact extends to human health, marine life, and flora & fauna. Currently, researchers are exploring the potential use of plastic aggregate concrete (PAC) in construction applications to mitigate waste problems and natural coarse aggregates (NCA) scarcity. More investigation on the uniform distribution of plastic coarse aggregates (PCA) in PAC is essential for real-world application. In this study, an optimum replacement level of 20% of NCA was replaced with PCA in both normal (NSC) and high (HSC) strength concrete and their workability performances were compared with conventional concrete. Here, the targeted normal and high strength were 30 MPa and 65 MPa, respectively. The main motive of this study is to observe the influence of superplasticizer (SP) on the workability performance of PAC and to assess the homogeneity of PCA in concrete. Plastobuild ES type SP and Masterglenium SKY 8233 type SP were utilized in NSC and HSC, respectively. In NSC, the workability of PAC exhibited a significant reduction of about 42% when 20% of NCA was replaced with PCA. It was attributed to irregular shape and sharp edges of PCA. The dosage of 300 ml per 100 kg of cement of SP enhanced the slump of NSC from 55 mm to 170 mm, without any segregation. Here, hand compaction ensured consistent distribution of PCAs within the concrete specimens. In HSC with SP, substituting 20% of PCA had minimal impact on the workability. Here, as the SP increased the workability (~230mm), some of the PCA tended to float to the top surface of the concrete when hand compaction was applied. Further, compaction using the vibrating table increased the number of PCA that float to the top surface. In summary, the dosage of SP should be limited, and appropriate compaction should be given to maintain the homogeneity of PAC.

Keywords: Plastic Aggregate Concrete, Superplasticizer, Workability

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Enhanced Degradation of Ciprofloxacin by Sri Lankan Red Earth

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Ciprofloxacin is the most widely prescribed fluoroquinolone-class antibiotic in the world. Excess application and improper utilization cause ciprofloxacin accumulation in natural environments. It's long half-life in soil can lead to the development of antibiotic resistance among microorganisms, which is a global health issue. Therefore, identifying mechanisms to enhance antibiotic degradation to reduce their half-life is highly important. This study investigated the efficiency of ciprofloxacin degradation via photocatalytic oxidation and Fenton process by a natural Fe and Ti oxides rich red soil (RE). The degradation experiments were carried out by mixing 500 mg of ciprofloxacin in 100 g of RE. Ciprofloxacin containing crude was extracted at different time intervals (1 day, 1, 3, 5, 7, 9 and 16 weeks) using methanol. The extracted crude was analyzed by the Fourier Transform Infrared Spectroscopy (FTIR) to identify the structural changes in ciprofloxacin. Antibacterial activity of the crude against *Staphylococcus aureus* ATCC 25923 was tested using the agar diffusion method and determining the minimum inhibitory concentration (MIC) by broth dilution method to semi-quantitatively assess the degree of degradation of ciprofloxacin by RE. Appearance of FTIR peak at 1741 cm^{-1} position after five weeks exposure time confirmed the formation of by-products by ciprofloxacin degradation. A decreased inhibition zone was observed at day 25 and no inhibition zone was observed after 64 days indicating complete degradation of ciprofloxacin. The MIC increased from 39 mg/kg to 1250 mg/kg at day 1 and week 16, respectively, suggesting a 32-fold reduction in biologically-active ciprofloxacin concentration. Results of the present study indicate that RE has the potential to degrade and reduce the half-life of ciprofloxacin.

Keywords: Ciprofloxacin, Iron rich soil, Degradation, Antibiotic

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Enhancing Virtual Patient Simulation in Dentistry: Custom Case Creation for Tailored Learning Experiences

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Virtual Patient Simulators (VPS) are vital in dental education, providing a safe environment for students to practice clinical skills, diagnostic skills as well as to practice formulating treatment plans. However, existing tutoring-type simulators, which use 3D models, often fail to replicate a broad spectrum of clinical cases due to their inability to automate the 3D model according to each different clinical case. This limitation hinders students' knowledge acquisition, as they are not exposed to a wide range of clinical scenarios with different presentations. Addressing this gap, this study aims to enhance the developed web-based VPS, by introducing a tutor (teacher) portal for custom case creation, without software expert support. This semi-automated approach requires the tutor to input case details into form-based interfaces provided by the system, which then uses these details to automate the 3D model according to the case. Additionally, a built-in question bank prevents repetitive questions, enhancing interactivity. The system evaluations were conducted with both dental students and tutors in order to measure their user experience and satisfaction with the enhanced simulator. The results indicate higher levels of user satisfaction and usability for custom patient case creation with the newly introduced approach. This novel method offers a promising solution to the current limitations of VPS and paves the way for future advancements in dental education technology.

Keywords: Virtual Patient Simulator, 3D Model Generation, Custom Case Creation, Patient Case Libraries, Score-Based Feedback System

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Entrepreneurial Competencies & Digital Marketing Orientation: Comparative Analysis of Empirical Evidence from the Literature

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Digital technology has had an impact on every sector of society. Global businesses are greatly affected by this, particularly in the modern marketing domain. Businesses, whether big or small, are constantly adapting and utilising digital technologies to identify consumers' needs, wants, and preferences and satisfy them while using them for business communication. Literature indicates the digital marketing orientation of small and medium businesses (SMBs) is subject to the intensity of entrepreneurial competencies. Academics accepted, entrepreneurs require applied knowledge of digital technologies, powered by sound competencies, to reach competitive advantages, but SMBs show major failures against corporate entities. It has led to the loss of great opportunities, competitive advantages, and growth potential. This is an existing problem that has been less researched. Literature from 22 selected countries is scrutinized to identify specificities and commonalities and examine how to impact entrepreneurs' competencies on digital marketing orientation in the SMB context in respective countries. Although literature reveals that the basic digital adoption level is approximately 75%, the actual use for marketing purposes is much lower than that. Consequently, 72% of the SMBs have a website, whereas updating and using it optimally for marketing initiatives indicates lower intensity. More than 64% have adopted email but do not use it, preferably for strategic marketing. More than 90% use social media but do not use the strategic tools available efficiently. Even in developed countries, only 25% use advanced technologies like AI, AR, VR, LLM, and DA. This context is created by the deficiency of entrepreneurs' competencies. It is expected that there will be two significant outcomes from the study in both theory and practice. First, a contribution has been made to entrepreneurial marketing theory and SMB literature by enhancing relevant knowledge. Secondly, study provides an empirical data-driven understanding, insights & analysis into the prognostic impact of entrepreneurial competencies on digital marketing orientation.

