



PERADENIYA UNIVERSITY
INTERNATIONAL RESEARCH SESSIONS

i PURSE 2023

“NAVIGATING THE NEW FRONTIERS : EXPLORING OPPORTUNITIES”

PROCEEDINGS
VOLUME 24



20th and 21st September 2023

UNIVERSITY OF PERADENIYA

SRI LANKA



“Navigating the New Frontiers: Exploring Opportunities”

PROCEEDINGS

PERADENIYA UNIVERSITY INTERNATIONAL RESEARCH SESSIONS (iPURSE) 2023

Volume 24

i PURSE 2023

20th & 21st September 2023

Hosted by

University Research Council

University of Peradeniya, Sri Lanka

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MESSAGE FROM THE VICE-CHANCELLOR

Professor M.D. Lamawansa

University of Peradeniya

Peradeniya University International Research Sessions (iPURSE) 2023



I am indeed happy to see that the signature research conference of the University of Peradeniya, iPURSE, is being held in an improved format this year. The decision to organize iPURSE under six sub-themes to encompass all disciplines is indeed commendable. This approach promotes inclusivity and allows researchers from various fields to showcase their work, fostering interdisciplinary collaboration and a holistic view of the university's research efforts.

The numbers that I understand, with 400 paper submissions and a 60% acceptance rate, demonstrate the strong interest and engagement within the university's research community.

iPURSE undeniably serves as a vital platform for the dissemination of research and knowledge sharing. It contributes significantly to the academic landscape of Sri Lanka and provides a space for scholars to engage in meaningful discussions and collaborations. The presence of eminent researchers further enhances the prestige and quality of the event, attracting a diverse range of perspectives and expertise.

I appreciate the University Research Council (URC) and the faculty-level organizing committees for their dedicated efforts in making iPURSE a success. Their commitment to maintaining the event's excellence and innovation while expanding its accessibility is noteworthy.

Your enthusiasm for attending the conference reflects the positive impact iPURSE has on the research community, and I'm sure your participation will contribute to the event's success. I wish you a productive and insightful experience at the conference.

MESSAGE FROM THE CHIEF GUEST

Vidya Jyothi Professor Chandra Wickramasinghe

Peradeniya University International Research Sessions (iPURSE) 2023



I am delighted to address your meeting today. As an alumnus of the University of Ceylon who graduated in 1960 (there was no Peradeniya campus then), and in particular as one who was instrumental in setting up the IFS (now NIFS) I am particularly happy to talk to you today. The setting up of the IFS in 1983 was really the beginning of a culture of pure scientific research that was not there in Sri Lanka in former years.

When I had my first discussions with President Jayawardene (1982-1983) regarding the setting up of an Institute of Fundamental Research in Sri Lanka, I became acutely aware of the need to encourage a scientific research culture in the island. President Jayawardene, who had just visited India, was impressed by the progress India had made in recovering their due place in scientific research. Now of course we know that they are the undisputed leaders in many areas of world class science including Space Science, recently becoming the first nation to successfully send a probe to the south pole of the Moon.

If India can do all this why not Sri Lanka? This was Jayawardene's exhortation to me and I fully agreed with his sentiment. The instinctive urge to understand the world in which we live is, I believe, a natural instinct in humans dating back possibly to tens or hundreds of thousands of years ago. In the Indian subcontinent this was no less a priority, and one that expressed itself in Vedic culture many thousands of years ago long before the Western world could boast of similar intellectual achievements. In fact, we often forget that fundamental concepts of mathematics and science have deep roots in the Indian subcontinent. For instance, the number system that we take for granted, the concept of negative numbers and infinity, all belong to this part of the world. The western world reluctantly adopted these ideas very late in the day!

The progress of humans over the past 10,000 years is better documented than at earlier times. Such progress was clearly punctuated by a long series of technological developments. The invention of agriculture, the use of metal tools, irrigating the land and the birth of urban settlements marked the beginning of a trend that led in turn to other specific technological advances. The invention of printing, the use of coal, the steam engine, the internal combustion engine followed in quick succession - leading to motor cars, aircraft at the dawn of the 20th century, and finally rockets and spacecraft, heralding the dawn of the space age.

The twentieth century witnessed perhaps the greatest revolutions in physics and biology – nuclear physics leading to the possibility of nuclear power that might eventually replace coal and gas, and also the more sinister repercussions of Hiroshima and dreaded prospect of future nuclear conflicts. In relation to biology the crucial step was the set of discoveries related to DNA – unravelling our genome – leading the way to either gene therapies and improved health outcomes, or the prospect of biological warfare. Developments in Computing, IT and electronic communications have perhaps had the most far-reaching impact on humanity in recent times, and further rapid progress in these areas appears to be a certainty. The development of Artificial Intelligence is grabbing the headlines today, but in my view the exploration of space, and the unreserved acceptance of our biological links with the cosmos may well occupy top place in our ambitions for the short and medium-term future.

Of the many future scenarios that we might wish to consider, the role of science and technology must inevitably rank high. Many long-overdue shifts of paradigm have been held in abeyance for too long, and future progress may well be contingent upon their acceptance. In this category the long overdue acceptance of the cosmic nature of life, and of the prevalence of alien life throughout the universe would be transformative for biology as well as astronomy and have far-reaching implications for humanity.

The major developments in science and technology that started gathering momentum in the middle of the 20th century must continue apace. and serve humanity in its attempt to grasp the problems of the future. With the emergence of subjects such as biophysics and astrobiology, transdisciplinary considerations will play an ever-increasing role in our future exploration of the planet, and our attempts to exploit our planetary

resources, alleviate disease, improve the quality of human life in ways that minimise environmental degradation.

Space exploration which began in the middle of the 20th century would undoubtedly continue with further searches for life in our planetary neighbourhood, and the existence of life on Mars, and the moons of Jupiter as well as in the wider universe might be confirmed. Space exploration would also almost inevitably include “space mining”, the exploitation of the mineral and biological resources of the interplanetary environment. Space biology, space medicine, development of IT, interplanetary travel are areas in which progress is bound to happen, and happen fast, leading to profound changes in our way of life in future generations.

The 20th century could not only be seen as a century of science and technology, but a century of wars. It is a century punctuated by wars from the very beginning. The First World War, the Second World War including wars against Nazi Germany and Japan, the Vietnam War and the war in Iraq. In the present century we now have the war between Russia and Ukraine, which is in essence a war between Communist Russia and the so-called free world. It is a clear priority for the future to work towards the avoidance of future wars which are likely to prove even more disastrous than the wars that took place before.

If we can avert the risk of lethal wars there could be much that our species can look forward to, provided we preserve our planet in a stable and habitable state. Alongside the great strides of technological progress that would be inevitable in the future, protection of the environment and prevention of its decay must remain an important priority for future planners. An increase in the Earth's average temperature seems almost inevitable if we look at modern trends, but keeping such increases to an absolute minimum would be of utmost importance. Continuing industrial development will at least for the near future involve some dependence on fossil fuels, but moving away from such a dependence is important and would depend upon continuing research investment in wind, wave, nuclear and possibly other alternatives. If the use of fossil fuels continues, the requirement to remove CO₂ from the environment using new technologies remains an option to be more fully explored. All modern states pay lip service to this important requirement but there is no guarantee that much will be achieved in the direction of “net zero carbon emissions” in the foreseeable future.

The theme of your conference, "Navigating New Frontiers: Exploring Opportunities," is both timely and thought-provoking. In today's world, we are facing unprecedented challenges including the spectre of climate change. But we also have unprecedented opportunities to address such challenges through innovation and collaboration for the benefit and well-being of all humanity.

I am sure, your conference will provide an opportunity for scientists and academics from all disciplines to come together and share their ideas to navigate new frontiers and exploring new opportunities. I am confident that the papers to be presented at your meeting will provide valuable insights and inspire us to think more creatively and effectively about the challenges and opportunities that we face in the decades that lie ahead.

I am particularly interested in seeing how the conference explores interdisciplinary solutions that benefit society as a whole. In today's complex world, it is more important than ever to approach problems from multiple perspectives. By working together, academics from different disciplines can develop innovative solutions that address the root causes of problems and create a more sustainable and equitable future for all. We need to bring together the many different strands of evidence that need to be pulled together for the benefit of all.

I would like to end with a quotation from a sonnet by the American poet Edna St. Vincent Millay from her book of Sonnets – Huntsman, what quarry?

*"Upon this gifted age, in its dark hour,
Rains from the sky a meteoric shower
Of facts . . . they lie unquestioned, uncombined.
Wisdom enough to leech us of our ill
Is daily spun; but there exists no loom
To weave it into fabric.... "*

Vidya Jyothi Prof Chandra Wickramasinghe, MBE, ScD (Cantab),
Hon DLitt (Tokyo)

Honorary Professor at the University of Buckingham, United Kingdom:
University of Ruhuna, Sri Lanka, and Adjunct Professor at the National
Institute of Fundamental Studies, Sri Lanka

MESSAGE FROM THE GUEST OF HONOUR

Professor Arun Chockalingam, Professor of Medicine and Global Health, University of Toronto, Canada

Peradeniya University International Research Sessions (iPURSE) 2023



The organizers of the Peradeniya University International Research Sessions – iPURSE2023 ought to be congratulated for a thoughtful focused multi-disciplinary program quite relevant and timely in this fast-changing world which is in crisis.

The theme of this annual conference *Navigating the New Frontiers: Exploring the Opportunities* is not only timely but also provokes the academic minds, both young and established, to explore interdisciplinary understanding and collaboration to create sustainable solution for human existence.

The world is in crisis, and it goes without saying that countries are struggling to keep afloat. When the developed economies are facing potential economic recessions, supply chain issues, unsustainable climate change and environmental degradation, all leading to a huge human sufferings post COVID-19, then we cannot even imagine the plight of most, if not all, LMICs.

When I looked at the program of iPURSE 2023, I am genuinely impressed by the efforts of all involved in creating an agenda for future research and development that should result in cross disciplinary research to find sustainable health and economic affordability for all concerned. My heart-felt congratulations to everyone who made a difference. The program is not only thoughtfully crafted but also laid a strong foundation for out-of-the-box approach to find sustainable and affordable solutions.

I look forward to sharing the global knowledge base and learning more

KEYNOTE ADDRESS - Prof. Ajith de Alwis

University Research and Research Advocacy for Economic Game Changing....

Abstract

Sri Lanka as we all know is facing polycrisis. The national professional response of flight is quite disconcerting. While you hear on debt restructuring and taxation efforts etc there is no significant sign of innovative programs to increase FDI or forex flow inwards. Mostly the issue of Sri Lanka is lack of economic development. When Triple Helix Model of Development came there was the clear recognition of Universities, State and Industry. We know that these interlinkages are missing in Sri Lanka and there never had been a strong movement in this direction. Our economic concepts appear to miss what Solow and Romer - two Nobel laureates in Economics - articulated as key enablers for significant economic growth. In the absence of understanding Universities will have to play the advocacy role as well. The university researcher taking on the challenge in addressing both complex and wicked problems that Sri Lanka faces is an imperative. The present situation also offers a researcher a unique opportunity to engage with impact. There are many examples in crisis times where researchers have absolutely shown the way and turn tables. What research to be carried is important. The presentation will push for the researcher to think and act differently.

About the keynote speaker



Prof. Ajith De Alwis is a Senior Professor of Chemical and Process Engineering at University of Moratuwa and currently the Dean of Faculty of Graduate Studies of UoM and the Chief Innovation Officer of the National Innovation Agency (NIA).

He graduated in Chemical Engineering from University of Moratuwa and subsequently obtained his PhD from University of Cambridge. He has a MBA from Postgraduate Institute of Management (PIM) University of Sri Jayewardenepura. He is a Fellow of the National Academy of Sciences Sri Lanka. Eco-innovations, Innovation Management and IP is now a serious interest of his from a National Development aspect.

MESSAGE FROM THE CHAIRPERSONS OF iPURSE 2023

Prof. J.B. Ekanayake and Dr. D.A. Satharasinghe

Peradeniya University International Research Sessions (iPURSE) 2023



The University of Peradeniya International Research Sessions (iPURSE 2023) is an annual conference that brings together eminent researchers from all disciplines to share their research findings, exchange contemporary knowledge, and build partnerships and collaborations to advance the frontiers of knowledge for the sustainability of all life on Earth. This year's conference is held under the main theme of "Navigating the New Frontiers: Exploring Opportunities" and the following sub-themes:

1. Business Resilience in Crisis
2. Innovations for Sustainable Cities and Societies
3. Towards Sustainable Agricultural Systems: Transforming Challenges into Opportunities
4. Managerial Turn in Higher Education: The Issues and Challenges for Human Existence
5. Global Health Challenges and Opportunities for Collaboration
6. Scientific Frontiers and Overcoming Challenges for Sustainable Transitions

Under these six sub-themes, we received about 400 extended abstracts. After a rigorous review process, 250 were selected for presentation over two days. We would like to thank the main organizing committee, faculty level organizers, and the eminent review panel for their continuous support in making this event a success. Without their support, we would

not be able to ensure the excellence of this event. We are also proud to note that we have a world-renowned eminent scientist as the Chief Guest, a multidisciplinary researcher as the Guest of Honour, and a number of well-known keynote speakers who will add glamour and pride to this event. We are confident that this event will be an ideal platform for our researchers to share their research findings and we must congratulate them for their commitment to make this event a success.

Prof. J.B. Ekanayake and Dr. D.A. Satharasinghe
Chairpersons,
Organizing Committee-iPURSE 2023

FOREWORD

It is with great pleasure that I write this Foreword to the Proceedings of the Peradeniya University International Research Sessions, iPURSE 2023 conducted under the theme “Navigating the New Frontiers: Exploring Opportunities”. The proceedings comprise of a total of 316 abstracts organized under 6 subthemes; Business Resilience in Crisis (26 abstracts), Global Health Challenges and Opportunities for Collaboration (102 abstracts), Innovations for Sustainable Cities and Societies (44 abstracts), Scientific Frontiers and Overcoming Challenges for Sustainable Transitions (46 abstracts), Towards Sustainable Agricultural Systems: Transforming Challenges into Opportunities (51 abstracts) and Managerial Turn in Higher Education: The Issues and Challenges for Human Existence (47 abstracts).

The conference aims to facilitate interaction between research students and early career academics with the more established academic community to discuss their current work. I am confident that the proceedings will be an added resource for the scientific community to inspire further study and research in all areas.

I would take this opportunity to express my gratitude to all expert reviewers who played a crucial role in the review process. Their dedication helped immensely to uphold the standard of the work presented at iPURSE 2023. I would also like to extend my sincere appreciation to all the chairpersons of the subthemes and the faculty-level editorial subcommittees. Their invaluable contributions were essential in making proceedings of iPURSE 2023 a reality. I would like to express my heartfelt gratitude to co-chairpersons of iPURSE 2023 organizing committee; Prof. J.B. Ekanayake and Dr. D. Satharasinghe. Their unwavering support eased the process of compiling the proceedings. I also wish to extend special thanks to Ms. Yashoda Thotahewa and Ms Kalsha Rathnayake of University Research Council for their invaluable secretarial assistance in compiling the proceedings.

Prof. P.R Jayasooriya
Publication Chair/ iPURSE 2023

KEYNOTE ADDRESS - Dr. S. Maheswaran

Business Resilience in Crisis: An Entrepreneurial Perspective

Abstract

In today's volatile, unpredictable, complex, and ambiguous (VUCA) world, businesses face tremendous pressure to survive. Business resilience is essential for enterprises to thrive in the face of crises. This speech proposes entrepreneurial mindfulness as a critical business resilience strategy for Sri Lankan entrepreneurs. Entrepreneurial skills allow enterprises to adapt and grow stronger in the face of challenges.

The speech begins by analysing the nature of crises in Sri Lanka, highlighting its history and complexities. It then focuses on how entrepreneurs provide insights at the individual level for business resilience at the enterprise level. The speaker then defines self-resilience as the agency of individuals and their priorities in crises. Owners of enterprises play a key role in shaping critical organizational outcomes. As large proportion of enterprises in Sri Lanka are small and medium sized ventures, the agency of entrepreneurs is crucial for decision-making and its governance structures. The speech then explains how different resilient strategies, including bricolage and effectuations, enable enterprises to become stronger than before. It uses several examples to explain how firms develop resilience capacity to react to and capitalize on unexpected events that could potentially threaten their survival. For example, social networks and embeddedness are identified as important facilitators of business resilience. Moreover, the dynamic capability of a firm for sensing and seizing of opportunities and reorganizing resources are also considered to be crucial for business resilience in ventures. Eventually, entrepreneurial ventures carefully consider crises as opportunities and become more proactive and resilient.

About the keynote speaker



Dr. S. Maheswaran is a Senior Lecturer in the Department of Operations Management, University of Peradeniya. He obtained his PhD in 2016 from the Norwegian University of Science and Technology, Norway. He is currently Head of the Dept. of Operations Management. His research interests include how entrepreneurs survive through challenges. He has experiences in coordinating international projects with World Bank Funded AHEAD Project and British Council. He currently promotes entrepreneurship education among undergraduates/postgraduates at the University of Peradeniya.

KEYNOTE ADDRESS - Prof. S.A.M. Kularatne

Global Health Challenges and Opportunities for Collaboration

Intuition and Research

Abstract

The research means a systematic study of material and sources to establish facts and reach new conclusions. Intuition by definition is an impromptu origination of thought without conscious reasoning. There are many synonyms for intuition such as instinct, and gut feeling which have additional connotations as well. What is the impact of intuition on the research process? Intuition is a spark of vague thought that all men possess and use while being unaware of it. This applies to researchers as well during their research process. Researchers very often use scientific intuition to originate a good research question and to find the best pathway to investigate it. Such kind of intuition-based research explores the truth and leads to ground-breaking outcomes. Neurophysiologically, intuition is a right brain activity whereas rational and logical thinking is a left brain activity. The research process is a whole brain activity, where the combination of intuition and rational, logical reasoning finally directs to the goal. Therefore, the balance of these two regions of the human brain creates a good researcher. In today's world development of human intuition is challenged due to multiple factors such as over-teaching in primary, secondary, and university education systems, where observation-based thinking time is restricted. Similarly, current trends in advanced technology such as artificial intelligence may have risks and benefits on intuition. Finally, Intuition is predominantly a gifted inborn ability and a skill, that can be sharpened through persistence and perseverance with the task. Also by association with peers, touch with surroundings, reading, gaining experience, thinking, and wise use of technology. Therefore, intuition can be cultivated in growing minds. Here, one's own thinking time should be given priority.

About the keynote speaker



Prof. S.A.M. Kularatne is a Senior Professor and Chair of Medicine, University of Peradeniya. He has 186 journal publications and won the CVCD Excellence award in 2010 and many presidential awards for research. He holds the position of Director, of the Centre for Research in Tropical Medicine (CRTM) and Chair of SLMA snakebite committee.

KEYNOTE ADDRESS - Prof. Ranjith Dissanayake

Innovations for Sustainable Cities and Societies

Abstract

The relentless urbanization reality has brought to light numerous challenges demanding a shift towards sustainability, with approximately 3 million people migrating to cities every week, and by 2050, 68% of the global population will reside in urban areas. Greening our urban landscapes is essential, but true sustainability extends beyond aesthetics. To achieve true sustainability, both cities and societies must transform. This transformation entails embracing green infrastructure, efficient public transport, renewable energy sources, effective waste management, and responsible water conservation. Therefore, one promising solution is biomimicry, drawing inspiration from nature's solutions. The happiness and well-being of citizens must be central to our efforts, much like nature's balance. Neglecting this integral aspect can result in negative externalities, including increased energy consumption, contributing to climate change. In pursuit of a sustainable society, we must prioritize environmental stewardship, human well-being, and economic prosperity. Sustainable cities are those that combine environmental resilience with social well-being. However, theory alone will not suffice; innovation is the catalyst for transformation. Sri Lankan academics and professionals must adapt, innovate, and follow strategies (AIS) that extend from basic research to commercialization, and wealth generation since the island is grappling with economic crises and imbalanced trade. Contribution to a circular economy can be done by adopting principles of green innovation and entrepreneurship. In conclusion, the imperative for innovation in achieving sustainability for cities and societies is clear. By harnessing nature's wisdom and fostering a culture of innovation, we can pave the way for a greener, happier, and more equitable future.