Keywords: Entrepreneurs' Competencies, Digital Marketing Orientation, Marketing, Small & medium Tourism Businesses

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Evaluation of Substrate Colonization Efficacy of Mushroom-Forming Fungal Isolates for Developing Mycelium-Based Biomaterials

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Mycelium-based materials (MBM) have become a greener alternative to conventional synthetic material and a solution in waste management. MBMs are produced by growing the mushroom-forming fungi on different organic substrates. The present study evaluated the colonization efficacy of several local basidiomycete fungal isolates *in vitro* as well as on selected agricultural and industrial waste material to select best performing fungal isolates for biomaterial production. Basidiocarps of 14 mushroom-forming fungal isolates grown on decaying trees were collected from Uda Peradeniya, Sri Lanka. By culturing on PDA medium supplemented with Streptomycin (40 mg/L), pure cultures of only seven isolates (1, 7, 8, 10, 12, 13 and 14) were obtained and four isolates were morphologically identified. Colony growth on PDA significantly differed among the isolates ($P<0.0001$) and isolates 12 (*Polyporaceae betulinus*) (⌀8.5cm/day) and 7 (unidentified) (⌀8.3cm/day) demonstrated the highest growth rate followed by isolates 8 (*Lentinus giganteus* Berk.) (⌀5.2cm/day), 10 (*Polyporaceae (Hirtus) betulinus*) (⌀3.2cm/day) and 1 (unidentified) (⌀3.0cm/day). Five isolates showing a higher *in vitro* growth rate were evaluated for their surface colonization efficacy on four different ratio combinations of substrates (i.e. saw dust, rice husk and an industrial material). Area of colonization on a given substrate was recorded and data were analyzed by ANOVA and Duncan grouping. Interaction effect of substrate and fungal isolate was highly significant on surface colonization ($P<0.001$). Industrial waste: saw dust at 1: 3 ratio was selected as the most suitable substrate to colonize the tested five fungal isolates. The highest surface colonization was given by isolate 12 (*Polyporaceae betulinus*) 37cm^2/day, 27 cm^2/day, 38 cm^2/day, 12.75 cm^2/day on all substrate combinations. All five fungal isolates showed the highest colonization on 1:3 ratio of the industrial waste and saw dust. The findings are useful for the development of MBMs using the tested substrates and the fungal isolates.

Key words: Saw Dust, Rice Husk, Cellulosic Absorbent Material, *Polyporaceae Betulinus*

Evaluation of the Potentiality of Sweet Potato (Ipomoea batatas) and Kiri Ala (Colocasia Esculenta) Starches for the Commercial Production of Boba Pearls and Assessment of their Physicochemical Properties

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Traditional tapioca pearls which are made from cassava starch face limitations due to their high cyanide content, perishability, and elevated glycemic index. This study was aimed to address these limitations by assessing the potentiality of utilizing underutilized starches available in Sri Lanka for the commercial boba production by considering abundance, starch yield, and improved nutritional qualities. Sweet potato (*Ipomoea batatas*) and Kiri ala (*Colocasia esculenta*) starches were primarily explored due to their exceptional ability to fulfill the desired characteristics considered above. The study utilized five formulations: T (control – 100% tapioca), TS (35% tapioca + 65% sweet potato), TK (35% tapioca + 65% Kiri ala), TSK (35% tapioca + 35% sweet potato + 30% Kiri ala), and SK (55% sweet potato + 45% Kiri ala). Native starches and starch mixtures were evaluated for amylose content, color, pH, morphology, and functional properties. The pearls were assessed for cooking performance, sensory attributes, and texture profile analysis. Among the formulations, boba pearls produced from the TS treatment emerged as the most promising, exhibiting consumer acceptance similar to the control sample, with no significant difference in assessed attributes (color, aroma, taste, texture and overall acceptance) ($P>0.05$) while demonstrating a lesser cooking time (1.37 min), lower cooking loss (3.56%), and higher water absorption percentage (53.99%). Additionally, they exhibited improved textural properties, notably reduced chewiness. Incorporating various starches significantly enhanced the cooking, textural, and sensory properties of the boba pearls. In the assessment functional properties, the TS starch mixture exhibited moderate Water Holding Capacity (WHC), solubility, and swelling power compared to others, with values reported as 1.61 ± 0.12 g H_2O g^{-1} starch, $0.71 \pm 0.35\%$, and 2.12 ± 0.10 g/g, respectively. In conclusion, this study underscores sweet potato starch as a valuable ingredient for improving the quality of boba pearls, resulting in better cooking performance and organoleptic properties.

Keywords: Boba Pearls, Tapioca Starch, Sweet Potato Starch, Taro Starch, Sensory Attributes, Cooking Performance

Identify the Barriers to Reduce the Life Cycle Cost of Green Buildings in Sri Lanka

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The implementation of green construction is being spearheaded by the global building sector as society shifts toward greater sustainability. The building industry can expand despite Sri Lanka's current energy and financial crises because to green building concepts. A building's Life Cycle Cost (LCC), which includes cost features for replacement, operations, maintenance, and demolition, should be considered. Therefore, the main objective of this research is to identify the barriers to reduce the LCC and provide strategies for reducing that component's impact to further limit LCC. To achieve this main objective this study used qualitative method as the research design. As qualitative research to collect data semi structured interviews were used with the constructional professionals in Sri Lanka. Four different data analyzing methods for qualitative research including thematic analysis, manual content analysis, PRISMA, and literature surveys. For this research to analyzed data manual content analysis was used. Purposive sampling was used as the sample and professional Quantity surveyors, Engineers, Project managers, Architects and Contractors were used as the sample of this research. Finally, this research achieved the main objective of this research and found the barriers to reduce the LCC in a green building and mitigating methods to those barriers. And this study identified 10 barriers and among those barriers the high initial cost as the most affected barrier to minimization of the LCC in A Green Building. To overcome these barriers in this research found 8 mitigating methods and among that giving education and awareness about the Green Buildings was the most suitable way to mitigate those barriers. Finally, this research identified as future research implementation of BIM-related software to minimize the LCC on GB, implement smart technologies for optimizing occupant comfort in green buildings, can be developed.

Keywords: Green Building, Life Cycle Cost, Operational Cost, Maintenance cost, Replacement Cost, Demolition Cost

Impact of Heat Moisture Treatment on Morphology and Physicochemical Properties of Starches from Kiri Ala (Xanthosoma sagittifolium), Hulankeeriya (Maranta arundinacea) and Buthsarana (Canna indica) Grown in Sri Lanka

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Roots and tubers have the potential to be used as an alternative source of carbohydrates due to their high starch content, with selected starches being significant for food security and industrial applications. In this study, starch was extracted from three underutilized root and tuber crops: *Xanthosoma sagittifolium, Maranta arundinacea* and *Canna indica* and those starches were modified and evaluated for their morphology and physicochemical properties in both native and modified forms. Heat moisture treatment as the physical modification, was conducted at moisture levels of 18% and 24%, temperatures of 100 ºC and 120 ºC for 4 to 6 hours. The granular morphology remained unchanged after HMT, although some granules exhibited rough surfaces. Modified *buthsarana* starch showed lower L* values (lightness) compared to other two types. The ΔE values of starch after modification from *kiri ala, hulankeeriya* and *buthsarana* were ranged in between 6.38-10.51, 7.90-8.16 and 12.61-16.05, respectively. Bulk density was decreased in all starches, while water holding capacity was increased in modified starches except 24%, 4h, 100 ºC and 24%, 6h, 100 ºC treatments in *kiri ala* compared to their native counterparts. Swelling power increased with temperature in both native and modified starches, with native starches showing higher values at higher temperatures compared to modified starches. Maximum water solubility was observed at 70 ºC and 80 ºC in modified *kiri ala* and *hulankeeriya* starches. Transparency increased after the modification in both *kiri ala* and *hulankeeriya* indicating reduced retrogradation. These findings highlight the potential of HMT to modify the physicochemical characteristics of starches from selected underutilized crops.

Keywords: Heat Moisture Treatment, *Kiri Ala, Hulankeeriya, Buthsarana,* Morphology, Physicochemical Properties

This research was supported by the University of Peradeniya through URG/2022/02/Ag grant

Impact of Supply Chain Capabilities on Operational Performance with the Mediation Effect of Technological Innovation in the Manufacturing Industry of Sri Lanka

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Supply chain capabilities are essential to Sri Lanka's manufacturing sector as they optimize operational efficiency, minimize costs and ensure on-time delivery of goods, contributing to competitive advantage and customer satisfaction. Effective supply chain management enhances resilience, responsiveness and adaptability, enabling manufacturers to navigate uncertainties, mitigate risks and capitalize on opportunities in Sri Lanka's dynamic market. The purpose of this study is to identify the impact of Supply Chain Capabilities on Operational Performance with The Mediation Effect of Technological Innovation in The Manufacturing Industry of Sri Lanka. This study underpins the resource-based view and the core competency theory. A quantitative cross-sectional survey was conducted using a structured questionnaire. The study sample included 79 manufacturing organizations in Sri Lanka. These organizations adopted supply chain capabilities such as information exchange, activity integration, coordination, and responsiveness. Structural Equation Modeling (SEM) with the help of SmartPLS was used for data analysis. The study's findings emphasize a strong positive correlation between the implementation of supply chain capabilities and operational performance, further the findings highlighted the significant mediating effect of technological innovation in enhancing this relationship. The primary objective of the study is to address operational performance improvement within the manufacturing industry through targeted improvements in both supply chain capabilities and technological innovation, thereby creating greater efficiency, resilience and competitiveness in the marketplace. The study aims to improve the operational performance of the manufacturing sector by improving technological innovation and understanding supply chain capabilities. Its insights are valuable to academics and provide practical guidance to middle and lower-level management, fostering informed decision-making and strategic improvements in industry practices.

Keywords: Supply Chain Capabilities, Operational Performance, Technological Innovations, Manufacturing Industry

Improvement of Drainage Efficiency of the Most Contributed Catchment of Mahaiyawa Tunnel Drainage Canal, Kandy

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The study employed the Stormwater Management Model (SWMM) to assess the impact of implementing best management practices (BMPs) in an upstream mountainous catchment, aiming to decrease peak flow rates and prevent downstream flooding in the Mahiyawa Tunnel area in Kandy, Sri Lanka. The entire catchment leading to the Mahaiyawa tunnel Drainage canal comprises four primary sections, each delineating distinct drainage paths from Udawatta Kale, Asgiriya, Old Matale Road, and Welikanda. The research specifically focused on the Udawatta Kale sub-catchment, which constitutes 42% of the area. Data collected during field visits facilitated the development of the SWMM model, incorporating spatial coordinates, average slope, invert level elevations, canal cross-section dimensions, and precipitation time series data. After thorough analysis, it was discovered that the selected sub-catchment consisted of two outlets. A carefully considered drainage channel with a consistent section and significant upper catchment coverage was selected for calibration during the conducted field visits. Field measurements were used for calibration, including velocity and water depth in a conduit near Outfall 1, along with rainfall data from the Udawatta Kale rain gauge. After comparing the measured values with the model outputs, modifications were made to various parameters such as roughness values, slopes, widths, and infiltration characteristics so that the results showed good agreement with the relative error remaining under less than 10%. The validated model was then utilized to explore the impact of various Best Management Practices (BMPs) on the considered catchment under ten different scenarios. As a result, detention ponds emerged as the most effective solution to improve drainage paths, indicating a significant reduction of 40% in peak flow according to the model output.

Keywords: SWMM (Stormwater Management Model), Validation, Best Management Practices (Bmps), Urban Runoff

Assistant given by the Kandy Municipal Council for data collection is acknowledged.

Knowledge, Awareness, and Attitudes towards Telemedicine among Patients on Continuous Ambulatory Peritoneal Dialysis in Two Distant Clinics and the National Hospital Kandy

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Introduction: Telemedicine combines information and communication technology with healthcare. Although telemedicine is new to Sri Lanka, developed countries around the world are experiencing its benefits. Patients who are on continuous ambulatory peritoneal dialysis (CAPD) are ideal to establish telemedicine due to implications such as non-institutional care, patient independence, and the routine nature of evaluation. This study aimed to identify the level of knowledge, awareness, and attitudes towards telemedicine among patients with CAPD in two distant clinics and the National Hospital, Kandy. Methodology: A descriptive, cross-sectional, quantitative study was conducted among 139 patients with CAPD who were attending the CAPD satellite clinics in Giradurukotte, Wilgamuwa, and the National Hospital, Kandy, Sri Lanka. Data were collected using a pre-tested, self-administered questionnaire designed based on an extensive literature search and the opinions of experts in renal medicine. SPSS version 26 was used to analyse the data. Results: The mean sum of scores for the knowledge, awareness, and attitude assessment questionnaires were 7.17 ± 2.25, 7.16 ± 4.16, and 40.85 ± 3.59, respectively. The majority of participants (50.4%) had good knowledge about telemedicine, 90.6% had poor awareness, and the majority (66.9%) had moderate attitudes towards telemedicine. No participant exhibited a poor attitude level. Out of 139 patients, 15 (10.8%) had personal experience with telemedicine services. Avoidance of transport, convenience, and effectiveness in laboratory results assessment were the main advantages of telemedicine, while financing for instruments and technical issues were the main barriers. Participant education status and residential area were significantly associated with knowledge levels. Higher education was linked with increased participant awareness of telemedicine. Conclusion: Although the awareness of the study participants towards telemedicine was poor, they had a good level of knowledge and a moderate level of attitudes towards telemedicine. Awareness programmes about telemedicine to improve their awareness should be needed.