About the keynote speaker



Prof. Ranjith Dissanayake is a Senior Professor in Civil Engineering at the University of Peradeniya. He is a Fulbright Scholar in the USA and was awarded the Young Scientist Award in 2007 for Excellence in Scientific Research by the National Science and Technology Commission. He is the Chairman of the Green Building Council of Sri Lanka (GBCSL), the President-Elect of the Institution of Engineers, Sri Lanka (IESL), and a Vice President of the Chamber of Construction Industry (CCI). He is also the former Secretary to the State Ministry of Rural Roads and the State Ministry of Urban Development. He is the founder of gapHQ, Colombo 07.

KEYNOTE ADDRESS - Prof. S.H.P.P. Karunaratne

Scientific Frontiers and Overcoming Challenges for Sustainable Transitions

Genetically Modified Mosquitoes for Mosquito-borne Disease Control

Abstract

Due to mosquito-borne diseases, nearly about one million deaths occur worldwide annually. Slow progress in vaccine development and pathogen resistance to drugs have diverted the disease control efforts towards vector mosquito control. Battle against mosquitoes has become intense with increased vector resistance to available insecticides and scarcity of new insecticides in the pipeline. Releasing genetically modified mosquitoes is becoming a promising novel tool for the control of mosquito populations. Two different endpoints are targeted by these interventions; population reduction or suppression and, population replacement with strains that are refractory to pathogen development and transmission. Sterile Insect Technique (SIT) and Release of Insects carrying a Dominant Lethal (RIDL) gene have been introduced to suppress mosquito populations. Although the latter has been successful in reducing dengue mosquito populations up to 95% in field trials, the high cost involved, need for mass rearing and frequent release, and low fitness shown by modified mosquitoes have hindered its success. Incompatible Insect Technique (IIT), using *Wolbachia* infections, has blocked transmission of dengue virus up to 98% in field mosquito populations in Australia and Vietnam. Transgenic mosquitoes have been recently produced using CRISPR/Cas9 system, a highly effective tool for precision genome-editing. A fascinating CRISPR gene-drive system with a gene cassette conferring resistance to malarial parasites had the ability to be transmitted to >99% in a population. These transgenic mosquitoes are still being tested at laboratory level and their acceptance in regulatory and social domains for field application is yet to be resolved.

About the keynote speaker



Prof. S.H.P.P. Karunaratne, B.Sc., M.Sc. (University of Peradeniya), Ph.D (University of London); is a Senior Professor & Chair of Zoology; Deputy Vice Chancellor (2018-2021); Dean/Faculty of Science (2007-2013); Director, National Institute of Fundamental Studies (2015 – 2018); Fellow of the National Academy of Sciences Sri Lanka (since 2006); Fellow of the Royal Entomological Society, London, UK (since 1997); Member of the DDT expert group, WHO/UNEP, Geneva, Switzerland (since 2015); Chinese Academy of Science PIFI

Scholar (2022-2023), Visiting Research Professor Liverpool School of Tropical Medicine UK (2001-2010), Visiting Research Fellow University of Wales Cardiff UK (1994-2000). He has more than 200 Research publications, Google Scholar h-index of 34; 3629 citations; Several National and International prestigious Awards for Excellence in Research.

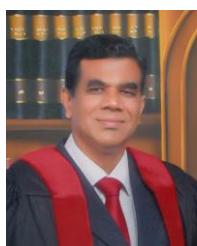
KEYNOTE ADDRESS - Professor W.A.J.M. De Costa

Towards Sustainable Agricultural Systems: Transforming Challenges into Opportunities

Abstract

A sustainable agricultural system is one that fulfils the demand for food and other products while ensuring its capacity to continuously fulfil the future demand. Increasing demand and diminishing resources make sustainable agricultural production a continuing challenge. Increasing the biological efficiency with which agricultural crops produce their yield is a key requirement to ensure sustainability. A major focus in this regard has been on increasing the efficiency of photosynthesis in terms of using three critical resources, *viz.* radiation, water and nitrogen. The maximum radiation use efficiency of the present photosynthetic machinery of C3 and C4 plants is only 4.6% and 6.0% respectively. The key photosynthetic enzyme, Rubisco, has been identified as a potential intervention point to engineer plants with higher photosynthetic efficiency via genetic modification. However, achieving higher photosynthetic rates via increased Rubisco concentration require simultaneous overproduction of its activator, Rubisco Activase. Although this achieves higher crop yields and greater nitrogen use efficiency (yield per unit of nitrogen), the crop's dependence on nitrogen increases. Therefore, increasing crop yields with a lower nitrogen supply remains a major challenge. Climate change offers an 'escape route' as the Rubisco requirement for photosynthesis decreases at higher atmospheric CO₂ concentrations and higher air temperatures. Increasing transpiration efficiency (photosynthesis per unit of transpiration) is an essential requirement for sustaining agricultural production with less water and tolerating drought. Increasing the sensitivity of stomata to evaporative demand offers the possibility of increasing transpiration efficiency without reducing yield. Possible downregulation of cellular-level improvements at the plant population level adds complexity to the efforts to increase biological efficiency of agricultural production. A holistic approach which takes in to account all processes of crop yield determination and their interactions is needed to overcome this complexity.

About the keynote speaker



Professor W.A.J.M. De Costa is the Chair of Crop Science at the University of Peradeniya. He earned his PhD from the University of Reading in the United Kingdom. In a career spanning over 30 years, his research has focused on the responses of agricultural cropping systems and tropical rainforests to environmental stresses such as drought, heat, salinity and climate change. His work has been based on empirical experimental research and simulation modelling.

Professor De Costa has authored over 100 peer-reviewed research articles with an h-index of 25 and has supervised 21 PhDs and 9 MPhils.

KEYNOTE ADDRESS - Professor Arjuna Parackrama

Managerial Turn in Higher Education: The Issues and Challenges for Human Existence

Abstract

"Higher education is not only a means to an end, it is also a crucial end in itself. It cannot be 'managed' any more than ethics can. Its value is not its cost. Rather than corporatizing education, we should be educating corporates."

The “managerial turn” in higher education marks a sea change in the way the field is both viewed and assessed, but this change has been almost entirely unsatisfactory. The attempt to transform universities into quasi-business entities, especially in Sri Lanka, is justified on the grounds that the system is badly “mismanaged”, is irrelevant, wastes scarce public resources and students’ time, provides inadequate knowledge to graduates to be useful working citizens, and makes little contribution to the economy. In all of this, there is a systematic attack on the non-science and non-professional faculties, as the villains of the piece. While these criticisms are valid, within limits, it has not been demonstrated that the reinvention of the universities as pseudo-corporatized yet highly bureaucratic and rigidly hierarchical entities through a “management” revolution has resolved or even begun to address any of these or similar concerns. The university is now being confusedly seen as a for-profit corporate entity with the Vice Chancellor as its CEO and the Council as its rubber stamp. VCs, Deans and Heads wield excessive and non-transparent power, which, in turn, leads to servility and conformism. Yet, red-tape and bureaucracy (unacceptable in the business sector) prevail, with no immediate avenue of redress or intervention, except as a supplicant.

It is clear that the university system needs re-thinking and even drastic, far-reaching change. However, the reductionism of these problems to the following can only lead to disaster: (i) an uncritical notion of [corporate] “quality” that is neither rigorous nor suitable, (ii) the blind replication of an archaic and grossly inappropriate business management formula and discourse as a panacea for all ills, equating *inter alia*, success with financial viability and business prospects, (iii) a non-transparent, hierarchical administrative framework and bureaucracy that, in addition to all its other inherent weaknesses is also gender biased, and finally (iv)

the abrogation of the social and civic responsibilities of nurturing human values and norms that build bridges across the economic, social, political, linguistic, cultural and ideological divides. In rejecting this managerial model, we urgently need to unite across disciplinary differences to ask ourselves the most fundamental questions in order to re-situate our vocation as scholars, teachers, and the conscience of our nation.

About the keynote speaker



Prof. Arjuna Parakrama has received senior visiting fellowships at Columbia University, the University of Pittsburgh, La Trobe University, the US Institute of Peace, the Carnegie Council for Ethics and International Affairs, the National University of Malaysia, and was a Fulbright New Century Scholar in

He obtained prestigious research grants from the Guggenheim Foundation, CCEIA and USIP. Until he retired in July 2023, he was Senior Professor of English (Cadre Chair), and for five years served as Director, Centre for the Study of Human Rights at the University of Peradeniya. He was also Dean, Faculty of Arts, University of Colombo. In addition to publishing many articles, monographs, and books of poetry, he is the author of *De-Hegemonizing Language Standards: Learning from (Post) Colonial Englishes about “English”*.

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Business Resilience in Crisis

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Human Resource Practitioners and Non-HR Staff Members' Perceptions of e-HRM: A Case Study Conducted in a Private Sector Bank in Sri Lanka

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Employee attitudes play a critical role in the success of e-HRM in Sri Lanka, especially about concerns related to job security, job satisfaction, and employability. Understanding the perspectives of HR practitioners on e-HRM in the banking sector is essential for overcoming implementation barriers. However, there is limited data available on e-HRM adoption perceptions in Sri Lankan private sector banks. This study, conducted at ABC Bank in Sri Lanka, explores e-HRM practices and employee perceptions. The study employs qualitative research with an interpretivist philosophy and uses an inductive approach to collect insights from employees in private sector banks. It primarily focuses on ABC Bank for an in-depth investigation. Data is gathered through semi-structured interviews conducted via Zoom, lasting 30 to 60 minutes, and recorded and transcribed. Snowball sampling is used to identify suitable interviewees. Additionally, the study supplements interview data with a review of annual and stakeholder reports. Prior research indicates that dimensions of organizational readiness significantly influence the intention to use e-HRM. This aligns with the key finding that a positive technological culture at ABC organization, supported by skilled employees, innovation, resources, and favorable information policies, has led to a positive perception of e-HRM among HR practitioners and non-HR staff. HR practitioners value e-HRM adaptability and see it as a positive factor in performance and productivity. User-friendly interfaces and strategic tasks are seen as beneficial, but concerns include reduced HR interaction, job displacement, security issues, and adaptability challenges. Non-HR employees at ABC Bank highly value the e-HRM system for its features, user-friendliness, and accessibility. In conclusion, the research findings emphasize the importance of user-friendly systems, proper training, and top management support. Contrary to conventional beliefs, the study demonstrates that e-HRM can actually enhance productivity and strategic work, dispelling concerns about reduced face-to-face interactions.

Keywords: e-HRM, Perception, HR practitioners, Banking sector, Organizational readiness

An Evaluation of Employee Perceptions of Digital Tools and Job Security

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Digital tools enable employees to work more efficiently, collaborate with each other easily, and access information and data from anywhere by automating repetitive tasks, reducing errors, and speeding up the information processing. This study focuses on the biscuit manufacturing industry in Sri Lanka since the Sri Lankan biscuit manufacturing companies adopt digital tools to enhance operational effectiveness, minimize wastage and augment the competitive edge impacting the job security of operational level employees who will be replaced with automation technologies, robotic technologies, or other digital tools. Hence, the purpose of this study is to evaluate the impact of digital tools on job security of operational level employees in the biscuit manufacturing companies in Sri Lanka. Hence, it is expected to ensure that the benefits of digitalization are balanced with the welfare of operational level employees. The research is designed as a quantitative study with Automation Technologies, Robotic Technologies, and Other Digital Tools as the independent variables and Job Security as the dependent variable. A sample of 341 participants from the five biscuit manufacturing companies is selected through the quota sampling technique. Data collection is performed through a questionnaire survey. Pearson's correlation analysis and multiple regression analysis are used to analyse the responses and determine the relationships among variables. The questionnaire is checked for validity and reliability. The findings reveal that Automation Technologies, Robotic Technologies, and Other Digital Tools have a significant positive impact on Job Security. Therefore, all the Sri Lankan companies must start utilizing digital tools in their factories to enhance operational effectiveness, minimize wastage and augment the competitive edge since these tools can further improve employee satisfaction and retention.

Keywords: Digitalization, Automation technologies, Robotic technologies, Digital tools, Job security

The Determinants of Accounting Professionals' Intention to Brain Drain in Sri Lanka

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The Accounting profession in Sri Lanka plays a significant role in corporate governance and accountability. Unfortunately, there is an intensification in the brain drain among accounting professionals in Sri Lanka. This study *initially* assessed the level of Accounting Professionals' intention to brain drain. *Secondly*, the study examined the determinants of intention to brain drain in Sri Lanka from a multi-theoretical perspective (i.e., Lee's Theory of Migration and Network Theory). The study followed a quantitative research approach using a sample of 400 consisting of current accounting and finance professionals representing all industries and potential accounting professionals (i.e., the individuals who are willing to be an accountant). Primary data are collected using a self-administered questionnaire, and data are analyzed using one-sample t-tests and multiple regression analysis. One sample t-test suggested an increased intention among Accounting Professionals to brain drain since the mean value (3.28) is above the test value of 3 with a significant mean difference of 1.28. Interestingly, multiple regression analysis indicates that Socio-Political Push Factors, Socio-Political Pull Factors and Economic Push Factors have a statistically significant positive impact on the intention to brain drain. In contrast, Economic Pull Factors display an insignificant impact. The research findings illustrate that the socio-political push factors are the most significant factors which impact the intention to brain drain, which refers to the existing political influence and government policies, corruption practices, the current rate of crime and violence and the organizational politics and family influence in job promotions and job transfers. The findings are helpful for the corporate sector, regulatory bodies, government and policymakers to create an appropriate socio-political environment to nurture the accounting profession in Sri Lanka. The results of this study provide an in-depth understanding of the intention to brain drain among Sri Lankan accounting professionals and provide a significant contribution empirically.

Keywords: Brain drain, Socio-political push factors, Socio-political pull factors, Economic push factors, Economic pull factors

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The Influence of Telecommuting on Emotional Exhaustion: Moderating Role of Intrinsic Motivation

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Telecommuting has become the new normal after the outbreak of COVID-19 which was embraced by organizations around the globe. Telecommuting is identified as a work practice that involves members of an organization substituting a portion of their typical work hours to work away from a central workplace and working from home using technology to interact with others as needed to conduct work tasks. However, with the rise of telecommuting, mental health issues reported by teleworkers continuously increased highlighting the issue of emotional exhaustion. Although emotional exhaustion was reported by numerous teleworkers, literature claims that very few studies have focused on addressing emotional exhaustion of teleworkers. Existing literature claims that individuals who engage in telecommuting tend to experience a higher level of intrinsic motivation due to the inherent features of telecommuting such as flexibility. In addition, the literature reveals that when individuals possess high intrinsic motivation, they are less likely to experience emotional exhaustion. This study consists of two research questions, namely, “What is the influence of telecommuting on emotional exhaustion?”, and whether intrinsic motivation moderate the relationship between telecommuting and emotional exhaustion?”. Accordingly, two hypotheses were developed based on the literature. Data were collected from 389 respondents derived through a convenient sampling method using a survey that consisted of pre-validated scales for the variables, and data analysis was done using Smart PLS. The study reveals that telecommuting influences the emotional exhaustion of teleworkers, but when teleworkers possess greater intrinsic motivation the influence on emotional exhaustion can be altered by their strong sense of intrinsic motivation so the relationship between telecommuting and emotional exhaustion is moderated by intrinsic motivation. Hence, the findings of the study show that it is essential to review the influence of telecommuting on emotional exhaustion and internal personal characteristics of individuals when implementing telecommuting to ensure a win-win situation for all parties.

Keywords: Telecommuting, Emotional exhaustion, Intrinsic motivation

Audit Quality and Its Impact on the Degree of Earnings Management in the Post-COVID Era: Evidence from Sri Lanka

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The purpose of this study is to identify the impact of audit quality on the degree of earnings management in the post COVID era. The research makes use of a literature review that covers the time between 1981 and 2022, focusing on audit quality-related literature, earnings management literature such as using discretionary accruals and a reworked version of the Healy's Model, an analysis is carried out to determine the level of control that is exercised on earnings. The quality of the audit is determined by looking at two proxies: the size of the audit firm and the independence of the audit company. The study was conducted using the data collected from 92 non-financial listed companies that have a financial year that ends in March during the post-COVID research period of 2019/20 to 2021/22. Descriptive statistics, correlation analysis, and regression analysis were some of the methods that were utilized when doing an analysis of the data that had been acquired. Although there are inconclusive results, the results of the study provide proof that the level of earnings management that occurs in Sri Lanka is not significantly influenced by the quality of the audits that are carried out in the country. Hence, this study concludes that the audit quality has no significant impact on the degree of earnings management in the post-COVID era. This study also states that it could be due to the absence of an efficient system for monitoring and overseeing the auditors.

Keywords: Audit quality, Earnings management, Audit firm size, Auditor Independence, Healy's model

Tourist Arrival Forecasting in Sri Lanka Amidst the COVID-19 Pandemic: Deep Learning and Machine Learning Models

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Tourism is a crucial pillar of Sri Lanka's economy, significantly contributing to its GDP and offering numerous employment opportunities. Accurate predictions of tourist arrivals are vital for the country's tourism industry, which is susceptible to various crises. In this study, we present our research on developing deep learning and machine learning models to forecast tourist arrivals in Sri Lanka, considering the COVID-19 impact. Using historical tourist arrival data from 1972 to May 2023, we applied MinMaxScaler() for data normalisation and explored LSTM, BiLSTM, ANN, SVR, and RF models. The ANN model outperformed others, demonstrating the best forecasting results for both pre- and post-COVID-19 scenarios. The impact of COVID-19 has brought unpredictability and volatility to tourist arrivals. Our models have adapted to these changes and have shown promising results. Although the models exhibited limitations in pre-COVID-19 forecasting, comprehensive feature engineering, hyperparameter tuning, and additional data sources can enhance their performance. In conclusion, our research showcases the applicability of deep learning and machine learning models for forecasting tourist arrivals in Sri Lanka amid the COVID-19 pandemic. The ANN model stands out as the most suitable for accurate predictions, offering valuable insights for the tourism industry's planning and decision-making.

Keywords: COVID-19 impact, Deep learning, Machine learning, Sri Lanka, Tourist arrivals

Mediating Role of Knowledge Acquisition Capabilities between Intellectual Human Capital and Financial Performance of Indigenous Craft Industries in Sri Lanka

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The study investigates the mediating role of knowledge acquisition capabilities between intellectual human capital and financial performance in indigenous craft industries in Sri Lanka. The data were collected from 225 owners of indigenous craft industries by using a structured questionnaire located in seven crafts villages in Sri Lanka and analyzed with the help of a Partial Least Squares Structural Equation Model (PLS-SEM). The study found that knowledge acquisition capabilities positively mediate the relationship between intellectual human capital and financial performance. Further, it proved that intellectual human capital has a positive impact on financial performance, and knowledge acquisition capabilities have a positive impact on financial performance. Thus, the study concluded that the knowledge acquisition capabilities of owners of indigenous craft industries are a vital tool to enhance the financial performance of these industries. The study suggests that owners of the indigenous craft industries, policymakers, donors, and others implement strategies to develop and strengthen the knowledge acquisition capabilities of indigenous craft villages to improve their financial performance.