Keywords: Knowledge Towards Telemedicine, Awareness Towards Telemedicine, Attitudes Towards Telemedicine, Patients With CAPD

Mix Optimization of Blended Mortar Containing Rice Husk Ash (RHA)

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Global infrastructure development and urbanisation drive demand for cement-related mixtures and concrete. Alternative solutions must be investigated due to the high cost of cement manufacture and its environmental impact. Using supplementary cementitious materials (SCMs) is a viable way to deal with these issues. Through hydration, pozzolanic reactions, or other processes, SCMs can reduce carbon footprint while maintaining or even improving the characteristics of concrete. This study investigates the possibility of adopting rice husk ash (RHA) as an SCM and the challenges associated with its use. RHA, a byproduct of rice production, is proven to be an excellent pozzolanic material. However, due to the lack of technical knowledge and other challenges, Rice husk is often discarded as only a waste. The literature suggests that in mortar production 10-20% replacement percentages of RHA are optimum. Our study examines the viability of substituting RHA (5%-30%) for various percentages in cement mortar and assesses the effects of this substitution on properties such as compressive strength, workability, and durability. According to the literature and our experiments, with the increment of RHA percentages in cement mortar, a gradual decrease in workability was observed. This is due to the porous nature and larger surface area in RHA. However, this can be addressed through various methods, such as using admixtures (superplasticisers) or by adding additional water. With the addition of extra water, there were no substantial reduction observed for the compressive strengths. It can be shown that 15% RHA can be considered as the optimum percentage of cement replacement, considering the compressive strength and its consistency. Furthermore, the variation of fresh and hardened properties of the 15% RHA mix was evaluated with varying water/binder ratios. Further studies on the durability aspects of concrete containing RHA are currently ongoing at the Department of Civil Engineering, University of Peradeniya.

Keywords: Sustainability, Supplementary Cementitious Material (Scm), Rice Husk Ash (Rha), Durability, Workability

Molecular Detection of Megalocytivirus in Live Bearing Tropical Fresh Water Ornamental Fish

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The global ornamental fish industry, valued at over $10 billion annually, heavily depends on vibrant captive-bred freshwater species as popular aquatic pets. Sri Lanka has emerged as a leading hub for ornamental fish farming and exports; however, disease outbreaks pose significant threats to the industry. *Megalocytivirus*, a member of the *Iridoviridae* family, causes widespread mortality in both marine and freshwater ornamental fish, especially in Asian regions. Despite documented cases of *Megalocytivirus* infection in ornamental fish cultured in Sri Lanka and exported to Australia, its impact on live-bearing ornamental fish within Sri Lanka remains poorly understood. Therefore, this study aimed to evaluate the presence of *Megalocytivirus* in live-bearing freshwater ornamental fish species in the Western Province (WP) of Sri Lanka. A comprehensive survey collected 144 live-bearing freshwater ornamental fish, including guppies, platys, swordtails, and mollies, with two specimens from each species obtained from 18 aquaria within the WP. Gill samples pooled from each aquarium underwent polymerase chain reaction (PCR) analysis using universal primers targeting all *Megalocytiviruses.* Surprisingly, none of the collected samples showed amplification of the expected 777 bp target, indicating either a low viral load or absence of active infections during sampling. Possible contributing factors to these findings include seasonal fluctuations, inhibitory substances, or genetic variability affecting primer binding efficiency. The study's limitations, such as its modest sample size and brief duration, highlight the need for future investigations with larger samples and extended study periods to enhance statistical robustness and generalizability. The absence of *Megalocytivirus* in apparently healthy ornamental fish populations presents optimistic prospects for the industry's sustainability and trade. Nonetheless, integrating alternative detection methods alongside PCR could yield a more comprehensive understanding of *Megalocytivirus* prevalence, enabling the development of more effective disease management and prevention strategies to ensure the long-term health and viability of the ornamental fish sector.

Keywords: Ornamental fish, Megalocytivirus, Aquarium fish, Live-bearing

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Moragahakanda Resettlement Program with Small Tank System and its Impact on Regional Land Use: A Gis Based Geospatial Analysis

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Resettlement programs have a significant impact on land use changes in an area. The Moragahakanda resettlement program in Sri Lanka is connected with a newly established tank system to fulfill the resettlement policy requirements relevant to the regional livelihood system. Accordingly, 13 small tanks were constructed by changing the original landscape of the region. So, the current study focused on investigating the impacts of this newly constructed small tank system under the Moragahakanda resettlement program on entire land use. To achieve this objective, GIS-based geospatial analysis was used to find the land use changes. Primary data was collected through semi-structured interviews with key stakeholders and direct field observations. As secondary data sources, Landsat 5 and Landsat 8 satellite images were used for land-use classification using supervised classification techniques. Accuracy assessment was completed using a confusion matrix, Google earth and ArcGIS. The findings of this study showed that there have been significant land use changes between 2009 and 2024. The analysis revealed a decrease in forest cover from 62% to 51%, as well as a decrease in grassland and scrubland uses due to reforestation programs and perennial crop development by 6%, were also identified. The Chena land decline coincides with the significant expansion of the resettlement area and agricultural lands by 12%. The construction of 13 new small tanks and irrigation canals, under the resettlement project appears to have contributed to an increase in water bodies by 4%. Further, 13% increase in built-up areas during this period. The observed land use changes may have both positive and negative impacts on the environment, livelihoods, and overall sustainability of the region. The growth of built-up areas and road networks has led to habitat fragmentation and increased pressure on natural resources. However, increased water bodies enhanced water security and groundwater availability, with the increase of seasonal and perennial crop production.

Keywords: Land Use Changes, Resettlement, Tanks, GIS, Geospatial Analysis.