Keywords: Financial performance, Knowledge acquisition capabilities, Intellectual human capital, Indigenous craft industries

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The Application of CAGE Distance Framework on Bilateral Foreign Direct Investment Inflows to OECD and Non-OECD Asian Countries

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The purpose of this study is to assess why some home countries find some host countries and regions more attractive for Foreign Direct Investments than others and whether cultural, administrative, geographical, and economic distance play a role in separating successful countries from others with special reference to The Organization for Economic Cooperation and Development (OECD) countries versus Non-OECD Asian Countries. The study included a subsample analysis of four Asian sub-regions (East, Southeast, South, and Middle East), which helps to shed light on how the effects of multiple distance dimensions alter according to structural differences in different Asian sub-regions. The panel data analysis includes bilateral flows from 8 major OECD investor countries to 17 non-OECD Asian countries and 12 OECD countries. The balanced panel sample consists of 232 country pairs and data from 2013 to 2019, for seven years and 1624 observations. The estimation techniques used are Pseudo Poisson Maximum Likelihood Estimator and Ordinary Least Square. This study contributes to the existing literature by combining multiple dimensions of the CAGE framework with the Augmented Gravity Model and addressing the literature gap of what is the role of multiple distance dimensions for location attractiveness. Our findings suggest that developed nations prefer to invest in administratively, geographically, and economically closer countries and multiple distance dimensions negatively impact bilateral Foreign Direct Investments between country pairs. Bilateral Foreign Direct Investment flows of developing nations are more vulnerable to the negative impact of distance dimensions than developed nations. The impact of cultural distance is insignificant, proving that the importance of cultural distance is lessening with globalization and the development of technology. Finally, due to structural disparities at the sub-regional level in Asia, several distance dimensions have different implications on bilateral inward Foreign Direct Investments. Our findings suggest improving government institutions' quality and political stability. GDP growth and rise in per capita GDP/income, improvement of transportation and communication infrastructure, and getting into Free Trade Agreements may enable inward Foreign Direct Investments.

Keywords: FDI, CAGE distance dimensions, Augmented gravity model, Asia, PPML

The Factors Influencing the Adoption of Management Accounting Practices in Small Medium Enterprises within the Puttalam District

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This study explains the factors influencing the adoption of Management Accounting Practices (MAPs) in Small and Medium Enterprises (SMEs) within the Puttalam district, Sri Lanka. Good MAPs are required for SMEs' growth since they have a significant impact on organizational performance. The objective of this study is to identify the factors that are influencing the adoption of MAPs among SMEs within the Puttalam district through the lenses of the Theory of Planned Behaviour and the Technology Acceptance Model. All the SMEs in the Puttalam district were considered as the population, but only 375 of the 7785 SMEs were chosen at random using the Morgan Table. Multiple regression analysis was employed as the analysis technique in order to achieve the objective of the study. The results of the regression analysis revealed, on the one hand, that the adoption of MAPs was positively and significantly influenced by the perceived benefit, attitude of the management, external pressure, and security. On the other hand, perceived ease of use and ICT knowledge have an insignificant influence on the MAPs adoption. As a result, only four of the six proposed hypotheses were confirmed. The study has found that the MAPs adoption in Sri Lanka is low and that there is a gap between the theory and practice of MAPs compared with the West. Initiating new promotional programs to make employees more familiar with these MAPs and arranging an awareness program related to the necessity of MAPs will increase awareness of the usefulness of MAPs.

Keywords: Adoption, Attitude, Management accounting practices, Perceived benefits, Small medium enterprises

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Sustaining a Brand in VUCA Environment through Internal Competencies: A Study Based on High End Star Class Hotels in Sri Lanka

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The corporate world is ever changing and becoming volatile with the need of strategies to overcome challenges generated by the dynamic environment referred to as the VUCA (volatility, uncertainty, complexity, and ambiguity) environment. Tourism and hospitality industry is subjected to changes as it is directly affected by the changing environment. Sustaining a brand is crucial as it acts as a lighthouse to safely survive the threats of the VUCA environment. Hotels use marketing strategies to be strong and strengthen the brand in the VUCA environment. The implementation of these marketing strategies requires changes in the internal business environment. The purpose of this paper is to examine the changes of internal competencies in brand building in responding to the VUCA environment. Researchers emphasized the internal competencies required for high end star class hotels to be competitive in the VUCA environment. This study was conducted using the qualitative case study approach. The data was collected using in-depth semi-structured interviews, images, and company documents in high end star class hotels in Kandy, Colombo and Negombo including Wattura Resort & Spa, Amaya Hills, Grand Kandyan Hotel and Cinnamon Lakeside Hotel. The generic qualitative data analysis method was used in analyzing the data. As per the findings, the hotels are required to undertake the changes for their internal competencies to sustain the brand in the VUCA environment: redefining soft elements in organization, enhancing organizational agility, enhancing employee talents, and adjusting physical presence. Therefore, hotels reflected the necessity to adopt the dynamic capabilities in responding to the changing environment. The findings imply that changing the internal environment is instrumental to be competitive in the marketplace. The hotels have shown that being innovative is no longer an option but table stakes to sustain their brands. Accordingly, the managers are required to continuously embrace these internal organizational changes.

Keywords: VUCA environment, Internal competencies, Case study method, Branding

The Impact of Corporate Social Responsibility on Financial Performance: With Special Reference to Listed Manufacturing Firms in Sri Lanka

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Corporate Social Responsibility (CSR), a management strategy, calls for incorporating social and environmental issues into daily operations and relationships with stakeholders. It is critical that CSR principles play a significant role in firm value and strategic planning for the effective use of such initiatives to enhance social wellness. There are many studies done on CSR and Financial Performance (FP) in Sri Lanka, but their findings are vague. The primary goal of the present research was to determine the relationship between CSR and the financial performance of the manufacturing firms listed on the Colombo Stock Exchange (CSE). The current study also aimed at determining the return on investment and/or advantages of funding CSR initiatives. Twenty-two manufacturing companies were selected from the total manufacturing firms listed on the CSE for the period from 2017 to 2021 using the convenience sampling method. Firms not engaged in CSR activities and newly registered firms in the population were excluded from the sample. The audited annual reports of companies were used to collect the required data. Financial performance was measured by using: return on assets, return on equity, return on sales, and return on investment. CSR initiatives, namely employee relations CSR, environment and consumer-related and community-related CSR, were measured using content analysis. Panel data regression analysis was used to test hypotheses and examine the impact of CSR on FP. The findings of the hypotheses state a negative impact of CSR on ROA, ROE, ROS, and a positive impact of CSR on ROI. According to the findings, CSR has a negative impact on the financial performance of the listed manufacturing companies. As an implication, it is highly advised to develop a CSR strategy that is focused on the long-term objectives of the company.

Keywords: Corporate social responsibility, Financial performance, Listed manufacturing firms

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Financial Literacy and Stock Market Participation among the Accounting and Finance Undergraduates in Sri Lanka

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Even though the capital markets are essential for economic growth, Sri Lankan households highly depend on personal savings for the accumulation of wealth. For several reasons, domestic investors may not prefer to invest in the capital markets, which are essential for economic development and from which the citizens can also benefit. In achieving individual financial wellbeing, financial literacy is crucial for making better investments and financing decisions. However, the proportion of young investors in Sri Lanka seems still low, with a lack of objective and subjective financial literacy. Through the lenses of Prospect Theory and Heuristic Theory, this study aimed at identifying whether undergraduates who possess sound financial literacy are willing to participate in stock market investment. A survey was conducted among randomly selected 306 final-year accounting and finance-specializing undergraduates at state universities in Sri Lanka. The multinomial logistic regression analysis was carried out to test the hypotheses of the study. The study found that there is no significant relationship between financial literacy and stock market participation of accounting and finance undergraduates at Sri Lankan state universities. This study provides information to interested parties in the financial and education sectors about the necessity of encouraging stock market participation and financial literacy among the young population. The study offers ideas on how to create financial education programs that will enhance financial literacy and promote stock market participation of undergraduates studying accounting and finance.

Keywords: Accounting and finance undergraduates, Financial literacy, Objective financial literacy, Subjective financial literacy, Stock market

The Impact of Environmental Knowledge and Awareness on Employee Green Behavior with Special Reference to Non-Executive Employees at ABC Manufacturing Company in Sri Lanka

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The 21st century is progressively seeing a rise in interest in environmental issues due to how industry growth affects ecological sustainability. Hence, businesses should attempt to minimize environmental harm as much as possible. In particular, becoming green has become a key component of organizational strategic goals. The importance of employees in environmental activities makes it imperative in today's company environment to encourage green behavior. Accordingly, employers are looking for highly proactive environmental concerns employees in order for their businesses to advance more successfully. Given the crucial significance of Employee Green Behavior (EGB), researchers focus on examining the predisposing factors that result in employee green behavior and promote the use of further empirical data to support their conclusions. As a larger-scale electronic manufacturing firm, ABC organization practices environmental health policies, procedures, and processes but eventually creates wastages indicating a red light for food and water wastage in practical situations. Apart from that, several studies stated the importance of conducting research on developing country manufacturing firms with non-executive employee green behavior with many antecedents. Thus, the objective of this study was to examine the impact of Environmental Knowledge and Awareness (EKA) on EGB with special reference to ABC manufacturing organization. This study adopted quantitative methodology with survey strategy, and the sample was selected using simple random sampling technique. The researcher adopted the questionnaire of Gatersleben, et al., (2002) and Safari, et al., (2018) for EKA and EGB. A self-administrated questionnaire survey was conducted, and data comprised responses from 280 non-executive employees, and a simple linear regression analysis was performed. The study found that EKA positively impacts EGB. The study findings made a significant contribution to the growth of EGB literature and provide guidance for HR people to create policies and promote EGB within the organization. Future researchers may concentrate on various industries, such as service and education, using mediating moderating, and independent variables.

Keywords: Environmental knowledge and awareness, Employee green behavior

Analyzing Direct Marketing Campaign Using Classification Techniques

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Marketing campaigns can be classified into two main types, namely, Mass and Direct. Direct marketing allows banks and other financial organizations to focus on customers who are likely to subscribe to their products, offers, and packages. However, identifying these potential customers often poses a challenge for financial institutions. This study considered a typical bank direct marketing campaign dataset to achieve four main objectives: discuss classification techniques, develop and optimize selected models to predict whether clients subscribe to term deposits or not, determine the key features influencing them, and finally, compare the performances of the developed models to select the best model. Firstly, a comprehensive understanding of classification techniques named Logistic Regression, Decision Tree, Naïve Bayes Approach, Random Forest and K Nearest Neighbor were applied. Secondly, key features were identified that influence a customer's decision to subscribe to a term deposit. Then prediction models were built to predict whether a client will subscribe to a term deposit or not. After the initial model development, data imbalance problem was addressed and the model performances were optimized by tuning the hyper parameters. The significant variables that affect subscription for term deposit were identified as term duration, initiating month, consumer confidence index, number of employees, campaign status, job, consumer price index, euribor-three-month rate, marital status, education, last contact day of the week, outcome of the previous marketing campaign and employment variation rate. Random Forest was identified as the best model which achieved 89% accuracy with 92% sensitivity, 72% specificity with 94% F1 score. Throughout the study, the focus was on maximizing sensitivity while maintaining accuracy, as banks aim to retain all potential customers. The developed model can be used to make suggestions and recommendations for identifying potential customers efficiently and with high accuracy for future scenarios.

Keywords: Classification techniques, Direct marketing campaign, Logistic regression, Sensitivity, Specificity

The Impact of Lean Manufacturing Practices on Operational Performance in the Apparel Industry in Sri Lanka: The Mediating Effects of Agile Manufacturing

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Global business organisations prioritise performance improvement amid a complex, unstable business climate due to globalisation, rivalry, and client expectations. Adapting to complex, dynamic, and uncertain environments requires approaches such as lean manufacturing practices and agile manufacturing practices. Sri Lanka's apparel and textile manufacturing sector, vital for GDP growth, is experiencing a decline in exports, necessitating new procedures and equipment adoption. In terms of the regional setting, the Sri Lankan apparel and textile industry is relatively new to adopting lean manufacturing practices and agile manufacturing. The common mistake is not implementing the Toyota Production System immediately without incorporating a lean manufacturing philosophy through appropriate customization to industry and organisational settings. Lean manufacturing practices, such as Total Productive Maintenance, Pull System, Just-In-Time, and Total Quality Management, are applied in the apparel industry to identify and eliminate waste, increase efficiency, and improve overall operational performance. Successful Lean manufacturing implementation necessitates not only adopting the tools but also embracing the underlying philosophy of Lean. This study assesses the impact of lean manufacturing practices on operational performance in the Sri Lankan apparel industry, examining the mediating effect of agile manufacturing. A cross-sectional, deductive, quantitative approach was utilised for this study. Data was collected from 104 manufacturing plants that have adopted lean and agile manufacturing practices, and the collected data was analysed using the SPSS software package. The study revealed a strong positive association with implementing lean manufacturing practices on operational performance and a strong mediating effect of agile manufacturing on the relationship between those variables of a manufacturing firm. Meanwhile, the study aims to address knowledge gaps in the apparel industry by improving procedures and understanding lean manufacturing practices. It supports academics, helps middle- and lower-level management and reduces labour hours, making it significant for future researchers and Sri Lankan apparel companies.

Keywords: Total productive maintenance (TPM), Pull system, Just-in-time (JIT), Total quality management (TQM), Agile manufacturing, Operational performance (OP)

Innovation Capabilities and Operational Performance: A Study of Public Sector Organizations with Special Reference to Divisional Secretariats in the Badulla District in Sri Lanka

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Service innovation is a key driver of growth and competitiveness in public sectors. It is essential for organizations to embrace innovation to stay relevant in today's fast-paced world. Quality is a pivotal factor in the transformation of public sector services that enhance operational performance. However, the impact of service quality on customer satisfaction in the public sector is a relatively unattended area by researchers. Hence, this study was carried out to identify types of innovations at the divisional secretariat to improve the level of quality and maximize customer satisfaction. The study shows that the implementation of innovation has been catalyzed by a developing service-oriented public sector. From the public-institutional theory of innovation perspective, service innovation is the catalyst for maximizing customer satisfaction. In consideration of this study, innovation will add newness to it, and it should be used in the public service delivery process at the divisional level to improve quality service and customer satisfaction. A questionnaire survey was conducted to collect data using the stratified random sampling method. A modified questionnaire was prepared based on innovations and service-quality determinants. A sample of one hundred and sixty service recipients and eight service providers from eight divisional secretariats in the Badulla district was drawn and represented based on each division's population. The relative influence of service quality on customer satisfaction was examined using correlation analysis and multiple regression analysis. The study revealed that digitally integrated service innovation, digital display service innovation, information-integrated service innovation, social care service innovation, and resource utilization innovation showed a positive association with service quality and customer satisfaction. The findings of the study show that service recipients are moderately satisfied with service quality and the results strongly suggest that new ways of doing things are essential to each procedure in the public sector at divisional level.

Keywords: Customer satisfaction, Divisional Secretariat, Service innovations, Service recipient, Service quality

The Impact of Resilient Leadership on Business Recovery During the COVID-19 Crisis: A Case Study on a Public Sector Bank in Sri Lanka

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With the spurt in technology and the complexity of the contemporary business context, 21st century leaders are engulfed by a myriad of challenges. The COVID-19 pandemic can be identified as one such conundrum that bombarded organizations with detrimental ramifications. Resilient leadership is defined as a leadership style that assists leaders in directing their subordinates to cope with a crisis and rebound from its setbacks triumphantly. This study focuses on the scrutinization of the effect created by resilient leadership on business recovery amidst the COVID-19 catastrophe. The research was conducted in a public bank in Sri Lanka to detect the manner in which the bank harnessed the power of leadership to combat the pandemic repercussions. The CORE (Comprehensive Resilience) framework which comprises physical, mental, emotional and social resilience was deployed to distinguish the facets of resilient leadership. This quantitative study has carried out data collection through an online questionnaire survey utilizing a sample of 169 bank employees. The sample was obtained from the branches in the North Western province, employing the stratified random sampling technique. Apart from the data gathered via the questionnaire, business recovery was further assessed through secondary data obtained from the bank for an in-depth investigation. Data analysis was conducted through regression utilizing the SPSS software. Conclusively, the study discovered a significant relationship between resilient leadership and business recovery. In fact, the findings of the study revealed that physical, mental, emotional and social constituents of resilient leadership are positively correlated to business recovery. Based on the outcomes, recommendations were provided to the bank to initiate programmes that grant outbound training, relaxation, work-life harmony and adeptness at networking. Moreover, this is the first study to utilize the CORE framework to explore the influence of resilient leadership on business recovery in the context of the banking industry.

Keywords: Resilient leadership, crisis, COVID-19, Business recovery, Banking sector

Harnessing the Power of YouTube for Female Empowerment

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This study investigates the empowerment of female entrepreneurs through the utilization of social media platforms, with a specific focus on YouTube. Recognizing the transformative potential of digital spaces, the research explores how female entrepreneurs leverage YouTube to enhance their entrepreneurial behavior and promote economic independence. This study employs a qualitative approach while using case study as research strategy and incorporating semi-structured interviews with women entrepreneurs who actively utilize YouTube as an entrepreneurial tool and followed thematic analysis to reveal significant patterns and insights derived from the collected data. By examining the strategies, challenges and outcomes of their digital engagement, this research offers insights into the unique ways in which YouTube contributes to women's empowerment within the entrepreneurial landscape. The findings emphasized global networking and opportunity identification generally. This reveals that video graphic storytelling of women's culinary skills on the YouTube platform serves as a compelling mediating factor in promoting women's empowerment by showing their diverse talents and fostering a sense of community engagement. Specifically, this research identifies the catalytic role of male involvement in fostering women's empowerment within the entrepreneurial domain and challenging stereotypical notions. Ultimately, this study contributes to the broader understanding of the symbiotic relationship between women entrepreneurship, social media and empowerment, highlighting the evolving dynamics of modern business practices. Empowerment for women entrepreneurs who use social media, YouTube is driven by a combination of elements, including participants, social media platforms, content and channel strategies, online community and engagement, digital skills and resources, socio-cultural factors. In conclusion, women entrepreneurs who leverage YouTube enhance visibility and popularity of business, fostering financial independence of women entrepreneurs through wider community engagement. It reveals that women entrepreneurs harness social media technology, to breakdown the glass ceiling effect.

Keywords: Women empowerment, Women entrepreneurship, Social media, Social media entrepreneurship, YouTube platform

Portfolio Entrepreneurship as a Resilient Strategy During the Economic Crisis in Sri Lanka

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The successful opportunity identification and exploitation in a market place is demanding and challenging for a venture. However, entrepreneurs consider themselves as risk seekers and choose to do so effectively on even more than one business simultaneously. Entrepreneurs who identified with multiple businesses are portfolio entrepreneurs. Portfolio entrepreneurs have been shown to operate fast-growing business models and contribute significantly to wealth creation. In times of crisis, there is a critical need for research into the structure, strategy, and administration of portfolio ventures. Therefore, this study aims to uncover how entrepreneurs operate more than one business in an economic crisis to overcome the pitfalls they experience. With the aim of finding the above the data collection has been done through semi structured interviews. The sampling methods were a purposive sampling method which was used to collect information from entrepreneurs who are ultimately experiencing the business portfolios. Thematic analysis was used for data analysis. The study found that the larger and more related portfolios executed asset redeployment more effectively especially in relation to physical assets to avoid the immerse of market and retain their economic profit and they wanted to utilize the resources that are readily available by engaging in portfolios. However, this overlooks the fact that portfolio entrepreneurs are risk-averse and need to build some diversification into their portfolios. The portfolio structure facilitates the main funding routes for portfolio growth, which is internal cash flow and new equity invested by active partners. Therefore, it is suggested that portfolio entrepreneurs may have an even greater importance than is yet realized. This paper contributes to the future entrepreneurs who are awaiting to engage in portfolios of business by providing an understanding on mitigating the volatility of business ventures.

Key words: Portfolio entrepreneurship, Economic crisis, Resilient strategy, Asset redeployment

Truths and Myths: Perceptions of Undergraduates about Specialization Areas in the Faculty of Management, University of Peradeniya, Sri Lanka

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It is widely recognized that many secondary school students enter university without a clear understanding of specialization areas due to limited public exposure and awareness. As per many studies, specialization choices are highly influenced by perceptions of diverse parties about each specialization area. Perception is the process by which people select, organize, and interpret information to form a meaningful picture of the world. Hence, it is very important to explore and identify the perceptions of students timely to properly position and publicize the real nature of the specialization areas. Accordingly, this study (under qualitative interpretive methodology, specifically case study strategy) was contextually undertaken in the Faculty of Management, University of Peradeniya, with two objectives: to uncover students' perceptions of specialization areas and to address the existence of truths and myths concerning them. Data were collected through semi-structured interviews with 24 students in the second and third years from different ethnicities and genders, where the data were analyzed using content analysis investigating two different paradigms, namely the perception on the own-specialization areas and the perception on the other-specialization areas. Study found that the students are holding several perceptions relating to each specialization from several paradigms like easiness level (58%), theoretical and calculation-based comparison (83%), job prospects (66.7%), social recognition and popularity (25%), stress level (33.3%), work-life balance (25%), fit with personal characteristics (58%), gender roles (25%), religious and ethical considerations (16.7%), lecturers involved (33.3%), and institutional practices (41.6%). Furthermore, the study recognizes the potential presence of false beliefs within certain perceptions (myths), and it suggests further research to debunk the myths. This study also underscores the need for universities to proactively address these perceptions, ultimately dispelling myths and fostering informed decisions. Continual investigation into evolving perceptions must be also undertaken to enhance the understanding and positioning of each specialization.

Keywords: Choice of specialization, Choice of career, Management undergraduates, University of Peradeniya, Perceptions

Acknowledgment: We dedicate this abstract in memory of late Mr. M.A. Zamry Ahamed, second year undergraduate, Faculty of Management, University of Peradeniya, to value his interest and contribution

The Role of Transformational Leadership on Supply Chain Resilience in Wake of COVID-19 Pandemic: in the Context of Private Hospital Chain

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The empirical research examines the impact of Transformational Leadership on supply chain resilience during the pandemic by relying on the established theories of leadership & business resilience. COVID-19 was a remarkable event that had an impact on company operations, and the recent wave of the outbreak has evolved dramatically faster than the initial wave. As opposed to earlier pandemics, COVID-19 forced organizations and corporate leaders to perform differently than they would in ordinary circumstances in terms of their business strategy and managerial capacities. As service organizations have focused on the pricing and services component of their revenue, managing supply chain has become fiercely competitive for the Healthcare sector. Therefore, this study carried out in the context of Private Hospital Chain (PHC) to examine how supply chain disruptions brought by the nation's shutdown during the first wave of the pandemic were replevin during the second wave by using the exemplary leadership for the company. This study employed correlation analysis to evaluate the stated hypothesis on Transformational leadership and supply chain resilience exerting 80 as the sample, comprising 12 members of the Group Operation Committee (GOC) and 68 department in-charges of PHC. The research findings corroborate Intellectual Stimulation and Individualized Consideration were the eminent behaviors that affected supply chain resilience during the pandemic, beside that study that all four dimensions facilitate a strong positive relationship on supply chain resilience. As study spearheads transformational leadership played a valuable role in supply chain resilience in PHC during the COVID-19 epidemic, Supply chain is more resilient in the manner that leaders strive to unleash the maximum potential of individuals by challenging their ideas and consultants therapeutic needs on individual level. Moreover, recommendations were provided based on the scrutiny to promote automation, collective ideas, shared information, and individual consideration as the best-supporting behaviors for business's survival.

Keywords: Transformational leadership, Supply chain resilience, Intellectual stimulation, Individualized consideration

Socio-Economic Impacts of COVID-19 on Local Communities of UNESCO World Heritage Cities: The Case of Galle Fort

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This research explored the socio-economic impacts of the COVID-19 pandemic on the local community of Galle Fort, a UNESCO World Heritage city and a major tourist destination in southern Sri Lanka. The research employed a sample of 180 community members who operate tourism-oriented Micro, Small, and Medium Enterprises (MSMEs) for a questionnaire survey and conducted semi-structured interviews in 2022. Over 90% of these MSMEs, ranging from guest houses to gem and jewelry shops, were temporarily closed during 2020 and 2021, creating serious losses that resulted in the drying out of savings and declined household incomes. The businessmen had to rely on methods such as borrowing money from close family and friends, obtaining gold loans or pawning gold, delaying payments, and even selling properties and vehicles, in order to overcome the cash flow shortage and for their daily living. Yet, over 95% of these MSMEs (family-run and home-based) survived, unlike the large-scale businesses, as they did not require higher rentals and employer salaries. Nearly 60% of businesses recovered by mid-2022 with the re-establishment of the market through increasing tourism arrivals. This was a slow process in the case of Galle Fort due to the economic crisis in Sri Lanka that followed the COVID-19 pandemic, unlike in other World Heritage historic cities. Despite the declining income, the life satisfaction of local community members improved in the post-pandemic period as they had more time for families. The study shows the volatility of tourism as a global process with unforeseen events that impact negatively on smaller local communities that depend entirely on it. The local community of Galle Fort who themselves became the victims of the COVID-19 pandemic have identified that diversifying their businesses, saving, investing, frugality, and catering to the local market will make them more resilient in future disasters.

Keywords: COVID-19, Galle Fort, World heritage, MSMEs

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Impact of Fiscal Policy on Balance of Payments: Evidence from Sri Lanka

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Every economic system, irrespective of its political arrangement has to identify its economic goals such as full employment, adequate economic growth, price stability and equilibrium in the Balance of Payments (BOP). These goals are usually achieved through the formulation and implementation of economic policies, especially fiscal policy. One of the major economic policies that every economy uses is the fiscal policy to maintain a healthy BOP to safeguard the external value of the national currency. Currently, Sri Lanka faces a BOP crisis. Thus, this study tested whether fiscal policy measures were adaptable variables to remove this imbalance BOP situation in the country. Moreover, the theoretical underpinning of the fiscal approach to the BOP was developed by Alexander (1952). The data on BOP, tax revenue (TAX), government expenditure (GEXP), gross fixed capital formation (INVE), government total revenue (INCO) and real gross domestic product growth (GDP) were collected from the Central Bank of Sri Lanka and World Development Indicator database of the World Bank using annual data of Sri Lanka from 1991 to 2021. The ADF and PP unit root tests confirmed that none of the variables are I (2). This allows us to examine the relationship between them using Auto Regressive Distributed Lag (ARDL) Bound testing method. AIC criterion is suggested to employ ARDL (2,2,1,0,2,0) model as the best model among the top 20 models. The Bound testing results detected the co-integrating relationship between the variables under consideration in this research. The bound test suggested that taxation has a negative and statistically significant impact on BOP in the long run. The error correction version of the ARDL model found that the government's total revenue has a positive impact on BOP while taxation has a significant negative impact on BOP in the short run. Finally, Granger Causality test detected only unidirectional causality that stemmed from TAX to BOP, INVE to BOP and INCO to BOP at the 10 % significant level. This study concluded that fiscal policy has a meaningful effect on Sri Lanka's balance of payments during the period of study. This means fiscal policy is effective in attaining a satisfactory balance of payments in the country. In sum, the government of Sri Lanka should take necessary action to reduce taxation and increase the non-taxation revenue to bring the surplus of BOP and the economy well off.

Keywords: Fiscal policy, Balance of payments, ARDL Model, Sri Lanka

Study on the Influence of Website Personalization, Usability, Content, and Trust on Online Shopping Behaviour among Female Consumers in the Central Province in Sri Lanka

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The purpose of the study was to investigate factors affecting online shopping behavior of Central Province Sri Lankan female customers when using clothing websites by Central Province Sri Lankan female customers to clothing websites. Online shopping behavior became popular with the use of the internet. In the clothing industry, it has been found that fashion clothing involvement is related highly to personal characteristics such as female and younger and fashion knowledge, which in turn have influenced consumer confidence in making purchase decisions. Most women like to purchase the latest fashion items through clothing websites. Nowadays, there is a high number of female employment in Sri Lanka, and their earnings have increased. Therefore, female consumers pay more attention to online shopping. Additionally, the Sri Lankan clothing and apparel industry provides a huge contribution to the country's economy. In this context, the study examined the influence of website personalization, website usability, website content and website trust on online shopping behavior. The study includes 312 respondents from the Central Province and applies the facts on online retail customers who visited or purchased from clothing websites. According to the results, all the independent variables have a significant positive impact on online shopping behavior. Notably, website Implications were derived from the results and findings, and recommendations were discussed. According to the findings based on the correlation analysis, website usability is the most influencing factor on online shopping behavior, while website personalization, website trust and website content influence respectively. This research provides detailed understanding about how to create and maintain best clothing websites in order to provide superior customer experience.

Keywords: Online shopping behavior, Website personalization, Website usability, Website content, Website trust

Transfer-Based Freight Transportation to Minimize Empty Return Runs of Trucks

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Sri Lankan freight transportation system depends much on roads via trucks. Most of the truck movements suffer from empty return runs. Another issue with the truck related freight transport system is the lack of warehousing facilities island wide. These reasons lead Sri Lankan direct freight transport system to incur increased freight transport costs. Increased freight transport costs affect the producer, consumer, and the Gross Domestic Product of the country. The objective of this study was to propose an alternative freight transportation system that minimizes empty return runs, while enabling the utilization of the existing warehousing facilities. Case study approach was selected for this study. Transport of imported items from Capital Colombo to Dambulla Dedicated Economic Centre (DDEC) on trucks was considered for the study. The details on transportation cost for empty return run of a truck from DDEC to Colombo was collected from local transport operators. The details on the quantity of products (packets of rice) directly transported to Colombo from nearby places to DDEC (Polonnaruwa) and their relevant transportation costs were collected from the local transport operators. The possibility of getting down, unloading, storing, and processing these packets of rice from Polonnaruwa to DDEC was investigated with the DDEC officials and local transporters. The details on costs incurred for processing the packets of rice received from Polonnaruwa at DDEC were collected from DDEC officials and transporters. This study proposed to transfer the packets of rice received from Polonnaruwa to an empty twenty-ton returning truck from DDEC to Colombo. The total cost for this transfer-based freight transport system was calculated and compared with the direct-based freight transport cost between Polonnaruwa to Colombo. It was found that this transfer-based freight transport system saved Rs. 14,000.00 per a twenty-ton truck. This system minimizes the empty return runs of trucks enabling them to better utilize the existing warehouses.

Keywords: Transfer-based, Freight, Empty return trucks, Savings, Warehouse

Unveiling the Profit-Boosting Potential of Reinsurance: Evidence from Sri Lankan Insurance Companies

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Modern businesses face escalating demands to effectively handle their loss exposures, with reinsurance emerging as a widespread risk management strategy among insurance firms. Beyond its role in risk management, many researchers have observed that reinsurance also influences the performance of insurance firms. However, empirical findings on the relationship between reinsurance and financial performance remain inconclusive. Moreover, existing studies primarily focus on developed countries with established insurance markets, limiting their relevance to developing countries like Sri Lanka. Thus, this research aims to address this empirical gap by investigating how reinsurance influences the financial performance of Sri Lankan insurance companies, using Corporate Demand Theory as a theoretical foundation. The study population comprised 28 insurance companies regulated by the Insurance Regulatory Commission of Sri Lanka and due to data constraints, the studied sample was limited to 15 companies. This study followed the deductive approach, and quantitative secondary data was collected from published annual reports of companies from 2012 to 2021. Return on Assets (ROA) serves as a proxy for measuring financial performance while reinsurance price, underwriting risk, financial leverage and reinsurance dependence act as independent variables representing reinsurance mechanism. The study employed multiple ordinary least squares method with the help of EViews software. Results of the study indicate that reinsurance price, financial leverage, and reinsurance dependence significantly impact financial performance, whereas underwriting risk demonstrates no influence on financial performance. The findings further elaborate that high reinsurance premiums and escalated corporate debt deteriorates the firms' financial performance, while a strong reliance on reinsurance enhances it. The study provides valuable insights for insurance companies and regulatory bodies, deepening their understanding of how reinsurance can influence insurance firms' financial performance.

Keywords: Financial performance, Reinsurance dependence, Reinsurance price, Underwriting risk, Insurance companies



PERADENIYA UNIVERSITY INTERNATIONAL
RESEARCH SESSIONS

GLOBAL HEALTH CHALLENGES AND OPPORTUNITIES FOR COLLABORATION

Epidemiology of Badminton Related Injuries and Effects of Static and Dynamic Stretching Exercises on Injury Prevention and Performance among Junior Badminton Players in Kandy District – Sri Lanka

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In Sri Lanka, Badminton is one of the most popular and widely played sports by school children. The first part of this study aimed to investigate the epidemiology of badminton related injuries among elite junior badminton players of Kandy district, Sri Lanka. Stretching exercises are assumed to be an integral component of physical fitness and conditioning program in order to promote wellness. Therefore, as the second part of the study, a static and dynamic stretching exercise program was introduced to the players to investigate the effects of two types of stretching exercises on injury prevention and performance. A prospective longitudinal study was conducted. Data were collected from all male and female junior badminton players of Kandy district, Sri Lanka, who compete under category “A” schools in national level tournaments. 222 badminton players were included in the epidemiological study. Among them, 150 players (67.56%) were males and 72 players were females. An overall injury prevalence of 14.00% was recorded. Injury prevalence among males and females were 7.33% and 27.77% correspondingly. Most of the injuries among males were upper arm injuries (27.3%) and most of the injuries among females were ankle injuries (35%). It showed that there is an association between warm up duration ($p = 0.009$), cool down duration ($p = 0.000$) and injury prevalence. Two sample t-test shows that the injury incidence of females is higher than males ($p=0.005$). Pre-interventional data were collected from 69 players Post-intervention data were collected from 39 junior badminton players and the drop-out rate was 42%. After 6 months of stretching intervention injury percentage of dynamic stretching group was reduced from 42.11% to 5.26% while it was reduced from 35% to 20% in static stretching group. After 6 months period of stretching interventions, dynamic stretching can improve agility and static stretching can improve EMG activity of biceps and hamstring muscles in players. Pre-participation stretching exercises (static or dynamic) can reduce the risk of injuries.

Keywords: Badminton, Elite players, Epidemiology, Static stretching, Dynamic

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Evaluation of Blood Cell Ratios and Blood Eosinophilic Changes in Patients with Oral Potentially Malignant Disorders - Findings from a Pilot Study

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Oral Potentially Malignant Disorders (OPMD) are defined as a group of mucosal disorders that have an elevated risk to proceed into oral squamous cell carcinoma (OSCC). Eosinophilia has also been described in hematological malignancies and rarely in solid cancers such as, OSCC. Therefore, we attempted to evaluate blood cell ratios along with blood eosinophilic changes in OPMD which is the precancerous stage of OSCC. The study employed an observational case-control design with four study groups, Oral Leukoplakia (OL), Oral Lichen Planus (OLP), Oral Submucosal Fibrosis (OSF), and disease-free controls. The sample size for the total cohort was 51. 2ml of IV blood was collected from all participants and the socio-demographic details and habit history were collected using questionnaire. Full Blood Count (FBC) was performed using automated hematology analyzer to evaluate neutrophil-to-lymphocyte ratio (NLR), monocyte-to- lymphocyte ratio (MLR), platelet-to-lymphocyte ratio (PLR) and blood eosinophilia. A blood picture was prepared and stained with Leishman stain and observed for eosinophilic morphological changes under the light microscope. Statistical analysis was done by comparing each study group with healthy controls using SPSS. Mild eosinophilia (0.5×10^9 - 1.5×10^9 cells/L) and moderate eosinophilia (1.5×10^9 - 5×10^9 cells/L) was observed in OLP and OSF patients and normal eosinophilic condition was observed in all control samples. As morphological changes, degranulation of the cells was observed in OL, OLP, and OSF and the 92.9% of the control group showed normal eosinophilic morphology. The MLR was significantly high in OL compared to controls ($P = 0.046$). High eosinophils in OL and OSF and morphological changes in OL, OLP and OSF may be due to the presence of inflammation in these patients. A significant difference in cell ratio indicates the evidence of underlying immune modulatory mechanisms in the pathogenesis of OL. Pilot data of this study indicate that there are significant differences in blood cell ratios, eosinophilic condition and morphology in OL, OLP and OSF patients compared to disease free group.

Keywords: Eosinophils, Oral Potentially Malignant Disorders, Blood eosinophilia, degranulation, Blood cell ratio

Faecal Excretion of Coronaviruses in Bats in a Selected Location in Sri Lanka

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Bats act as a reservoir host for three out of the ten pandemic viruses including coronaviruses (CoV). Bats have harboured CoV for centuries before causing spill-overs to animals or humans. Objective: In this study, we aimed to identify the frequency of CoV shedding in bat faeces in a selected environment in the Central Province of Sri Lanka between September 2022 to May 2023 for a period of nine-months. Sampling was done in the Royal Botanical Gardens (RBG) in Peradeniya. Bat guano (faecal dropping) was collected once a week in the mornings by laying out polythene sheets (2m x 2m), the previous day afternoon, under randomly selected trees. Viral RNA was extracted to perform a Pancoronavirus (PanCoV) nested RT-PCR, which is designed to target the RNA-dependent RNA polymerase gene with a 442 base pair fragment. A total of 94-bat guano was collected, however, between the start of October 2022 to end of January 2023, bats have migrated therefore no guano was found. Of the 94-bat guano tested, 44 (46.8%) were identified as CoV by RT-PCR. Previous sequencing data on RBG bat guano was identified as betacoronaviruses (Nobcovirus) 97% similar to *Pteropus giganteus* in India and *Pteropus lylei* bats in Cambodia (2). In this study, we wanted to identify the frequency of bat CoV shedding in RBG bats. The month of September 2022 had the highest positivity for bat CoV (78%) whereas April 2023 showed the lowest positivity for bat CoV (25%). Overall, a reduction in bat CoV positivity was detected moving forward post the COVID-19 pandemic in Sri Lanka. Based on the interim results, 46% of RBG bats were tested positive for CoV. A reduction in bat CoV was detected with progressing months in 2023. Sequencing studies are in progress to identify the details of these bat CoVs.

Keywords: Bats, Coronaviruses, Sri Lanka, One Health

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Feminization of Medical Doctor Workforce in Sri Lanka

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It has been observed in many countries around the world over the past decades, and especially in the last few years, that there are consistent trends of increased participation of females in the medical profession and that the profession of medicine is no longer dominated by males as it once was. The authors were concerned to find out if Sri Lanka is experiencing the same phenomenon in the feminization of doctors. How has the ratio between men and women medical doctor workforce changed in Sri Lanka over the years? Authors analysed medical student cohorts from 1990 to 2020, to understand the medical workforce feminization patterns using secondary from state Medical Faculties and UGC. Over the years, there has been a notable rise in the number of women entering state medical schools and pursuing careers as doctors. Between the years 1990-1995, 1996-2000, 2001-2005, 2006-2010, 2011-2015 and 2016-2020, percentage of female medical students had been 42,46,51,54,60 and 63 respectively. Above results clearly demonstrate the rising number of female medical students from 1990 to 2020. Cohorts from 1991-1995, up to 2011-2015 have already entered the doctor workforce, while a portion of the 2016-2020 are still medical students. According to the liner trend analysis, percentage of female medical students would rise to 68.6 in 2025 and 72.6 in 2030. Currently, Sri Lanka has around 7500 medical students in the training pathway and out of which nearly two thirds are females. More women are attending medical school and becoming doctors in Sri Lanka. Therefore, the authors foresee a future shortfall of male-dominated surgical trainees and specialists as medical school graduates are becoming more feminized. Sri Lankan Health policy makers should take serious note of feminization of the medical doctor workforce and act proactively from the perceptive of Health Human Resources.