Nasal Colonization of Staphylococcus Aureus and Streptococcus Pneumoniae in Preschool Children Attending Selected Immunization Clinics, Kandy, Sri Lanka

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Staphylococcus aureus colonization is quite common in children in Sri Lanka. Pneumococcal carriage is a prerequisite for pneumococcal disease. The objective of this study was to examine the prevalence and risk factors of nasal carriage of *S. aureus* and *Streptococcus pneumoniae* in preschool children. Both anterior nasal swabs and nasopharyngeal swabs (NPS) were collected from 375 children between 2 to 5 years, attending immunization clinics at Teaching Hospital Peradeniya and Yatinuwara MOH area during June 2023-January 2024. Nasal swabs were enriched in 6.5% NaCl and NPS were stored at -80 ºC. *S. aureus* and *S. pneumoniae* were isolated using conventional microbiological testing. The study group had a median age of 54 months (IQR: 36-60), with 188 (50.1%) males and 187 (49.9%) females. Among 375 participants, 101 (26.9%) were colonized with *S. aureus*, 73 (19.5%) with *S.pneumoniae* and 21 (5.6%) with both. Of these, 52 (13.9%) carried only *S.pneumoniae* and 80 (21.3%) carried only *S.aureus*. Kindergarten attendance (OR=1.92, 95% CI=1.13-3.27), smokers at home (OR=1.85, 95% CI=1.04-3.30), having recent upper respiratory tract infections – (URTI) (OR=16.39, 95% CI=2.23-120.47), family members with URTI (OR=1.83, 95% CI=1.09-3.08) were significantly associated with pneumococcal colonization. No significant associations were found with *S.aureus* colonization. The median age was significantly different between co-colonized (60 months, IQR: 52.5-60) and non-co-colonized children (48 months, IQR: 36-60) (p=0.017). The median weight differed significantly between co-colonized (15.000kg, IQR: 12.450-16.475) and non-co-colonized children (13.200kg, IQR: 11.690-15.100) (p=0.021). Kindergarten attendance (OR=4.016, 95% CI=1.33-12.18) was significantly associated with co-colonization. No significant association found between *S.aureus* and pneumococci colonization (p=0.694). As a conclusion, *S.aureus* and *S.pneumoniae* colonization rates are considerably higher among children aged between 2 to 5 years. Kindergarten attendance is a significantly associated factor for *S.aureus* and *S.pneumoniae* co-colonization.

Keywords: *S.Aureus*, *S.Pneumoniae*, Co-Colonization, Kindergarten Aged Children

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Optimization of Railway Transit Operations through the Implementation of an Enterprise Resource Planning (Erp) System: Automating Concessionary Pass (Season Ticket) Issuance in the Sri Lankan Railway Network

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Lack of efficiency and integrity in the season ticket issuing process of Sri Lanka has been a crucial problem for years as most of the daily train travelers use season tickets. Efficient and reliable season ticket issuance is imperative for the Sri Lankan Railway to meet the needs of daily commuters and to improve operational effectiveness. This study proposes the development and implementation of an Enterprise Resource Planning (ERP) system to automate the season ticket issuing process, addressing the current inefficiencies and integrity issues prevalent in the manual system. The study will begin with a comprehensive analysis of the current season ticket issuing process, with the identified bottlenecks and areas for improvement. Based on the findings, the ERP system will be developed using agile methodology for iterative development, database management systems for data storage, and web technologies for User Interface (UI) design by incorporating features such as online application submission, digital document management, and automated billing for government departments. Moreover, the ERP system's frontend components will be built using React.js by November to provide a rich and responsive user experience. The database will be created using Firebase and allow data to be stored and synchronized in real time. Selenium will be used for automated testing, specifically UI testing across several browsers and devices. The implementation of the ERP system is expected to significantly enhance the efficiency and integrity of the season ticket issuing process including reduced waiting times and streamlined application procedures. Moreover, the automated billing system will minimize errors and ensure accurate accounting for government departments. Railway staff should be trained through workshops to make them technically savvier to operate the system. During the pilot deployment period, beta users faced some challenges in admitting the system and proper guidance and training avoided such challenges.

Keywords: ERP system, Concessionary Pass/Season Ticket, Sri Lankan Railway, Automation, Efficiency

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Phenotypic and Genotypic Characterization of Carbapenems Resistant Escherichia coli Isolated from Humans and Dogs

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Carbapenems are the treatment of choice for *E. coli* producing Extended Spectrum Chephalosporines (ESBLs). Resistance to carbapenems is also emerging through various mechanisms. We assessed the phylogeny, production of ESBLs, carbapenemases (CP)/metallo-beta-lactamases (MBLs), and presence of plasmid-mediated antimicrobial resistance genes in carbapenem-resistant *E. coli* isolated from extra intestinal infections of humans (n=21) and dogs (n=4). Antibiotic susceptibility was determined following EUCAST guidelines. ESBL production was assessed by the double disk synergy test (DDST) recommended by EUCAST 2017. CP and MBL production were determined by the Modified Hodge Test and Combined Disc Test following EUCAST guidelines. Phylogenetic group, ST131-O25b clone, and plasmid-mediated beta-lactam, carbapenem, and quinolone resistance genes, namely bla_{TEM}, bla_{SHV}, bla_{CTX-M}, bla_{KPC}, *qnrA*, *qnrB*, and *qnrS*, were assessed by PCR. Phenotypic tests confirmed four (16%), 12 (48%), and 17 (68%) were identified as producing ESBL, CP, and MBL respectively. Eight isolates did not produce CP and/or MBL. Carbapenem-resistant isolates were mostly in the phylogroup B2 (24/25), of which 41.6% belonged to the O25b-ST131 clone. Of the tested isolates, 72% harbored *qnrB*, while bla_{TEM} and $blas_{CTX-M}$ were present in 76% and 44% of the isolates, respectively. The *blaKPC* was detected only in five isolates. A considerable proportion of non carbapenemase producing carbapenem-resistant (NC-CR) strains were also detected. It warrants further studies to identify the resistance mechanisms of NC-CR isolates. The bla_{KPC} gene was detected only in a small proportion of isolates, and it is necessary to screen the isolates for other carbapenem-resistant genes to comprehend carbapenem resistance mechanisms.

Key words: *E. Coli*, Carbapenem, Resistant, Genes, Phylogroup

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Prevalence, Clinical Characteristic and Pattern of Distribution of Seasonal Corona Virus Associated Acute Respiratory Tract Infections among Adults and Children in the Central Province of Sri Lanka from January 2020 - October 2022

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Human coronavirus (hCoV) is commonly detected in nasopharyngeal aspirate samples from patients with respiratory tract infections. hCoV has gained increased attention after the severe acute respiratory syndrome CoV (SARS-CoV) outbreak in 2002. However, epidemiological understanding of seasonal CoVs (sCoVs) is currently incomplete in many settings including Sri Lanka primarily due to the fact that these viruses are not a part of the standard diagnostic testing panel. A total of 1062 respiratory samples from patients with acute respiratory tract infections (ARTIs) were tested to detect respiratory pathogens including sCoVs using a real time reverse transcriptase polymerase chain reaction from January 2020 to October 2022. Respiratory pathogens were detected in 51.03% patients with the detection rate of 6.96% for sCoVs. Among the sCoV positive patients, 36 hCoV-NL63/HKU1, 29 hCoV-229E and 9 hCoV-OC43 were detected. Fever, cough and sore throat were the most common symptoms detected in all three sCoVs. None of the hCoV- 229E and hCoV-NL63/HKU were detected in 2020. The major peak of hCoV- 229E was observed in April 2021 and hCoV- 229E was prevalent from January 2021 to July 2022. The major peaks of hCoV-NL63/HKU were observed in April 2021 and 2022. The least prevalent sCoV was hCoV- OC43. hCoV -OC43 was detected January to March 2020 and none of this virus was detected during 2021. There were only two hCoV- OC43 detected in June and October 2022. In conclusion, this study shows a prevalence of 6.96% for sCoV infections in patients with ARTI. The circulation pattern of sCoVs and their subtypes varied during the study period. Introducing national sCoV surveillance system will help early detection and monitoring of sCoVs, which will aid in tracking emerging CoVs such as SARS-CoV-2.