Keywords: Medical students, Doctors, Feminization

Curry Leaves, Lemongrass and Ceylon Cinnamon Demonstrates Antihyperglycemic and Antihyperlipidemic Potential under *In-vitro* Conditions

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Atherosclerosis, insulin resistance, and associated inflammatory responses are the precursors to glycaemic stress, oxidative stress, and associated inflammatory responses, which cause cardiovascular illnesses and type 2 diabetes mellitus. In order to determine the effectiveness of cinnamon, curry leaves, and lemongrass as dietary therapy candidates to lower post-prandial hyperglycaemia and post-prandial hyperlipidaemia, this study evaluated the in-vitro inhibitory capability of these ingredients against pancreatic lipase and pancreatic -amylase. The relevant plant powders were created via air drying and size reduction. The plant powders were subjected to chlorophyll removal, sonication and rotary evaporation respectively prior to free drying. Pancreatic lipase and pancreatic -amylase inhibition assays were used to test freeze dried extracts for their in-vitro antihyperglycemic and antihyperlipidemic potential, and the data were collected using UV-Visible Spectrophotometry. Mild but significant ($P<0.05$) pancreatic lipase inhibitory activity levels of 38.81%, 24.52% and 22.16% were noted for the aqueous extracts of lemongrass, curry leaves and cinnamon consequently. Moreover, moderate but significant ($P<0.05$) α -amylase inhibitory activity levels of 15.31%, 39.97%, and 46.05% respectively were noted for same aqueous extracts of lemongrass, curry leaves and cinnamon respectively. Lemongrass extract shows considerable ($P<0.05$) lipase inhibition whereas the inhibitory effects of cinnamon and curry leaves were not significantly different ($P>0.05$) from each other. However, there was a statistically significant ($P<0.05$) difference for α -amylase inhibition amongst the three extracts. The results of this study suggest that cinnamon, curry leaves, and lemongrass are potential options for dietary therapy. These aqueous extracts can be potentially used to lower the risk of developing post-prandial hyperglycaemia and post-prandial hyperlipidaemia. Cinnamon (*Cinnamomum zeylanicum*), Curry leaf (*Murraya koenigii*), and Lemongrass (*Cymbopogon citratus*) can be potentially used in dietary therapy for adults at risk of type-2 diabetes mellitus, atherosclerosis. To establish the relevance and effectiveness of the observed in-vitro actions in human subjects, more research is needed.

Keywords: Enzyme inhibition, Alpha-amylase, Pancreatic lipase, Post-prandial hyperglycaemia, Post-prandial hyperlipidaemia

Comparative Analysis of Serum Biochemical Properties among Cattle in CKDu High Prevalence Areas in Anuradhapura District of Sri Lanka

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Epidemics of Chronic Kidney Disease of uncertain etiology (CKDu) in human is presented in agricultural communities in Sri Lanka and other hotspots worldwide. However, there is no detailed research work done to date to study the chronic kidney disease prevalence among cattle populations living in high CKDu prevalence areas in the country. Moreover, reference data for clinical biochemistry parameters in milking cows is limited by considering their kidney functions. Thus, the objective of this study was to compare four selected biochemical parameters by referring to their kidney functions among milking cows reared in CKDu high prevalence areas in the Anuradhapura district vs. control areas in the Kandy district. A total of 83 milking cows (50 test group and 33 control) were included in this study. Results showed that Serum Creatinine (SCR), Blood Urea Nitrogen (BUN) and Total Protein (TP) values were significantly higher ($P < 0.001$) for the test group than the control group, while the Serum Albumin (SAL) levels were significantly lower ($P < 0.001$) for the test group than the control group. The percentage of test samples that lie outside the standard interval for healthy subjects is 100% for all four biochemical properties. According to the results, it is possible to indicate ‘Hypoalbuminemia’ associated with inflammation suggesting chronic nephritis conditions in cow kidneys belong to the test group similar to indications reported in the CKDu patients in high CKDu prevalence areas. Hence, four biochemistry parameters used in this study strongly provide evidence, that milking cows of the high CKDu prevalence areas are more prevalent for CKD/CKDu than in control areas. Further research is recommended to address public health and animal welfare concerns.

Keywords: Blood Urea Nitrogen, Chronic Kidney Disease of uncertain etiology, Cow, Serum Albumin, Serum Creatinine

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Patient Satisfaction on Tele-consultation for the Management of Acute Oro-dental Problems: Findings from a Preliminary Study on Tele-dentistry in Sri Lanka

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Telemedicine is defined as ‘the provision of real-time and offline medical care such as diagnosis, treatment planning, consulting and follow up via electronic transmission when the distance separates the participants. At the inception of the concept of telemedicine, it had been widely used in psychiatry, dermatology and paediatrics. Tele-dentistry was not a widely used tele-health service worldwide in the pre-Covid era. The scientific evidence related to the applications of tele-dentistry in Sri Lanka are scarce. The aim of this study was to assess patient satisfaction on tele-consultation for the management of acute oro-dental problems among a group of patients who have received tele-consultation via a private tele-consultation platform. A descriptive cross-sectional survey was carried out using an online questionnaire following tele-consultation with a single dental surgeon on a private tele-consultation application. It was conducted over a period of 12 weeks and questionnaires were sent to a convenient sample of 93 patients. The 11 items of the questionnaire assessing several aspects of patient satisfaction were developed based on a modified version of the “University of Washington telemedicine patient satisfaction Survey”. The responses were recorded in 5-point likert scale. The data were obtained from 55 patients and majority (54%) of patients were males. Out of the 55 patients, 38 had obtained an educational qualification of undergraduate degree or above. Nearly twenty two percent declared that this was their first experience in tele-consultation. Sixty five percent of the participants revealed that they were “very satisfied” to meet a dentist through tele-consultation and 53 out of the 55 participants declared that they would like to seek dental care through such tele-consultation again. Despite their satisfaction to use such tele-health services, a majority reported that connectivity was a barrier to continue such services. However as the findings are based on a preliminary study, it is recommended to conduct a survey with a larger sample.

Keywords: Tele-dentistry, Telemedicine, Patient satisfaction, Sri Lanka

Acknowledgement : We would like to acknowledge oDOC, the tele-consultation platform for sharing the required database of contact numbers of patients for the data collection of our study.

Evaluation of Social Media Platforms in Promoting Oral Health Among Sri Lankan Adults: A Survey Based Study

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Social media has integrated into daily life promoting oral health and awareness, aiding eliminating the disparities among different groups. Main purpose of this study was to evaluate social media platforms in promoting oral health. Specific purposes of the current study were to determine the relationship between oral health information seeking through social media and demographic factors of Sri Lankan adults, by identifying the beneficiaries and barriers and its effective use in oral health practices. Ethical clearance for the study was obtained from the Ethical Review Committee, Faculty of Dental Sciences, University of Peradeniya. An electronic self-administered survey-based questionnaire was distributed as a Google form via social media platforms. Completeness and accuracy of the collected data via google sheet were verified and the incomplete data were omitted from the study. A descriptive analysis of the obtained data was carried out using the SPSS Statistical Package (SPSS, Version 21). Sample characteristics were expressed as means and percentages. Highest preferred social media platform for information on oral health was YouTube (75.2%) and most of the participants ‘Rarely’ searched oral health on social media platforms (62.9%). About 54.5% rated ‘3’ as the reliability of related information found in social media. The recorded factor considered in assessing the reliability of oral health information in social media was ‘quality of information (46.4%). In preference to obtain information on oral health via social media, the majority (45.9%) rated ‘3’ of the Likert scale. Between social media and websites, the recorded frequency was obtained for both platforms (51.2%). After accessing social media 70% of the participants changed their oral health behaviours. In dissemination of oral health information, about 39.5% entirely preferred short videos by professionals. In conclusion, social media platforms are suitable in promoting oral health allowing access to all socio-economic groups and they increased awareness among the general population for a better tomorrow.

Keywords: Social media, Oral health promotion, Sri Lanka, Survey-based study

Perceived Barriers for Seeking Oral Health Care During Present Economic Crisis among a Group of Patients Attending Dental Clinics in Kandy District

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Economic crisis has shifted private sector health seekers to already overburdened and underfunded state sector. The phenomenon that dental services have a high-income elasticity of demand explains this observation. Lack of availability, accessibility and affordability to dental and deteriorated dental health care are the main concerns during a crisis. The purpose of this study was to identify perceived barriers for seeking oral health care among patients in Kandy District due to the economic crisis in Sri Lanka. Eligible participants attending the government and private dental clinics in Kandy District were randomly recruited following convenient sampling technique in this cross-sectional and qualitative phenomenological study. Ethical clearance was obtained by the Ethics Review Committee, Faculty of Dental Sciences, University of Peradeniya. Collected data of the Self-administered survey-based questionnaire were checked for completeness and accuracy, and the inconsistent data were excluded. The quantitative analysis of the study was done using simple descriptive statistics of SPSS Statistical Package (SPSS, Version 21). Sample characteristics were expressed as means and percentages. According to the results, the number of patients who visited the government hospitals was increased by 9.7% and the number of patients who visited the private hospitals was depleted by 10.1% during the crisis. Majority of the patients belonged to the middle-income socio-economic groups (42%), thereby 40.4% were able to maintain oral health and treatments and 65.5% were able to purchase medicines prescribed by their doctor at an outside pharmacy. Majority of the patients (79.4%) did not own a health insurance. About 46.2% had avoided the systematic access to dental clinics, 76.8% stated that the cost of dental treatments had been increased and among them, 29.7% avoided regular treatments. In conclusion, the present economic crisis has a negative impact on the maintenance of oral healthcare of the patients. Recognizing and addressing these issues will assist in facing future crises in a more prepared manner.

Keywords: Economic crisis, Oral healthcare system, Dental attendees, Kandy

Correlation between Pre-treatment Serum Thyroglobulin Levels and Dose Rates Emitted from Radioiodine (¹³¹I) Treated Patients

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The treatment of thyroid cancer generally comprises of total thyroidectomy followed by oral administration of ¹³¹I. Patients receiving radioiodine are potentially a significant source of radiation to the medical staff, family members and public. Serum thyroglobulin is used as tumor marker and to see whether there are any functioning residual thyroid tissues in differentiated thyroid cancer (DTC) after surgery. Our aim was to identify the correlation between the pre-treatment thyroglobulin levels and emitted dose rates of ¹³¹I treated patients. Data was collected from selected thyroid cancer patients who attended the routine clinic at the Nuclear Medicine Unit, University of Peradeniya. Blood samples were obtained one week prior to the ¹³¹I treatment date to measure the serum thyroglobulin. Dose rates from 131-I treated patients (treated with the activity of 30 mCi) were measured at one meter distance from the anterior neck area after 1hour and 2 hours using survey meter. Data were analyzed using Minitab 18.0 by using Pearson's correlation. The study comprised of 74 patients with a mean age of 40.56 years (SD= 10.82) and of this population 84.12% were females and 15.88% were males. The mean serum thyroglobulin level was 5.338 ng ml⁻¹ (SD= 5.981) with a minimum of 0.1 ng ml⁻¹ and a maximum of 22.80 ng ml⁻¹. The mean dose rates emitted after one and two hours were 45.13 µSv h⁻¹ (SD = 4.367) and 41.83 µSv h⁻¹(SD= 4.83) respectively. The Pearson's correlation showed a moderate relationship between the pre-treatment serum thyroglobulin levels and emitted dose rates from ¹³¹I treated patients after 1 hour ($r=0.679$) and 2 hours ($r=0.690$) of the therapy. Higher Serum Thyroglobulin in DTC patients is an indication of more residual thyroid tissue, and higher emitted dose rates from these patients.

Keywords: ¹³¹I Therapy, Radiation Protection, Thyroid Cancer

Detection of Bat Coronaviruses in the North Central and Sabaragamuwa Province, Sri Lanka

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Bats are the most widely distributed terrestrial mammals in the world. They have unique animal behaviours act as a reservoir host for many zoonotic viruses, including coronaviruses (CoV). Since the emergence of the SARS-CoV in 2002, SARS-like bat CoV have been detected in bats from Asia and Europe (1). Bats, as the native host for CoV, are of greater importance in identifying future pandemic CoVs evolving through bats. Objective: In this study, we aimed to identify the frequency of bat CoV in several selected locations in the Sabaragamuwa Province of Sri Lanka between December 2022 to January 2023. Sampling was done between December 2022 to January 2023 from the Minneriya National Park and surrounding areas like Giritale, Nildiyamankada and Thimbolkatiya from both fruit and insectivorous bats. Sampling of bat guano was done once in every location where droppings were collected into cryovials containing 1.5 mL of Phosphate-Buffered Saline. Viral RNA was extracted to perform a Pan-coronavirus (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. A total of 38-bat guano were collected, out of which 24 (63%) bat guano had bat CoV by RT-PCR. Further sequencing data is required to confirm the bat CoV and species of the bats. The frequency of bat CoV shedding was calculated for the different locations within the Province. Nildiyamankada had the highest positivity for bat CoV (80%) while Minneriyawa showed the lowest positivity for bat CoV (43%) shedding. Based on our interim results, overall, 63% of bats tested positive for bat CoV in the Sabaragamuwa Province. This is a high positivity rate for bat CoV shedding compared to the Central Province of Sri Lanka (Data not shown).

Keywords: Bats, Coronaviruses, Zoonoses, One Health

Surgical Correction of Persistent Right Aortic Arch in a German Shepherd Puppy: A Case Report

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Vascular ring anomalies (VRA), such as the Persistent Right Aortic arch (PRAA), result from congenital malformations of the great vessels and their branches, leading to constriction of the esophagus. PRAA is most commonly diagnosed in young large-breed dogs like German Shepard and Greyhounds, and surgical intervention is the recommended treatment option. This case report presents the diagnosis and successful surgical correction of a PRAA in a 2-month-old female intact German Shepherd puppy named "Nico", was presented to the Veterinary Teaching Hospital, University of Peradeniya, with a history of regurgitation, vomiting undigested food immediately after eating, unthrifty hair coat, bounding pulse with bradycardia, prolonged capillary refilling time, dyspnea, hypersalivation, quiet alert responsive, malnourished, and tachypnea. Diagnostic imaging, including thoracic radiographs and contrast esophagogram, confirmed the presence of a dilated esophagus cranial to the base of the heart and ventral deviation of the trachea, supporting the diagnosis of PRAA. Surgical correction was done through a left lateral thoracotomy. Then the ligamentum arteriosum, a fibrous band encircling the esophagus, was identified and transected followed by meticulous closure of the thoracic cavity. Post-operative analgesia with tramadol (2mg/kg) once daily for one week and Cefuroxime 8hourly for one week continued. Promethazine (0.2mg/kg) was administered intravenously to prevent regurgitation and vomiting. After one week hospitalization, oral feeding was resumed milk and highly nutritious soup every two to three hours were fed while the head was kept in elevated position. The patient was discharged after being given appropriate management advice. At present, 2 months after the surgery, the puppy is active, playful with no vomiting and appears normal. A Contrast esophagography, one month after the surgery, revealed no postsurgical complication.

Keywords: Contrast esophagogram, Ligamentum arteriosum, PRAA, Regurgitation, VRA

Serotyping of Fowl Adenoviruses Associated with Inclusion Body Hepatitis (IBH) in Broiler Chickens in North-Western and Central Provinces of Sri Lanka

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Fowl adenoviruses (FAdVs) belong to the family *Adenoviridae*. There are five different FAdV species (FAdV A-E) and 12 serotypes. Serotyping is based on the loop 1 region of the hexon gene. FAdV-D (serotypes 2, 3, 9, and 11) and FAdV-E (serotypes 6, 7, 8a, and 8b) cause Inclusion Body Hepatitis (IBH) which is an economically important acute disease mainly affecting 3-7 weeks old broiler chickens. The objective of this study was to identify the circulating FAdV serotype/s in commercial broiler farms in North-Western and Central Provinces of Sri Lanka. One dead broiler chicken manifesting IBH clinical signs (i.e. lethargy, huddling, ruffled feathers, depression, inappetence and adopting a crouching position) was collected from 17 different flocks (14 from North-Western and 3 from Central Provinces) were used for the study. Necropsy of dead broilers revealed liver lesions, i.e., hepatomegaly, pale yellow discolouration with necrotic foci, and multifocal petechial haemorrhages. Histopathology of liver samples (11 from North-Western and 3 from Central Provinces) revealed diffuse, large, basophilic, intranuclear inclusion bodies in hepatocytes with hepatocellular degeneration and necrosis. A conventional Polymerase Chain Reaction (PCR) was performed for the liver samples with histopathological lesions, targeting 897 bp fragment of the FAdV hexon gene. PCR revealed 54.55% and 100% positivity in North-Western and Central Provinces respectively. Resultant PCR products were sequenced and analysed by BLASTN against GenBank sequences. Analysis revealed that the liver samples obtained from North-Western Province had serotypes 8b and 11, and Central Province had serotype 8b. Further, our analysis revealed both FAdV-D and FAdV-E were circulating in North-Western Province. However, only FAdV-E was detected in the Central Province. These findings are important for vaccination strategies, emphasizing the need to match circulating serotypes. Accordingly, the serotype 4 FAdV vaccine currently used in Sri Lanka may not be effective in controlling IBH.

Keywords: Broiler, Fowl adenovirus, Gene sequencing, Inclusion body hepatitis, Serotype

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Developing a Healthy Human Clinical Trial Unit to Advance Post-prandial Glycaemic Response Research in an Academic Institution

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The post-prandial glycaemic response (PPGR) is a valuable indicator of carbohydrate-rich diets that are used to assist people to manage their blood glucose levels and improve overall health. The healthy human clinical trial unit (CTU) in glycaemic index (GI) studies has a competing demand to conduct advanced research in many academic institutions. However, there is no commercially established, accredited CTU for GI testing exists in Sri Lanka. This study was conducted to establish a healthy human CTU to analyze the PPGR of food. Initially, 301 undergraduate students of the Faculty of Agriculture, University of Peradeniya were recruited in the age group of 21-25 years, and anthropometric and demographic parameters were collected. The recruited participants were screened based on anthropometric and demographic parameters. Then 97 participants were screened and trained for clinical trials in GI studies. Finally, 50 interested and available participants were chosen as the “healthy human CTU for GI studies”. Moreover, the bio-clinical evaluation of participants was conducted. The CTU consisted of participants aged between 22-25 years, mean body mass index of 20.9 ± 1.7 kg m⁻² and a mean waist-to-hip ratio of 0.8 ± 0.1 . The randomly selected participants' fasting blood glucose level and oral glucose tolerance test results were 85.7 ± 6.5 mgdL⁻¹ and 70.6 ± 19.1 mgdL⁻¹ respectively. This research results consist of a guidebook (ISBN 978-624-94637-0-7). The research outcome generates a harmonized and standardized procedure for research investigators and other stakeholders in different academic institutions to advance PPGR research in educational activities or in regulatory services. Therefore, the established healthy human CTU can be used in future GI studies of the food industry to analyze the GI of available food structures and to facilitate GI labelling of food products. Moreover, the guidebook provides the long-term sustainability of this procedure in an academic institution.

Keywords: Clinical trial unit, GI labelling, Glycaemic index, Glycaemic load, Post-prandial

Prevalence and Identification of *Cryptosporidium* Species in Post-renal Transplant Patients in Sri Lanka

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Cryptosporidiosis, caused by *Cryptosporidium* spp., is one of the major causes of diarrhoeal disease worldwide. It causes self-limiting disease in immunocompetent patients and life-threatening disease in the majority of immunosuppressed patients. However, there is limited data available regarding cryptosporidiosis, specifically in post-renal transplant patients (PRT) in Sri Lanka. Hence, this study aimed to determine the prevalence of *Cryptosporidium* species and identify associated risk factors in this patient population. The study was carried out on PRT patients attending nephrology clinics at teaching hospitals Kandy and Peradeniya between January 2020 and December 2022. An information sheet was used to collect demographic and risk factors. Faecal samples were collected and transported to the laboratory. Samples were concentrated using modified formalin ethyl acetate and stained with the Modified Ziehl-Neelsen (MZN) stain. All the *Cryptosporidium* oocyst-positive samples were subjected to PCR using *Cryptosporidium* genus specific primers. A chi-square comparison test was utilized to assess correlation. Of 430 consented patients, 209 faecal samples were collected. Among them, the majority were males (163, 52.6%) and aged between 1 and 70 years (mean age 42). Of the 209 stool samples tested, 11 (5.3%) were positive for *Cryptosporidium* oocysts on MZN staining and PCR. A significantly high *Cryptosporidium* positivity was in patients aged 36–50 years ($P=0.02$). Out of 209, 28 had diarrhoea and all the *Cryptosporidium* positives had diarrhoea. *Cryptosporidium* infections were significantly associated with occasionally drinking boiled water ($P=0.001$) and washing hands after going to toilets ($P=0.05$). Sources of drinking water, animal contact, and washing hands before meals were not significantly associated with *Cryptosporidium* infection. In conclusion, present study identified *Cryptosporidium* as one of the etiological agents causing diarrhoea. It is important to practice good personal hygiene and consume boiled water to prevent transmission. Furthermore, this study recommends routine screening for *Cryptosporidium* oocysts in all PRT patients.

Keywords: *Cryptosporidium*, Post-renal transplant patient, Immunocompromised, Diarrhoea, Modified Ziehl-Neelsen stain.

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Knowledge and Practices on Healthy Lifestyle among Medical Students at the University of Peradeniya, Sri Lanka

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Knowledge acquisition alone does not ensure the translation of acquired knowledge into practice. Therefore, it is essential to assess the extent to which medical students adopt healthy lifestyle practices and to examine the relationship between their knowledge and behaviour in this regard. This cross-sectional study involved 454 medical students of the Faculty of Medicine, University of Peradeniya. A self-administered questionnaire was used to assess the knowledge on healthy lifestyle and several close-ended questions were used to determine their current practices. Collected data was analysed using SPSS. Among the participants, 58.8% were females and 41.2% were males. 49.4 % had adequate knowledge about healthy lifestyle. Only 21.6% of the students engage in an adequate amount of physical activity according to WHO recommendations. Out of them, 61.23% identified time as the main constraint for engaging in physical activities. Only 23.3% perceived they consumed a balanced diet, and 91.8% reported consuming junk food more than twice a week. Only 27.3% slept 7 hours or more, which is the recommended level of sleep according to CDC guidelines. 96.5% of students did not smoke and 91% did not consume alcohol. There was no statistically significant association between the knowledge on healthy lifestyle and engaging in physical activities ($p=0.546$), consuming a balanced diet ($p=0.365$), getting adequate sleep ($p=0.310$), smoking ($p=0.573$), and consuming alcohol ($p=0.562$). The knowledge on healthy lifestyles is adequate among participants. Whilst the numbers of students refraining from alcohol and smoking are very high, the number of students engaging in adequate physical activities, having a balanced diet, and getting an adequate amount of sleep is low. There was no statistically significant association between the level of knowledge about healthy lifestyle and their current practices. This could be attributed to various constraining factors that hinder individuals from engaging in healthy practices, including time constraints.

Keywords: Healthy lifestyle, Physical activity, Knowledge, Medical students

Circulation of Chicken Anemia Virus Among Poor-Performing Broiler Flocks in Kurunegala District

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Chicken Anaemia Virus (CAV) infection is a well-known immunosuppressive disease that can increase the susceptibility of chickens to other disease-causing pathogens and even interfere with the efficacy of vaccination against those pathogens. This study was carried out to determine the presence of CAV infection in sick/ poor-performing broiler farms through conventional PCR. Four, medium to large-scale broiler farms in Kurunegala district with higher mortality rates were randomly selected for the study. Tissue samples were collected from recently dead birds during postmortem examinations. Thymus samples were collected and stored at -20 °C for downstream molecular biological studies. Total DNA was extracted from twelve selected thymus samples using the QIAGEN DNAeasy® mini kit. Conventional PCR targeting 186 bp fragment of the highly conserved VP2 coding gene of the CAV was performed using the CAV1: 5'-GCA GTA GGT ATA CGC AAG GC-3' and CAV2: 5'-CTG AAC ACC GTT GAT GGT C-3' primers. The CAV vaccine was used as the positive control. The PCR products were analyzed by electrophoresis in 1.5% agarose gels and images were captured. Nine out of the twelve samples tested were positive for CAV. At least one thymus sample was positive for CAV in all four farms. This study showed that CAV is perpetuating in the broiler farms in Kurunegala district that was subjected to our study. This emphasizes the importance of improving CAV vaccination and controlling programs to prevent CAV in broiler farms.

Keywords: Chicken anemia virus, Immunosuppression, Broiler chickens

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Harmonizing Tradition and Child Welfare: The Ordination of Buddhist Child Monks in Sri Lanka

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In Sri Lanka, where a majority follows the Theravada Buddhism, there are rituals and norms related to the ordination of monks, as well as a process of certification of ordination. Authors are highlighting issues with possible recommendations for this process, especially considering the child monks by presenting a case where the monk has been produced for clinical forensic examination (CFE) with an alleged history of physical abuse. The CFE of an 8-year-old male novice monk revealed soft tissue lesions, and some of them were compatible with the given history of physical assault by fellow monks, and the other lesions were benign. Further investigation revealed that he has not undergone the proper process of ordination, including probation period and certification of ordination. Furthermore, this monk had been moved from temple to temple by his father bypassing accepted practice while keeping the monk under his custody, citing various reasons. Subsequently, de-robing was performed according to the decision of a multi-disciplinary team and the custody of the child was granted to the father under observation of probationary care to monitor the safety, welfare, and education. This case highlights the deficiencies in the process of ordaining/de-robing novices from the existing system in Buddhism in Sri Lanka. The authors present several suggestions for safeguarding the welfare of child monks while supporting the norms and traditions of the priesthood. These include setting a minimum age limit for ordination, granting 3-6 months of compulsory probationary period before ordination, developing a process to assess whether ordination and de-robing are done according to the religious law, notifying regional child welfare officials on de-robed child monks and children whose probationary period was unsatisfactory, developing an easily-accessible online database, and decentralizing the registration centers.

Keywords: Child abuse, Child welfare, Human rights, Monks, Sri Lanka

Impact of E-Health Literacy on Quality Improvement in the Health Sector: A Study of Public Hospitals in Sri Lanka

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Healthcare is one of the priority services in Sri Lanka. Unfortunately, the public health sector faces many issues like uneven healthcare infrastructure distribution and resource distribution, people in rural areas not having much access to healthcare services, and the shortage of healthcare professionals for years. It has shown the incorporation of technology can give great benefits to the public health sector but existing involvement in technology, awareness of using technology, and implementation of technology are not enough to get great outcomes from the public healthcare service. Maintaining a better e-health system is the best way of avoiding existing technological gaps. This research aims to investigate the existing impact of e-health literacy on quality improvement to have a useful e-health system with a positive mindset to accept the technology by all related parties. According to the research problem and availability of data sources, this study has taken the form of positivism research. A cross-sectional survey has been selected as the most suitable strategy to have a deductive approach and the choice is the mono method since this considers only quantitative data type. Using the simple random sampling method, 150 public sector hospitals in Sri Lanka were taken as the sample size to represent the whole population; 1003 government hospitals in Sri Lanka. Surveys have been distributed via an online platform to the directors of hospitals who are responsible for the administration of the organization since this is an organizational-level analysis. Finally, all the gathered data were analysed using the SPSS software. Data analysis shows positive relationships between the dependent variable, the independent variable, and the technology acceptance model. So, this study suggests advanced usage of e-health literacy is associated with improved quality of care, increased engagement of cases, and other applicable parties for a better healthcare service.

Keywords: E-health literacy, Attitudes towards adopting e-health, Quality improvement, Technology acceptance model, Public sector hospitals

In vitro Glycation Induced Cross-linking Inhibition of Selected Plants of Sri Lanka

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Advanced glycation end products (AGEs) are stable irreversible compounds formed by non-enzymatic reaction of amino groups of proteins with reducing sugars. Accumulation of AGE leads to protein cross-linking which enhances the complications of diabetes. Glycation inhibition can slow down the production of AGEs and protein cross-linking with reduction in the pathogenesis of diabetic complications. The objective of the study was to evaluate glycation induced protein cross-linking inhibitory potential of five selected plant extracts. Fruits of *Bunchosia armeniaca* (Malpighiaceae), *Garcinia zeylanica* (Clusiaceae), leaves of *Coleus hadiensis* (Lamiaceae) (Synonym: *Plectranthus zatarhendi*), roots of *Hibiscus furcatus* (Malvaceae) and seeds of *Gossipium* sp. (Malvaceae) were selected and dried under shade. Dried plant parts were sonicated and extracted to methanol or methanol:dichlormethane 1:1 mixture. Solvents were evaporated using rotary evaporation at 40°C to obtain extracts of each plant part. Inhibition of glycation induced protein cross-linking was evaluated using sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-PAGE). Results of *in vitro* assays showed that except *B. armeniaca*, all plant extracts inhibited the glycation induced protein cross-linking. *G. zeylanica* showed the highest inhibitory potential among the five selected plants. With *G. zeylanica* complete inhibition of glycation induced protein cross-linking was observed at 0.2 mg/ml even after 26 days and with concentration as low as 50 µg/ml after 11 days. Based on the results it can be concluded that the fruits *G. zeylanica*, leaves of *C. hadiensis*, roots of *H. furcatus* and seeds of *Gossipium* sp. have the potential to reduce diabetes associated complications caused by AGEs.

Keywords: *Garcinia, Coleus, Hibiscus, Gossipium*, advanced glycation end products, Protein cross linking

Acknowledgement: University Research Grant (URG/17/06/AHS)

Knowledge, Attitudes, and Practices Regarding Risk factors of Coronary Heart Disease among the Medical Students of Faculty of Medicine, University of Peradeniya, Sri Lanka

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Coronary heart disease (CHD) stands as the foremost cause of non-communicable disease-related fatalities worldwide, with Sri Lanka being no exception. Knowledge, attitude, and practices with regard to risk factors of CHD are associated with mortality and morbidity due to CHD and therefore are considered primary targets for prevention of the disease. The objectives of this study were to assess the knowledge, attitudes, and practices with regard to risk factors of CHD among the medical students of the Faculty of Medicine, University of Peradeniya, Sri Lanka. A descriptive cross-sectional study was conducted using a Google Form. Data were analysed using descriptive statistics, and chi-square test. Of the 375 respondents, 205 were from the first-year batch and 170 from the second-year batch. The mean age of the participants was 22.09 ± 0.05 , with the majority being female (62.4%). The mean and standard deviation of the knowledge, attitude, and practice scores were $86.66\% \pm 8.85\%$, $73.83\% \pm 9.54\%$, and $86.45\% \pm 11.56\%$, respectively. Obesity was the risk factor known by the majority (99.7%) of the participants. The knowledge of “the level of physical activity sufficient to prevent CHD” scored the least (35.5%) among all risk factors. Coursework was the most utilized source of knowledge ($n = 300$, 80%). The association between attitudes and practices was found to be statistically significant ($\chi^2 = 4.980$, $p = 0.026$). The knowledge regarding risk factors was statistically significant across the batches ($\chi^2 = 16.930$, $p = 0.000$). Regarding knowledge, attitudes, and practices related to CHD risk factors, respectively, only 59.73%, 13.83%, and 55.20% of participants achieved a score above 85%. With a cutoff threshold set at 85%, there is evident room for improvement in the knowledge, attitudes, and practices of medical students concerning CHD risk factors.

Keywords: Coronary heart disease, Knowledge, Attitudes, Practices, Medical undergraduates

Variations in the Right Posterior Hepatic Duct Insertion and Differences Between Genders

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The biliary tract consists of a duct system draining the liver. Their pattern shows several variations. Knowledge regarding these variations is important in treating disorders of biliary tract. Endoscopic retrograde cholangiopancreatography (ERCP) and cholangiography are widely used radiological techniques to assess biliary tract. ERCP is used for therapeutic interventions as well. The objective of this study was to describe the variations in insertion of right posterior hepatic duct (RPHD) based on Huang classification using ERCP and cholangiogram images and to report the variations with gender. This retrospective descriptive study was conducted at Faculty of Medicine, University of Peradeniya and Teaching Hospital, Peradeniya. 74 ERCP images ($n = 49$) and cholangiogram studies ($n = 25$) conducted for diagnostic purposes from January 2021 to July 2023 were retrieved, and 13 were excluded due to incompleteness, low image quality, structure overlays and blurs. 61 images were reviewed by a radiologist and an anatomist to identify variations. Population age range was 23 – 81 years with 65.6% being females ($n = 39$). Variations and Huang types observed in the population were insertion of RPHD to right anterior hepatic duct (Type A1) - 42, to hepatic confluence/ trifurcation (Type A2) - 15, to left hepatic duct (Type A3) - 3, to common hepatic duct (Type A4) - 1. Insertion into cystic duct (Type A5) was not observed. No significant difference observed in variations of RPHD insertion with gender ($p = 0.684$). Our study population shows Huang A1 as the dominant pattern followed by Huang A2. Uncommon Types A3 and A4 variants were also observed but not Type A5. Pattern observed in our sample is similar to data from East Asia and not South Asia. A thorough knowledge on the pattern in Sri Lanka will aid clinicians to diagnose and treat biliary tract diseases more accurately.

Keywords: Biliary tract variations, Cholangiography, Endoscopic retrograde cholangiopancreatography

A Descriptive Analysis of How Sex Work Impacts the Psychological well-being of Transgender Sex Workers (Male to Female) in Sri Lanka

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Sex work is a controversial profession that exists globally. It is also present in Sri Lanka, but it is perceived rather negatively by society, and those who engage in it are stigmatized, marginalized, and criminalized. Research focused on the sex work industry in Sri Lanka is scarce. Existing studies primarily highlight the difficulties, discrimination, exploitation, harassment, and abuse faced by female sex workers, with less attention given to minority groups within the industry. Therefore, this study aimed to explore the impact of sex work on the psychological well-being of transgender sex workers in Sri Lanka. The study has been conducted in a qualitative manner using semi-structured interviews and utilized a purposive sample of nine transgender sex workers selected from the Colombo district. The interview questions were designed based on Ryff's Psychological Well-being scale, encompassing Autonomy, Environmental Mastery, Personal Growth, Positive Relations with Others, Purpose in Life, and self-concept. The data were analyzed along these six dimensions using the thematic analysis method. The negative effect was predominantly observed and held particularly true across all six dimensions of Ryff's framework. Notably, the study uncovered that their gender identity and profession led to repeated betrayals by romantic partners, leaving them with a sense of emptiness and disappointment, which subsequently influenced their negative perception of men. Moreover, while the study suggests some positive insights into transgender sex workers' access to healthcare services in Sri Lanka it is evident that they have been still adopting poor coping strategies for an extended period. Overall, the findings of the study show that there is a considerable impact of sex work on the psychological well-being of transgender sex workers and the adoption of poor coping strategies for a long period.

Keywords: Psychological Well-being, Sex Work, Transgender Sex Workers, Sri Lanka, Ryff's model of psychological wellbeing, Eudemonic Wellbeing

Acknowledgement: Appreciate the support of the Heart to Heart Institute in Narahenpita for facilitating access to study participants.

Evaluation of Medical Students in the Final Year Professorial Clerkship of Gynaecology and Obstetrics at the Faculty of Medicine, University of Peradeniya, Sri Lanka: A Descriptive Study

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Medical education is a vast, evolving field that spans five years. Assessing and evaluating students throughout their education is essential. Pre-tests and post-tests are commonly used methods to gauge students' initial knowledge and measure progress after teaching interventions. The purpose of this study is to evaluate final-year medical students at the University of Peradeniya during their gynaecology and obstetrics professorial clerkship in 2022. A descriptive study was conducted with a sample of 210 final-year medical students who were participating in gynaecology and obstetrics professorial appointments at the University of Peradeniya. Participants have shown an over 90% response rate. Pre- and post-test assessments included written questions (Multiple Choice Questions (MCQ), best answer type), Objective Structured Clinical Exam (OSCE), and VIVA. The data was analysed using SPSS 26.0. Results were reported as percentages and mean values. Paired t-tests were used to compare the pre-test and post-test grades; p-value <0.05 was considered statistically significant. Student feedback was categorized as negative and positive in qualitative analysis. The post-test scores showed a significant overall improvement, reflecting enhanced knowledge and clinical skills (pre-test: 54.52 ± 11.943 ; post-test: 76.79 ± 12.648). OSCE had the highest mean (pre-test: 60.20 ± 20.110 ; post-test: 88.15 ± 12.365), and MCQ scored lowest. (pre-test: 38.67 ± 13.758 ; post-test: 63.78 ± 13.228). Our findings provide evidence that higher post-test scores can be attributed to increased attentiveness, curiosity, knowledge retention, and repeated experience, as supported by previous studies. The study underscores the importance of OSCE in enhancing clinical skills compared to traditional testing methods. It also highlights the necessity of assessing the clerkship program to nurture competent physicians. The gynaecology and obstetrics clerkship, with pre-test, and post-tests, effectively enhances students' knowledge and skills, as acknowledged by over 60% of participants. Sustained progress requires continuous improvement and regular discussions, with a particular focus on MCQs.

Keywords: Medical student evaluation, Obstetrics and Gynaecology, Professorial clerkship program, Pre-test and Post-test, OSCE

Incidence, Aetiology and Outcome of Hyponatremia Following Strokes

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Hyponatremia is a frequently found complication of stroke. Cerebral salt wasting syndrome (CSWS) and Syndrome of Inappropriate Anti Diuretic Hormone secretion (SIADH) are the most common aetiological factors for developing hyponatremia following stroke. The impact of hyponatremia on stroke outcome is poorly understood. Therefore, its effect on stroke mortality was studied. Two hundred and forty six patients with confirmed stroke were prospectively observed throughout the hospital stay in a tertiary referral center in Sri Lanka. Hyponatremia was defined as serum Na⁺ level less than 131mmol/l. Differentiation of the CSWS and SIADH was based on physical examination findings and laboratory parameters. Mortality was recorded in all patients and early mortality was defined as the total number of deaths occurred by 70 days. The incidence of hyponatremia in our study population was 19.1% (95% Confidence Interval 14.39-24.58). The majority of patients (24, 51%) were attributed to CSWS. SIADH group comprised of 17 (36.2%) patients and 6 (12.7%) patients had other undetermined causes. Hyponatremia was not associated with in-hospital motility (OR -1.73, 95% CI- 0.71-4.21, P = 0.22). However, it was associated with early mortality (OR- 2.08, 95% CI 1.05-4.1, P=0.034). Kaplan Meier survival curve analysis showed better chance of survival in non-hyponatremic group compared to hyponatremic group (P value =0.02).The incidence of CSWS is higher than the incidence of SIADH. Hyponatremia has a negative impact on mortality of stroke patients..