Keywords: Seasonal Corona Viruses, Prevalence, Distribution, Clinical Characteristics, Sri Lanka

Response to GnRH Administration at Artificial Insemination in Crossbred Temperate Dairy Cattle Supperovulated under Tropical Environment

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Gonadotrophin Releasing Hormone (GnRH) plays a key role in the endocrine control of superovulation in cattle. The objective of this study was to assess the effectiveness of GnRH injections at the time of artificial insemination (AI) in super ovulated temperate (Friesian-Jersey crossbred) dairy cows reared in a tropical environment (30–32 ^{o}C and 19–22 ^{o}C, day and night, respectively, with 77–80% relative humidity). Superovulations were conducted using 1st parity, 3-3.5 body condition score, 3–4-month post-partum, imported cows (n = 12) in January–June 2020 at the veterinary teaching farm. Cows were administered an intramuscular (IM) injection of PGF2α (500 µg) 7 days before the intravaginal progesterone devisors (CIDR) insertion on day 0 of the programme. Superovulations were conducted with IM injections of FSH (20 mg/mL) in the morning and evening for 4 consecutive days (2.2, 1.6, 1.1, and 0.6 mL/dose, respectively) from day 7. On day 9, CIDR was removed, and PGF2α was administered in the morning (500µg) and the evening (250µg). Cows were divided into two groups (treatment-TG, control-CG) equally. Twelve hours after the commencement of estrous, 2 AIs were done in 12-hour intervals for both groups. Cows in the TG received GnRH (100µg) at the first AI, and the CG didn't receive it. A replicate was conducted following the cross-over design. Embryos were collected by the non-surgical retrograde flushing technique on day 7 post-AI and classified according to the FAO guidelines. The ovulation rate tended (P=0.083) to be higher, while the median number of embryos recovered (P=0.003), embryo recovery rate (P=0.008) and percentage of transferrable embryos (P=0.019) were significantly higher, with notably lower degenerated oocytes in the TG. Results revealed that administration of GnRH at the time of AI in superovulation would be highly beneficial in Friesian-Jersey crossbred cows in tropical environments.

Keywords: Artificial insemination, Cattle, Embryo transfer, GnRH, Superovulation

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Screening Metabolites of Selected Soil Fungi and Their Potential Bioactivities

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Fungal metabolites possess a broad range of functions, ranging from antibiotics to mycotoxins. These metabolites are either retained within the cell, secreted into the surrounding environment, or exuded via guttation. This study screened metabolites produced by seven different soil fungal strains isolated from a grassland near the University of Peradeniya, Sri Lanka, for potential industrial applications. Two *Penicillium* spp. (PEN1 and PEN2), one *Aspergillus* sp. (ASP1), one *Gongronella*-like sp. (GON1), and three unknown spp. (UNK1, UNK2 and UNK3) were among the isolates. Of them, five isolates demonstrated guttation. Both guttation droplets and ethylacetate broth extracts of fungal metabolites were screened using Thin Layer Chromatography (TLC), Fourier Transform Infrared spectroscopy (FTIR), and qualitative chemical tests. Metabolites were also evaluated for their antibacterial activities against *Staphylococcus aureus* and *Escherichia coli*, as well as for antifungal, and toxin production, with appropriate positive and negative controls. All fungal isolates produced varying metabolites, with ASP1 and PEN2 producing a higher number of metabolites. FTIR results suggest the presence of nitriles in both *Penicillium* spp. (PEN1 & PEN2), with amides and esters specific to PEN2. Guttation droplets of UNK1 demonstrated a significant antibacterial activity against *S. aureus* (with an inhibition zone diameter of 17.37±0.85mm), while ethylacetate extract of ASP1 exhibited potent antibacterial activity against *E. coli* (17.67±0.18 mm). Ethylacetate broth extract of GON1 displayed notable antibacterial (11.33±0.36 mm) and antifungal (10.00±0.20 mm) activity against *E. coli* and *Cladosporium* sp., respectively. The highest antifungal activity against *Cladosporium* (13.70±0.20 mm) was reported with PEN2, whereas UNK2 and PEN1 showed no effect. Furthermore, ethylacetate extracts from ASP1, PEN1, and PEN2 inhibited *Brassica juncea* seed germination, indicating potential herbicidal effects. The study concludes that soil fungi have the potential to produce bioactive metabolites that can be utilized in various industrial applications.

Keywords: Antibacterial, Antifungal, Chemical screening, Metabolites

"SharePlate": A Surplus Food Redistribution Application for Promoting Sustainability and Wellbeing in Sri Lanka

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Food waste presents significant challenges, impacting the economy, environment, and societies across Sri Lanka. This study investigated the sources and causes of surplus food waste in Sri Lanka while technology development focuses on designing and developing the SharePlate application. The SharePlate, a mobile application designed to minimize food waste by facilitating surplus food redistribution. The application uses smart resource allocation techniques to efficiently match surplus food with individuals or organizations in need. SharePlate redistributes surplus food to reduce waste and promote social and environmental benefits. This study outlines the application's key concepts, operation, and potential advantages, highlighting its role in supporting sustainability and enhancing community well-being. The development process involved collaboration with stakeholders, and evaluation assesses the app's impact through user feedback and data analysis. SharePlate utilizes mobile app development, geolocation services, database management, user interface design, and feedback mechanisms. SharePlate was developed using a variety of programming tools and techniques that are important to its performance and efficacy. Mobile app development frameworks such as React Native are used for cross-platform compatibility by assuring widespread accessibility. Geolocation services are combined with Google Maps Application Programming Interface (API) to provide exact location monitoring for food donors and recipients. Database management solutions are used to effectively store and retrieve data by allowing for smooth communication between users and food providers. In addition, user interface design principles combined with feedback systems improve the app's usability and responsiveness to give a pleasant user experience. SharePlate intends to change surplus food management in Sri Lanka by using these software engineering practices while also promoting sustainability and responsible food consumption. Through SharePlate, it offers efficient surplus food management, reduced food waste, responsible consumption promotion, community engagement, and scalability for broader adoption as an innovative solution in Sri Lanka.