Keywords: Cerebral salt wasting syndrome, Hyponatremia, Mortality, Stroke, Syndrome of inappropriate antidiuretic syndrome

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Postpartum Women's Perceptions on the Quality of Intrapartum Care during Vaginal Births: An Exploratory Descriptive Qualitative Study

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Childbirth is a major milestone in a woman's life, and its memory lasts forever. How a woman experiences childbirth care influences not only the woman's own health but also the well-being of the newborn as well as the family. Therefore, this study aimed to explore postpartum women's perceptions of the quality of care they received during labour and childbirth. An exploratory descriptive qualitative study was conducted at the postnatal wards in Teaching Hospital Peradeniya, Sri Lanka. Individual, in-depth interviews were conducted among fifteen purposively selected postpartum women. The interviews were tape-recorded, and the data were analysed using Braun and Clarke's thematic analysis method. Data analysis identified three major themes and nine sub-themes: 1) women's current childbirth experiences (positive childbirth experiences, negative childbirth experiences); 2) perceived quality of childbirth care (human resources, physical resources, appropriate birth environment, women's expectations vs. reality); and 3) perceived needs for quality childbirth care (effective communication and timely information, respect and preservation of dignity, labour companionship). Many participants perceived the quality of current childbirth care to be good, as there was adequate and competent staff, adequate equipment, and an appropriate birth environment. Most of the women's current childbirth experience was on or above their expectations. On the contrary, some women perceived that the care would be improved by adequate and proper supervision, effective communication, providing timely information, allowing labour companionship, showing respect, and preserving women's dignity. Women's negative childbirth experiences have affected the quality of care during labour and childbirth. However, the good outcomes of the childbirth process have allowed women to overlook those negative experiences. The findings of this study might be helpful in clinical approaches and designing future studies about the prevention of negative birth experiences and improving the quality of intrapartum care to ensure that all women experience a positive labour and birth.

Keywords: Childbirth experience, Intrapartum care, Perceptions, Quality of care, Vaginal births

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Prevalence of Metabolic Syndrome and its Components Among University Students at the University of Peradeniya, Sri Lanka

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Metabolic syndrome (MetS) is a complex disorder characterized by a cluster of risk factors that increase the likelihood of developing non-communicable diseases. The prevalence of MetS is rising globally, particularly in developing countries like Sri Lanka. University students are a unique group with distinct characteristics and lifestyle habits that may contribute to the development of MetS. This descriptive cross sectional study aimed to assess the prevalence and predictors of MetS among university students at the University of Peradeniya, Sri Lanka. 1371 students were included, and data on socio-demographic characteristics, behavioral risk factors, physical measurements, and blood samples were collected. Bivariate analysis was conducted to identify significant predictors. The prevalence of MetS was found to be 3%. High triglyceride levels were observed in 14.6% of students, low HDL level in 4.7%, high fasting blood sugar in 0.2%, high waist circumference in 6.3%, and high blood pressure in 7.9%. Sex and total cholesterol levels were identified as significant predictors of MetS. It was observed that 4.9% of males and 2.2% of females were diagnosed with MetS. There was also a significant association between age and MetS, with individuals with MetS having a higher mean age compared to those without MetS. None of the students met the recommended daily intake of fruits and vegetables, indicating the need for improved dietary habits. Consumption of fruits and vegetables was found to be a protective factor against MetS, while consumption of rice and meat was associated with an increased risk of the syndrome. Accordingly this study highlights the importance of early detection and intervention for MetS among university students in Sri Lanka. The prevalence of MetS in this population was relatively low but still significant. The findings emphasize the need for targeted interventions to promote healthier lifestyle habits, particularly in terms of diet and physical activity.

Keywords: Metabolic Syndrome, University Students, Risk factors

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Health Related Quality of Life in Patients on Maintenance Hemodialysis; A Descriptive Study in Two In-center Dialysis Units at a Major Tertiary Care Medical Institution in Sri Lanka

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The chronic and progressive debilitating nature, cumbersome fluid and dietary restrictions, obligatory time commitments with limitations in active participation in social life have shown to pose a significant bearing on a health-related quality of life (HRQOL) among people undergoing haemodialysis (HD). This study was aimed at describing the HRQOL and the associated factors among patients on maintenance hemodialysis. An analytical cross-sectional study included 317 hemodialysis patients. Kidney Disease Quality of Life-Short Form (KDQOL-SF™) was used to assess the HRQOL. Kidney disease summary component (KDSC), physical component summary (PCS) and mental component summary (MCS) scores which are derived from the KDQOL-SF™ were assessed. There was a preponderance of males among the study population (69.4%, N=220). Mean age of the study population was 51.8 ± 12.6 years. Median KDSC (70.7; inter-quartile range (IQR) 42-79.1), was higher than the median summary scores of PCS (31.9; IQR 16.2-40.7) and MCS (45.5; IQR 35.9-55.7). The results indicated that the HRQOL in relation to KDSC was significantly greater for females than for males ($U = 7840.5, P = <.001$). Screening positive for depression ($U = 7015.5, P = <.001$), having comorbidities ($U = 3200.0, P = .001$) and currently not being employed ($U = 5085.5, P = .021$) were significantly associated with low HRQOL in KDSC. HRQOL in relation to PSC ($U = 7205.5, P = <.001$) and MSC ($U = 7927.5, P = <.001$) were significantly greater for females than for males. Screening positive for depression ($U = 7771.0, P = .001$) was also significantly associated with low HRQOL in MSC. The HRQOL of the hemodialysis patients in the study population was found to be poor. Absence of comorbidities, screening negative for depression and being employed were found to be independently associated with better HRQOL.

Keywords: Health related quality of life, Haemodialysis, Morbidity and Mortality

Acknowledgement: University Research Grant (URG/2019/04/AHS)

Cytotoxic Effects of *Citrus aurantifolia* Crude Leaf Extracts on Vero Cells and C6/36 Cells Prior to Test the Anti-Dengue Viral Activity of the Extracts

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Citrus aurantifolia is a traditionally used medicinal plant, which can be tested against Dengue-virus (DENV) infections. The objective of this study was to identify *in vitro* cytotoxicity of *C. aurantifolia* leaf extracts against normal African green monkey kidney epithelial (Vero) cells and *Aedes albopictus* (C6/36) cells prior to antiviral studies against DENV infections. CytoTox-96®-Promega-USA is a colorimetric assay that quantitatively measures lactate dehydrogenase released upon cell lysis. *C. aurantifolia* leaves were ground and fresh, neat extract was diluted in normal saline to prepare the two-fold dilution series. Two 96-well assay plates were prepared separately with Vero and C6/36 cells. The assay was set up using CytoTox-96®-Promega-USA-kit manufacturer's instructions, including 1. Negative control-without cells, 2. Vehicle control-untreated cells, 3. Positive control-lysis solution with four replicates. Leaf extract was added into the test wells at different concentrations and plates were incubated for 5 and 24 hours at 37 °C and at 28 °C. The absorbance data were measured using a standard 96-well plate reader (Labtech-LT-4500-Singapore) and the percentage cytotoxicity was calculated. The cytotoxicity-driven colour intensity, absorbance values and percentage cytotoxicity decreased with the decreasing concentrations of leaf extract. The percentage cytotoxicity against Vero cells for dilutions of 1/4, 1/8, 1/16, 1/32, 1/64, 1/128, 1/256, 1/512, 1/1024 were 104.99, 83.96, 75.33, 82.96, 22.23, 35.56, 25.97, 11.26, 5.82, respectively, for the 5-hour incubation and 104.55, 91.16, 53.26, 45.83, -17.61, -31.52, -34.47, -30.51, -25.73, respectively for the 24-hour incubation. The percentage cytotoxicity against C6/36 cells were 99.42, 80.34, 50.09, 36.46, 12.23, 7.12, 7.44, -7.19, -8.99, respectively for the 5 hours and 119.10, 96.59, 63.43, 42.04, 31.42, 20.14, 9.21, 5.19, 1.73, respectively for the 24 hours. High leaf extract concentrations were cytotoxic to both Vero and C6/36 cells. Cytotoxicity of *C. aurantifolia* leaf extracts helps select the minimum toxic concentrations for testing the anti-viral activity against DENV infections.

Keywords: Absorbance, *Citrus aurantifolia* leaf extract, Colour intensity, Cytotoxicity

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Antiviral Activity of *Syzygium aromaticum* Leaf Extract Against Experimental Infections with Dengue Virus-1, -2, -3 and -4

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Dengue is a global public health issue. To date, there are no antiviral treatments to combat dengue. Plant-based products have become a primary source in the development of antiviral drugs. *Syzygium aromaticum* has been used in traditional medicine in most tropical countries. The objective of this study was to determine the anti-dengue viral activity of *S. aromaticum* leaf extract against experimental (dengue virus) DENV-1, DENV-2, DENV-3 and DENV-4 infections. Leaf extract was prepared in two-fold dilutions from neat to 1/1024 in normal saline. First, the cytotoxic effects were determined to select the minimum toxic concentration of leaf extract in both Vero cells and C6/36 cells. Then, plaque assay was done to determine the anti-viral activity of *S. aromaticum* leaf extract against experimental DENV infection. Based on the plaque assay results, plaque reduction was observed against DENV-1 at concentrations $>1/16$, DENV-2 at concentrations $>1/64$, DENV-3 at concentrations $>1/32$ and DENV-4 at concentrations $>1/16$. Based on the cytotoxicity assay results, concentrations higher than 1/64 and 1/32 were toxic to C6/36 cells after 5 and 24 h post-treatment, respectively whereas the concentrations higher than 1/32 and 1/4 were toxic to Vero cells after 5 and 24 h post-treatment, respectively. Water-based *S. aromaticum* leaf extract demonstrated anti-DENV activity against all four DENV serotypes in a dose-dependent manner while inhibiting the replication of DENV. Concentrations that are toxic to C6/36 cells and Vero cells were identified. These findings are the early steps in producing scientific evidence for the anti-viral activity of *S. aromaticum* leaf extracts against all four DENV infections. It is necessary to isolate and identify leaf chemical compositions and proper concentrations for further appropriate intake of leaf extract. More experiments will be conducted on the anti-viral activity of *S. aromaticum* leaf extracts on experimental DENV infections in Vero cells prior to clinical trials.

Keywords: Antiviral activity, Cytotoxicity, DENV, *Syzygium aromaticum* leaf extract.

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Identifying the Learning Styles of Dental Undergraduates of University of Peradeniya: VARK-Questionnaire Based Study

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Visual, Auditory, Reading/Writing, and Kinesthetic learning styles can be identified using a VARK questionnaire. This study aimed to identify the main learning style of dental undergraduates who were in their clinical years of training. A cross-sectional questionnaire-based study was conducted among 7th and 9th Semester students in 2023. The VARK questionnaire was self-administered in a Google Form. Chi-square test was used in R-Studio for statistical analysis. Response rate was 85% with 1:1.8 male to female ratio. Most preferred styles were Kinesthetic 39.5% and Auditory 28.5%. There was a significant difference between males and females in their preferred styles (p value=0.045) The existing teaching- learning system in the Faculty of Dental Sciences University of Peradeniya, provides professional assistance to undergraduates from hands on clinical experience and laboratory practicals supported with lectures and discussions. This suggests that the teaching methods are aligned with the majority of students' preferences. However, individuals' learning preferences might differ, and some may benefit from multimodal approaches. In-depth investigation is required to find out multimodal preferences. It can be concluded that the dental students perform best when given experiential learning opportunities and auditory-based teaching strategies.

Keywords: Learning styles, VARK questionnaire, Dental Undergraduates

Serum NT-proBNP for Predicting Left Ventricular Systolic Dysfunction in Hospitalized Patients in Sri Lanka

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Limited research has delved into the significance of N-Terminal pro-Brain Natriuretic Peptide (NT-proBNP) in the detection of Left Ventricular Systolic Dysfunction (LVSD) in South Asian populations. Therefore, current observational study was aimed at assessing the use of serum NT-proBNP levels in predicting LVSD in a hospitalised population in Sri Lanka. A random sample of 278 prospective patients referred for echocardiography at Teaching Hospital, Peradeniya provided the consent and venous blood samples were collected for serum NT-proBNP assay by sandwich ELISA method. Then, based on the ejection fraction (LVEF) and fractional shortening (FS), participants were differentiated as LVSD patients ($LVEF < 50\%$, $FS \leq 29\%$) and non-LVSD individuals ($LVEF > 60\%$). SPSS version 26 was used for results analysis in terms of non-parametric statistical tests. A total of 173 were finally eligible for the analysis, in which 100 were LVSD patients and 73 were non-LVSD individuals. The mean ages of the LVSD and non-LVSD groups were $69.1 (\pm 6.2$ years) and $70.8 (\pm 3.8$ years) ($p=0.718$) respectively, suggesting that LVSD is mostly a disease of elderly. The median NT-proBNP value (with IQR) among LVSD patients ($528.2 \text{ pg/mL}, 355.2\text{--}924.2$) was comparatively higher than that of non-LVSD individuals ($204 \text{ pg/mL}, 175.5\text{--}306.8$). NT-proBNP levels gradually increase through non-LVSD, mild, moderate and severe LVSD groups ($Kruskal-Wallis H(3)=122.6$, $p<0.001$). Strong correlations of log NT-proBNP level with LVEF (Spearman $\rho = -0.859$, $p<0.001$), FS ($\rho = -0.812$, $p < 0.001$) and LV mass ($\rho = 0.727$, $p<0.001$) suggested that NT-proBNP concentration in serum increases in parallel to deteriorating left ventricular functions. The area under receiver operating curve of serum NT-proBNP for differentiating LVSD was 0.866 (95% CI: $0.801 - 0.931$) and the optimal cut-off level of NT-proBNP for predicting LVSD was 265 pg/mL with 90% sensitivity and 70% specificity. Therefore, the current Sri Lankan study revealed

a considerable correlation of serum NT-proBNP level with the severity of LVSD, and the proposed cut-off level can be an optimal reference point to predict LVSD in high-risk local individuals.

Keywords: Serum, NT-proBNP, Left Ventricular Systolic Dysfunction, Natriuretic peptides, Left Ventricular Ejection Fraction

Acknowledgement: This study was financially (partially) supported by the Peradeniya University Research Grant under the project number (URG/2021/04/AHS).

Use of Space Maintainers in Children Following Early Loss of Deciduous Teeth: A Case Series

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Early loss of deciduous teeth commonly occurs due to dental caries and trauma. When an extraction is planned it is possible to maintain the space following tooth removal utilizing an appropriate space maintainer. However, there is no strict guideline or evidence to support this practice. Furthermore, provision of prosthesis is both financially and technically demanding. Therefore, children often present with detrimental effects such as crowding, impaction, midline deviation, over eruption of opposing teeth and ultimately complain of functional and esthetic complications.

A case series on the use of different types of space maintainers in a cohort of four patients in the age group of 7-12 years is presented. Case 01: Crown and loop on mandibular right first deciduous molar Case 02: Crown and loop on maxillary right first deciduous molar and an acrylic Removable partial denture for the mandibular deciduous molars. Case 03: Band and loop on left mandibular first permanent molar Case 04: Maxillary Trans palatal arch with Nance button Literature recommends review visits at least at 6-month intervals; however, this may vary depending on the caries risk of individual patient. Space maintainers can undergo de-cementation, become loosen with time, wear off, accumulate dental plaque and even cause soft tissue irritation. Therefore, replacement or repair may be required. Based on recent evidence authors suggest use of Crown and loop for unilateral loss of the said teeth unless the adjacent tooth has no dental caries or indication for placing a prosthetic crown. Such patients may benefit with Band and loop or Direct bonding technique. Bilateral tooth loss can be treated with Trans palatal arch, Lingual arch fixed prosthesis or a Removable acrylic denture.

Keywords: Early loss, Deciduous teeth, Dental caries, Space maintainer.

Assessing the Quality of Life using WHOQOL-BREF among Hemodialysis Patients in Monaragala District, Sri Lanka

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The effects of hemodialysis on overall Health-Related Quality of Life (HRQoL) in patients undergoing hemodialysis (HD) in Sri Lanka is unknown. This study aimed to evaluate the HRQoL among hemodialysis patients in the Monaragala district. Methods: In this prospective cross-sectional observational study, all adult patients (n=100) undergoing maintenance HD at two HD units in Monaragala from January 2022 to September 2022 were enrolled. HRQoL among patients on hemodialysis was measured using the World Health Organization Quality of Life Assessment Brief version (WHOQOL-BREF) questionnaire, which evaluates four domains: physical health, psychological health, social relationships & environment. Descriptive and inferential statistical (Pearson Correlation, two-tailed) analysis was conducted using SPSS Version 26. Results & Discussion: The mean (SD) age of 100 patients was 53.5 (11.83) years. The majority (77%) of the participants were males. Overall health satisfaction was 2.62 ± 0.852 out of five scores. Mean \pm SD scores of each HRQoL domain were physical 34.66 ± 11.80 , psychological 44.72 ± 12.69 , social 44.50 ± 17.28 and environmental 64.43 ± 12.67 . A moderately positive correlation was observed between physical and psychological domains ($r=0.621$, $p<0.05$). Weak positive correlations were observed between psychological domains and overall quality of life ($r=0.386$), overall health satisfaction ($r=0.317$), social relationship($r=0.431$), and environmental domains ($r=0.416$), (p for all <0.05). A statistically significant association was found between patients having diabetes with physical ($p=0.001$) and psychological ($p=0.007$) domains of WHOQoL-BREF. A statistically significant association was found between females and overall quality of life ($p=0.029$). Furthermore, low education was associated with the social domain ($p=0.024$). Conclusion: The patients had overall better HRQoL scores in environmental domains than in other domains. The physical HRQoL was mainly impaired. Having diabetes female gender and low education levels impacted the HRQoL of HD patients.

Keywords: Hemodialysis, Quality of life, Sri Lanka, Renal failure

Development of Educational Content for a Health Promoting Smartphone Application for Sri Lankan Sub-fertile Women with Obesity

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Obese sub-fertile women of childbearing age striving to achieve pregnancy is a global concern. Lower level of knowledge and awareness about sub-fertility and obesity, and the void in scientific knowledge dissemination among the women of childbearing age in Sri Lanka are concerns. Smartphone applications as a form of knowledge dissemination is a timely requirement. There were three phases in developing the educational content: the literature review, collecting previous success stories, and the expert consultation. Literature within the past fifteen years was considered. In the second phase, information was gathered from thirty succeeded individuals who were obese/ overweight and then conceived after weight reduction. This was a cross-sectional study. Expert consultation through focus group discussions with a panel of three nutritionists, a gynecologist, a counselor, a sport and exercise science expert, and two developers was considered. All the participants reported that they had lost weight (weight reduction percentage varied from 7.14% to 25%) before conceiving. They followed a Low Carbohydrate Diet/ intermittent fasting/ balanced diet under dietary management. It was found that there was no proper awareness regarding sub-fertility caused by excessive weight gain among participants. This justified the need for the dissemination of knowledge regarding obesity and subfertility among the target group. Twenty-three participants reported weight reduction resulted in regular menstrual cycles and the literature proves proper menstrual cycle is a key factor for conception. Most participants had followed imbalanced dietary practices with an energy-dense diet and had led a sedentary lifestyle which resulted in obesity. From the obtained information from all three phases, the content was validated and verified for the mobile application under the guidance of the expert panel. It was finalized to have content on; Body Mass Index (BMI), obesity, subfertility, insulin resistance, Glycemic Index (GI), maintaining weight loss, circadian rhythm, pre-pregnancy nutrition requirement, and fertility window.