Keywords: Food Waste, Surplus Food Redistribution, Mobile Application, Sustainability, Sri Lanka

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Shear Capacity Prediction of Ultra-High Performance Fiber Reinforced Concrete (UHPFRC) Beams using Machine Learning Techniques

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Ultra-High Performance Fiber Reinforced Concrete (UHPFRC) is a cutting-edge material known for its superior strength, durability, and versatility in structural applications. Its unique composition, including higher cement content, ultra-fine particles and high-strength steel fibers, contributes to exceptional mechanical properties. While UHPFRC finds applications in various structural elements such as bridges, prestressed elements, and building components, its widespread use is particularly notable in retrofitting elements due to these performance characteristics. Steel fibers in UHPFRC enhance both the shear capacity and ductility of elements, allowing for thin sections without shear reinforcement. In structural applications of deep beams, shear deformation becomes a critical consideration as the failure is primarily governed by shear forces. Thus, optimizing the shear capacity of deep beams becomes highly important and UHPFRC typically offers promising attributes in this regard. The accurate prediction of shear capacity and a detailed analysis of the factors influencing the shear strength of beams are paramount in structural and material engineering perspective. Despite experimental and numerical approaches being employed to explore the shear capacity of UHPFRC, still there is no robust and accurate method that considers the combined effect of all features due to the complex and non-linear nature of relationships between parameters. This research addresses this gap by leveraging Machine Learning (ML) techniques to develop a reliable prediction model for shear capacity estimation. For this, a comprehensive database was formed, incorporating material and performance characteristics gathered from the literature and a Gradient Boosting Regression (GBR) model was trained using this database. The final prediction model showed commendable accuracy with an R^2 value of 89.2%. Furthermore, a feature importance analysis was conducted to study the most influential parameters impacting the shear capacity of UHPFRC beams and the shear span-to-depth ratio and the shear reinforcement ratio emerged as the most critical parameters to the final outcome.

Keywords: UHPFRC, Shear Capacity, Machine Learning, Feature Importance

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Shrinkage Characteristics of Modified High-Volume Fly Ash Concrete

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This research investigates the drying shrinkage characteristics of high-volume fly ash concrete (HVFA) modified with slag, which are industrial by-products with significantly lower carbon footprints than cement. Motivated by the growing significance of supplementary cementitious materials (SCMs) in sustainable construction, this research seeks to enhance the environmental and mechanical performance of concrete. Despite the known benefits of SCMs, challenges remain, particularly concerning the drying shrinkage properties of modified concrete. A comprehensive literature review was conducted to synthesize the existing knowledge, identify gaps, and lay the groundwork for experimental investigations. Experiments were carried out separately for mortar and concrete, modifying the mixes by replacing 70% of the binder with fly ash and slag, thereby reducing the cement content to 30%. Tests were conducted to collect data on shrinkage (up to 90 days), compressive strength (up to 90 days), porosity and mass variation. For the mortar samples, six different mixes were used: one control mix, one with 70% fly ash, and four with varying slag content (5%, 10%, 15%, and 20%) while maintaining fly ash at 65%, 60%, 55%, and 50%, respectively. For the samples made for compressive strength and shrinkage testing, alkali-activated slag finer than 45 μm and 75 μm was used respectively and the samples were cured under different environmental conditions. Three different mixes were used for the concrete samples: one control mix, one with 70% fly ash, and one with 15% slag while maintaining fly ash at 55%. Slag addition helped to mitigate the reduction of early-age compressive strength of mortar. For studies like this, it is vital to ensure the quality and the fineness of the raw materials before using them, to achieve reliable results. The findings are expected to contribute to the advancement of environmentally conscious construction practices.

Keywords: Drying Shrinkage, High-Volume Fly Ash Concrete, Slag Modification, Supplementary Cementitious Materials, Sustainable Construction

Study on Use of Bee Honey as the Energy Source for Synthesis of Goat Semen Extender

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Goat semen cryopreservation crucially conserves genetic resources for animal breeding programs. This study focuses into the investigation utilization of bee honey as a potential energy source in this process, aiming to assess its impact on sperm motility and viability over time. The main objective of this study is to investigate the effectiveness of bee honey as a natural energy source in goat semen cryopreservation, specifically examining its influence on sperm motility and viability. Five samples were obtained from sexually matured, fertile Saanen male goat via electro-ejaculation. Initial analyses of fresh semen samples included physical and microscopic evaluations. Various concentrations of bee honey (3%, 3.5%, 4%, and 5%) were tested alongside a fructose control group. The semen was then processed, diluted with extender, chilled. Extended semen was chilled at 4ºC for 2.5 hours, then processed semen was again diluted with the appropriate extender until they reached the necessary final volume and loaded into 0.25 ml French mini straws, and cryopreserved in liquid nitrogen at -196ºC. Sperm quality s parameters sperm motility and sperm viability via eosin nigrosine staining technique were assessed pre-freezing, post-chilling, and at various intervals post-thawing. The goat semen viability was founded to be dependent on the concentration of bee honey in the tris-egg yolk extender. The live-dead ratio of goat semen which was assessed gave high values for 3% ,3.5% while 4% and 5% groups low values with comparison to the control group. This study demonstrates the potential of bee honey as a cryo-protective agent in goat semen cryopreservation. Tris-egg yolk extenders supplemented with 3% and 3.5% bee honey showed improved post-thaw semen quality parameters compared to the control. These findings contribute to the advancement of techniques for preserving goat genetic resources and have implications for animal breeding programs.

Keywords: Goat, cryopreservation of semen, tris- egg yolk-based extender, bee honey, sperm viability

The Effect of Cereal based Functional Beverage on Patients with Chronic Gastritis: A Pilot Study

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Chronic gastritis (CG) is a common gastrointestinal condition that can be seen all around the world. It significantly reduces the quality of life (QoL) of its affected individuals. Therefore, this study was aimed at finding the effect of a rice-based beverage on the QoL of CG patients. The beverage was comprised with a traditional red rice variety, "*Kuruluthuda*", and soy milk powder as major ingredients. The volunteer participants for this study were recruited after ensuring they are CG patients through a medical screening. The study participants included a convenient sample of 22 young adults. The QoL Instruments for Chronic Diseases-Chronic Gastritis (QLICD-CG) questionnaire was employed in this study as the major data collection tool to measure the changes in QoL of the participants for a period of 10 weeks. The QoL data were gathered weekly for 8 weeks during the beverage consumption as the starting meal for the day and for another 2 weeks after the discontinuation of the beverage consumption. The socio-demographic data of the study group were collected using a socio-demographic questionnaire during the baseline data collection. Anthropometry, body composition, psychological stress and 24-hour dietary recall data were gathered during baseline, 4th week and the 8th week during the data collection period. The status of psychological stress was measured using a "Perceived Stress Scale" (PSS). The study results showed that there was a significant improvement in the QoL of the participants after the beverage consumption. The average QoL at the baseline was 54.1% and it increased to 75% at the end of the beverage consumption period. Additionally, the psychological stress of the study participants had an inverse relationship with the QoL. There was no significant difference in the anthropometry and body composition measurements due to the beverage consumption. In conclusion, further research is warranted to investigate the effect of regular consumption of the beverage on the potential of improving the quality of life of patients with chronic gastritis.

Keywords: Anthropometry, *Kuruluthuda*, QLICD-CG, Soy

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The Role of Machine Translation and Computer-Assisted Translation Tools in Global Business Success: A Comprehensive Analysis

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In today's hyperconnected global economy, businesses face the challenge of overcoming linguistic barriers to effectively communicate and engage with diverse audiences worldwide. Machine Translation (MT) and Computer-Assisted Translation (CAT) tools have emerged as indispensable technologies in facilitating cross-border communication and driving global business success. Globalization has heightened the demand for efficient translation solutions in international business. Yet, the effectiveness of Machine Translation (MT) and Computer-Assisted Translation (CAT) tools in enhancing global business success remains insufficient. This study aims to evaluate the role of machine translation (MT) and computer-assisted translation (CAT) tools in overcoming linguistic barriers, enhancing operational efficiency, and fostering cross-cultural communication within global business. It will analyse their impact in both multinational corporations (MNCs) and small-to-medium enterprises (SMEs) across various industries, and identify best practices and challenges related to their adoption and use. This study employs a mixed-methods approach, combining quantitative surveys and qualitative interviews with professionals from MNCs and SMEs engaged in international business activities. The quantitative phase involves the distribution of surveys to gather data on the utilization, perceived effectiveness, and challenges of MT and CAT tools. The qualitative phase comprises in-depth interviews to gain deeper insights into the experiences, strategies, and recommendations of practitioners using these technologies in global business contexts. Initial findings show widespread use of MT and CAT tools in various sectors, aiding in overcoming language barriers, enhancing translation quality, and speeding up localization. Challenges include linguistic accuracy, cultural nuances, and integrating tools into existing workflows. Success requires investing in training, using hybrid approaches of automation and human input, and selecting tools that align with linguistic needs and business goals. In summary, MT and CAT tools are essential for businesses to address global linguistic and cultural challenges. Effective use demands careful consideration of organizational needs, technology, and human input. Strategic adoption can enhance expansion, efficiency, and competitiveness. Recommendations include investing in employee training, adopting hybrid translation approaches for accuracy and cultural sensitivity, regularly evaluating tool performance, and fostering collaboration among language professionals, technology developers, and business stakeholders to tailor solutions to industry needs.

Keywords: Computer-Assisted Translation, Global Business Success, Machine Translation, Multinational Corporations, Small-to-medium Enterprises

Traffic Sign Detection and Recognition for Next-Generation Advanced Driver Assistance Systems for Smart Transportation

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Traffic sign detection and recognition have garnered significant interest due to advancements in autonomous vehicles, intelligent and advanced driver assistance systems, and smart transportation. These systems rely heavily on accurate detection and interpretation of traffic signs to ensure safe and efficient navigation. Research findings indicate that a significant proportion of accidents caused by human errors are due to non-compliance with traffic signs. To mitigate this issue, a robust system capable of accurately recognizing the road environment and detecting traffic signs has been proposed. In this study, 11 traffic and road signs were identified as the most critical based on their impact on driving safety and regulation compliance. An AI-based model capable of identifying these traffic sign classes was developed using the YOLOv8 platform. The model was trained using a dataset comprising 2200 images, and manually annotated to ensure accuracy. Preprocessing steps included resizing, normalization, and data augmentation techniques such as rotation, scaling, and brightness adjustment to increase robustness. The training process involved 10 epochs with a batch size of 1. The model achieved an accuracy of 95% and higher in the detection and classification of all traffic sign categories. Furthermore, the model's performance metrics were evaluated, with an error in class prediction recorded at 0.95, bounding box error calculation of 0.39, and mAP50 of 0.99. The evaluation employed a cross-validation technique with an 80-10-10 train-validation-test split. For implementation, the model was deployed on a Jetson AGX Xavier GPU, which enabled specific optimizations, such as CUDA integration and parallel computations, to achieve real-time detection and recognition, making the system highly suitable for integration into autonomous vehicles and advanced driver assistance systems. Through these advancements, the proposed system represents a significant step forward in traffic sign detection and recognition technology, promising to enhance road safety in smart transportation systems.

Keywords: Deep Learning, Parallel Programming, YOLOv8, Jetson AGX Xavier, Traffic sign detection

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Water Safety Plans for Rural Communities: A Case Study from Drinking Water Treatment Plants in Badulla, Sri Lanka

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The Water Safety Plan (WSP), endorsed by the World Health Organization, is essential for ensuring global access to safe drinking water. However, its effectiveness in rural areas like Badulla, Sri Lanka, is largely unexplored. This study investigates WSP strategies in rural regions, focusing on factors influencing water quality risks. Data on risk elements affecting water safety were collected from five major drinking water supply systems managed by the National Water Supply and Drainage Board (NWSDB) and four smaller systems operated by Community-Based Organizations (CBOs) in Badulla. The study utilized questionnaires, on-site observations, and location-specific surveys. Additionally, the study analyzes long-term water quality trends, system effectiveness, and climate change impacts. In NWSDB-managed facilities, raw water turbidity ranged from 10 to 1000 Nephelometric Turbidity Units (NTU) due to rainfall, typically reduced during treatment, though treated water occasionally exceeded guidelines, raising concerns about contamination or operational issues. Epidemiological studies and five years of water quality data from nine treatment plants showed no correlation between water quality and waterborne illnesses. However, pathogens were found in 46% of 50 household tap samples within the NWSDB distribution area in the Badulla Medical Officer of Health zone. The risk assessment highlighted challenges for CBO-operated facilities in maintaining water quality, mainly due to inadequate treatment and poor catchment area management. Despite an overall assessment of drinking water quality in Badulla as acceptable, only four out of nine schemes implementing WSP consistently delivered higher-quality water. The study offers recommendations to improve operations, performance, and reduce costs, providing valuable guidance for professionals and stakeholders in water treatment and public health management in rural areas.

Keywords: Drinking Water Treatment, Risk Assessment, Water Quality Management, Performance Evaluation, Community Engagement

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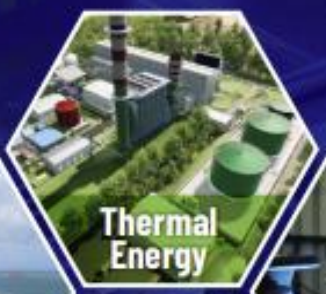

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