Keywords: Education, Obesity, Smartphone Application, Sub-fertile

Relationship between Mobile Phone Screen Time and the Quality of Life among Students in University of Peradeniya

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Increased smartphone usage among young people poses concerning risks of addiction and detrimentally impacts their quality of life (QoL). Therefore, this study aimed to describe mobile phone screen time and its association with QoL among undergraduates. This cross-sectional study was conducted among 662 undergraduates from University of Peradeniya using stratified random sampling method. Data were collected through an online questionnaire, which included validated tools such as the Smartphone Addiction Scale (SAS-SV) and the World Health Organization Quality of Life-BREF Questionnaire (WHOQOL-BREF). Descriptive statistics and independent sample t-tests were used to examine associations between variables. A total of 533 participants (80.5% response rate) participated. The mean age was 23.6 years ($SD = \pm 1.89$) and the majority were females (61.2%; n=326). The average duration of using mobile phones was 5.27 ± 2.83 hours on a weekday and 6.96 ± 3.17 hours on a weekend day. WhatsApp (93.7%; n=492) was the most commonly used application followed by Facebook (72.2%; n=379) and Instagram (37.9%; n=199). The average score of smartphone addiction was 30.69 ± 10.17 with 44.5% (n=237) of participants found to be addicted. In the QoL assessment, the mean scores for Physical, Social, Environmental and Psychological domains were 63 ± 14.8 , 56 ± 17.4 , 56 ± 13.6 , 54.5 ± 8.5 respectively. Participants who were addicted to their mobile phones had significantly lower scores in both physical ($p=0.002$) and psychological ($p=0.010$) domains. Leisure time activities showed significant associations with all domains of QoL (Physical $p<0.001$, Psychological $p<0.001$, Social $p=0.001$, Environmental $p=0.008$). The study has found that higher mobile phone screen time has made a negative impact on QoL. Therefore, undergraduates must be aware on the use of mobile phone in productive way, and they should be encouraged to reduce the mobile phone screen time and involve with leisure time activities to improve their QoL.

Keywords: Screen time, Smartphone addiction, Quality of life, University students

Study of Relationship between Body Mass Index (BMI) and Bone Mineral Density (BMD) in Postmenopausal Women

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Obesity and osteoporosis are growing and important public health problems while osteoporotic fractures are main concerns of postmenopausal women. Low BMD is a risk factor for osteoporosis and related fractures. BMI has been found to be inversely related to the risk of osteoporotic fractures. Although several studies have investigated the association between BMI and BMD, the results are inconsistent. The aim of this study was to investigate the relation between BMI and BMD in postmenopausal women. This is a retrospective study of Dual-Energy X-ray Absorptiometry (DXA) database from 01.01.2019 to 31.12.2022 at Nuclear Medicine Unit, University of Peradeniya. Postmenopausal women underwent a standard BMD scan of lumbar vertebrae (L1-L4) and total hip. Participants were categorized into two BMI groups; normal weight $< 25.0 \text{ kg m}^{-2}$ and overweight and obese $\geq 25.0 \text{ kg m}^{-2}$. The clinical details were analyzed by Minitab 18.0 using BMD of lumbar spine and total hip. Total 953 patients, 839 of them were females. Out of them; 765 (91.17 %) were postmenopausal women with the mean age of 61.88 years (SD = 9.538). Among the postmenopausal women; 476 (62.22 %) had BMI $\geq 25.0 \text{ kg m}^{-2}$ and 289 (37.78 %) had BMI $< 25.0 \text{ kg m}^{-2}$. The mean BMD of postmenopausal women with BMI $\geq 25.0 \text{ kg m}^{-2}$ and with BMI $< 25.0 \text{ kg m}^{-2}$ were 0.769 (SD = 1.37) and 0.693 (SD = 1.40) respectively. Mean BMD of postmenopausal women with BMI $\geq 25.0 \text{ kg m}^{-2}$ had higher significance ($P = 0.000$ with 95% CI) than those with BMI $< 25.0 \text{ kg m}^{-2}$. It was noted that higher BMI and weight were associated with a higher BMD. These data indicated both BMI and weight are associated with BMD of hip and vertebrae; and overweight and obesity decrease the osteoporosis risk.

Keywords: Bone mineral density, Body mass index, Osteoporosis, Post-menopause

Single Versus Two Dental Implants Retained Mandibular Over Dentures: Comparison of Function, Patient Satisfaction, Oral Health-Related Quality of Life and Success of Treatment

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An implant-retained/supported prosthesis provides greater stability and retention, improved chewing forces with higher patient satisfaction than a conventional denture. Objective of the study was to compare the effectiveness of prosthetic rehabilitation of edentulous patients with single median dental implant retained over dentures with those retained by two dental implants in the canine or first premolar region. Completely edentulous patients who presented to the Department of Prosthetic Dentistry, Faculty of Dental Sciences, University of Peradeniya were selected for the study. All patients who were randomly selected for a single implant or 2 implants retained mandibular overdentures after assessment. Surgical implant placement and prosthetic procedures were carried out. Patients were reviewed at 3 months, 6 months and 1 year and outcome was assessed by the clinician (retention, stability, support of the overdenture and success of the implant), by the patient (self-administered questionnaires), oral health related quality of life using OHIP-14 scale, and patient satisfaction with the prosthesis using a questionnaire. Data were analyzed using Minitab. Patient comfort, esthetics, chewing, speech, general satisfaction, denture retention, stability and support with 2-implant and 1-implant retained overdentures had been significantly increased than conventional dentures ($p<0.05$) at 3, 6 months, and 1year review. Further, OHIP-14 scale showed statistically significant improved oral health related quality of life with single and 2 implant retained dentures when compared with conventional dentures. However, when the 2-implant and single implant retained dentures were compared, a significant difference was observed only with patient comfort at 3 months review. In conclusion, single and 2 implant retained overdentures improve outcome assessed by the patient and clinician and oral health related quality of life of the individual than conventional complete dentures. Single implant retained overdentures can also be considered for improved outcomes in the management of completely edentulous patients.

Keywords: Single implant, Two-implant, Overdentures, Implant retained over dentures, OHIP-14, Patient outcomes

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Pharmacological Inhibition of Alternative Nf-Kb Pathway Ameiliorates Periodontitis after Ovariectomy in a Murine Model

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Many studies have highlighted an association between periodontitis and osteoporosis. The defective alternative NF-κB pathway has been demonstrated to prevent bone resorption triggered by LPS, the main culprit implicated in chronic periodontitis. In the present study, we utilized a well-established NF-κB inhibitor SN-52, which specifically targets alternative NF-κB pathway. Prior ethical approval for all animal experiments was obtained. *In vitro* osteoclastogenesis and osteoblastogenesis were performed based on previously described methods. An *in vivo* study involved the administration of either 2 µl of PBS or *E. coli* LPS (10µg/µl) into the palatal gingiva between the right maxillary first and second molars for one month. Concurrently, intraperitoneal injections were administered twice daily as follows: sham/PBS/Veh [sham operated (Sham)], sham/LPS/Veh, OVX/PBS/Veh, OVX/LPS/Veh (OVX-Veh), and OVX/LPS/inhibitor at a dosage of 25 mg /kg/day. Statistical differences among groups were evaluated using one-way analysis of variance (ANOVA). We have observed that SN52 exhibits a dose-dependent suppression of osteoclast formation induced by MCSF and RANKL. Additionally, there is an augment impact on osteoblast generation, as evidenced by ALP staining and quantification as well as by von Kossa staining and quantification on day 7 and day 21, respectively. Compared to PBS-injected control animals, there was an increased CEJ-ABC distance in maxilla in LPS-injected animals and OVX-LPS animals. Conversely, animals administered with SN52 injections demonstrated a reduced CEJ-ABC distance, indicating that the increase in CEJ-ABC distance induced by LPS was mitigated by SN52 treatment suggesting that inhibition of NF-κB by SN52 *in vivo* is effective in reducing the ABC-CEJ distance under conditions of LPS and estrogen deficiency. The current study underscores the potential of SN52 as a promising therapeutic agent to mitigate the detrimental effects of these factors on bone health, especially in conditions characterized by exacerbated bone diseases such as osteoporosis.

Keywords: Periodontitis, Osteoporosis, LPS, Murine model, NF-κB

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Sinhalese Version of the Neck Disability Index: A Reliability and Validity Study

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The Neck Disability Index is a validated and reliable questionnaire used in assessing pain in the neck region. The Sinhalese version of the Neck Disability Index has not been validated yet. Thus, the objective of the current study was to assess the validity of the Neck Disability Index- Sinhalese version (NDI-S) among Sinhalese individuals with neck pain. This cross-sectional study was conducted among 100 patients with neck pain attending the Department of Physiotherapy, Teaching Hospital Peradeniya and National Hospital Kandy from September 2021 to February 2022. To evaluate the performance of the NDI-S, Short Form 36 Health Survey Questionnaire (SF-36) and Visual Analogue Scale (VAS) were used in their mother tongue on their first visit. After a 10- day interval, all the participants were asked to complete the Global Rating of Change (GRoC) and NDI-S to prevent participant from recall bias. The study sample consisted of 45 males and 55 females with mean age of 36.93 ± 1.14 years. Cronbach's alpha for the NDI-S was 0.896 indicating excellent internal consistency and intraclass correlation coefficient value was 0.985 indicating excellent reliability. The Bland and Altman analysis showed that the mean of the difference was 0.021 ± 0.14 . Mean NDI-S \pm standard deviation value of test and re-test studies were 30.73 ± 6.09 and 30.71 ± 6.07 respectively. The Pearson's correlation test revealed a significant correlation between NDI-S and the SF-36 scores ($r = -0.786$, $p < 0.001$). There was also a significant positive correlation between NDI-S score and VAS score ($r = 0.799$, $p < 0.001$). NDI-S demonstrated a structure with two dimensions and these factors explained 73.25% of the total variance. The NDI-S has been successfully translated and cross-culturally adapted into the Sinhalese language and it is a reliable and valid measuring tool of pain and functional ability.

Keywords: Neck Disability Index- Sinhalese version, Sri Lanka, Translation, Reliability, Validity

A Feasibility Study on the Use of MeMoSA® Software by Dental Surgeons in Kandy District, Sri Lanka

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During the COVID19 pandemic, mobile phone-based technology evolved in elastic demand and expanded to dentistry, identified by the term ‘tele-dentistry’. MeMoSA® is a web-based application (App) developed by Cancer Research Malaysia (CRMY) to transmit image and clinical data to specialists to obtain review decisions by primary care dentists. The purpose of this study is to assess the feasibility of using MeMoSA® software among dental surgeons in Kandy district. Ethical clearance was obtained from the Ethics Review Committee, Faculty of Dental Sciences, University of Peradeniya (ERC/FDS/2022/03). A post-study questionnaire survey was conducted to assess the experience after three months. A descriptive analysis of the questionnaire data was performed using statistical analysis software (SPSS, Version 21). Initially, the App was introduced to primary care dentists (n=47) and oral medicine specialists (n=2). The response rate for the post-study survey after three months was 51%. The factors which motivated the users were 41.7% (n=10) opinionated as user friendly, 75% (n=18) stated that it conserves time, 37.5% (n=9) stated it is easy to learn, and 45.8% (n=11) stated the research team provided adequate support. The dissatisfied concerns by the users were 12.5% (n=3) not user friendly, 4.2% (n=1) time-consuming, 25% (n=6) it was challenging to learn how to use it, 12.5% (n=3) reported it challenging to take pictures, 8.3% (n=2) individuals stated that the support and training provided by the research team were inadequate and one individual (4.2%) stated the App was not compatible to their device. The outcome of the feasibility study indicated lack of motivation to use the App at the working environment, less technological competency due to advanced age group of the cohort, less compatibility with some devices, unavailability and cost of internet facilities, and misconceptions about tele-dentistry were concerns for early detection of oral cancer using mobile technology. We conclude that further research and awareness programs are necessary to promote tele-dentistry in Sri Lanka.

Keywords: MeMoSA®, Teledentistry, Dental surgeons, Kandy, Early detection, Oral cancer

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Prevalence of Falls and Comparative Analysis of Health-Related Physical Fitness Factors among Older Adults in Elderly Homes in Kandy District: Non-Fallers, Fallers, and Frequent Fallers

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Falls can be identified as one of the major issues which may lead to serious health consequences among older adults. Health-related physical fitness factors are important in the perspective of healthy ageing. The objective of the study was to determine the prevalence of falls and to compare health-related physical fitness factors between non-fallers (no fall), fallers (one fall) and frequent fallers (two or more). The study sample comprised 172 older adults above 60 years of age, living in registered elder's homes in Kandy District. They were recruited by cluster random sampling. The number of falls reported by the subjects during the past 12 months was used to determine the prevalence of falls and the category of faller. Body Mass Index (BMI), 2-minute walk test, 30 second sit to stand test, hand grip strength, chair sit and reach test and back scratch test were used to assess health-related physical fitness factors. These factors were compared between the three categories of fallers using one-way ANOVA and pairwise comparison was performed using Scheffe test. Of the total sample, 47.1% had a fall at least once during past 12 months. Out of them 18.6% reported frequent falls, while 28.5% sustained only one fall. Higher BMI, lower cardiovascular endurance and lower flexibility in lower body were associated with increased prevalence of falls ($p<0.05$). There was no significant difference in body fat percentage, hand grip strength, lower body muscle strength and endurance and upper body flexibility between the three categories of fallers ($p>0.05$). The results of the present study emphasize that exercise programs aimed to prevent falls may need to address cardiovascular endurance and lower body flexibility. Further, longitudinal studies to assess the health-related physical fitness and interventional studies are suggested among institutionalized older adults.

Keywords: Falls, Health-related physical fitness, Older adults, Institutionalized older adults

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Prevalence of Risk Factors for Non-Communicable Diseases among Teachers at a Selected School in Peradeniya

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Planning appropriate control measures for non-communicable diseases (NCDs) requires research into the risk factors. This descriptive cross sectional study was organized with the intention of identifying behavioral and physical risk factors for NCDs among teachers at a selected school in Peradeniya and the study was conducted in June-July 2023. A pretested set of questionnaires were used to collect data. All the teachers at a selected school in Peradeniya were considered as the study population. The sampling method was purposive sampling, and the sample size was 43. Written permission for the study was obtained from the principal of the school. The proportion of participants in the normal body mass index (BMI) range was 53.48%. Another 41.86% were in the overweight range, and 4.6% were obese. The highest overweight range was reported in the 41–50 age category and it was 58%. The percentage of participants with high blood pressure was 44.18%. The highest proportion of high blood pressure was reported in people aged 41–50, and it was 53%. The percentage of 66.67 of participants used deep dishes for their main meals and 33.33% who consume healthy dishes. Almost all participants used a large spoon to distribute rice for dishes and a small spoon to distribute vegetables. All the participants prefer additional meals, with 37% selecting a healthy food plate and 63% selecting an unhealthy food plate. Less number of participants (14%) participated in daily exercise for more than 20 minutes. The high levels of physical inactivity, improper diets, being obese, and a relatively high prevalence of high blood pressure are identified cardiovascular disease and diabetes risk factors that require immediate attention.

Keywords: Body mass index, Cardiovascular diseases, Non-communicable diseases, Public health risk factors.

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Manual and Ventilator Hyperinflation Parameters Used by Intensive Care Physiotherapists in Sri Lanka: An Online Survey

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Hyperinflation is a common procedure to clear secretion, enhance oxygenation, and increase lung compliance in mechanically ventilated patients. Hyperinflation can be provided as manual hyperinflation (MHI) or ventilator hyperinflation (VHI), where outcomes depend upon the methods of application. It is crucial to assess the application of techniques in Sri Lanka due to observed variations from recommended practices. This study aimed to evaluate the application and parameters used for MHI and VHI by physiotherapists in intensive care units (ICUs) in Sri Lanka. An online survey was conducted among physiotherapists who are working in ICUs in Sri Lanka using WhatsApp groups and other social media platforms. A total of 96 physiotherapists responded. The survey comprised three sections to obtain information about socio-demographic data, MHI practices and VHI practices. Most (47%) respondents worked in general hospitals. 74% of participants had a bachelor's degree in physiotherapy and 31.3% had 3-6 years of experience, 93.8% used hyperinflation, and 78.9% used MHI. MHI was performed routinely and as needed to treat low oxygen levels, abnormal breath sounds, and per physician orders while avoiding contraindications. Self-inflation bags are frequently used for MHI (40.6%). Only a few participants (26%) used a manometer or tracked peak inspiratory pressure (PIP). In addition to the supine position, (37.5%) participants used the side-lying position as well. Most physiotherapists followed the recommended MHI technique: slow squeeze (57.3%), inspiratory pause (45.8%), and quick release (70.8%). VHI was practised by 19.8%, with medical approval and it was frequently performed by medical staff compared to physiotherapists. Treatment time, number of breaths, and patient positioning varied, and parameters were not well-defined. The study found that MHI was not applied with the recommended PIP, and VHI parameters were not identified. The study indicates a need to educate ICU physiotherapists about current VHI and MHI practice guidelines.

Keywords: Intensive care, Manual hyperinflation, Physiotherapists, Ventilator hyperinflation, Hyperinflation

Acknowledgement: Sincere gratitude is offered to all the participants and all physiotherapists who helped in data collection and Dr (Mrs.) Kate Hayes for granting permission to use the questionnaire developed to assess VHI techniques.

Evaluating Groundwater Quality as Drinking Water in Hambantota District: A Water Quality Index Analysis

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With the escalation of diverse developmental and agricultural activities, both human-induced and natural, the groundwater quality within Hambantota district has undergone changes. An analysis of the suitability of groundwater for drinking purposes is imperative, given that it serves as the second most important source of drinking water in Hambantota. Utilizing the Water Quality Index (WQI), this study aims to analyze and evaluate the appropriateness of groundwater quality for drinking purposes within the district. To achieve this goal, a total of 335 groundwater samples were collected and analyzed by the National Water Supply and Drainage Board. Subsequently, these samples underwent detailed analysis to determine the suitability of groundwater as a drinking water source in Hambantota. The analysis process involves establishing a Pearson correlation to construct a relationship matrix among eight variables: Total Dissolved Solids (TDS), Magnesium (Mg^{+2}), Chloride (Cl^-), Sulphate (SO_4^{+2}), Total Iron (Fe^{+2}), Nitrate (NO_3^-), Total Hardness (TH), and Fluoride (F). Additionally, the Water Quality Index (WQI) is computed using descriptive statistics. Based on the secondary data, spatial distribution maps for each parameter, as well as the WQI, were generated. The study's findings revealed that, in terms of drinking water quality, the WQI classification assigns 13% to the excellent groundwater quality class and 28% to the good groundwater quality class. Conversely, the remaining WQI classifications, amounting to 6% for poor, 5% for very poor, and 47% for unsuitable, emphasize the unsatisfactory suitability of groundwater for drinking within Hambantota district. Of notable significance, the study found a substantial correlation between the Total Iron content within the samples and the WQI, with a correlation coefficient of 1.00. Therefore, these spatial distribution maps prove to be invaluable for identifying groundwater quality patterns across the Hambantota district.

Keywords: Groundwater, Suitability, Water Quality Index, GIS

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Effect of Haematinics on Patients Diagnosed with Symptomatic Oral Submucous Fibrosis

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Oral submucous fibrosis (OSF) is a well-established oral potentially malignant disorder (OPMD). It is a chronic, insidious disease with progressive fibrosis in the submucosal tissue leading to restriction in opening the mouth with the advancement of the disease. It has a malignant transformation risk. OSF has been shown to have an association with iron deficiency anemia. The current study is a prospective case control study designed to see the effects of haematinics on the symptoms in patient diagnosed with OSF conducted at the Oral Medicine clinic, Faculty of Dental Sciences, University of Peradeniya. A total of 30 patients between the age range of 19-75 years were recruited to each group, control (OSF without iron deficiency anemia) and test group (OSF + iron deficiency anemia). A male predilection was observed in the sample (90 %). There is a statistically significant association between the improvement of mouth opening, burning sensation and hemoglobin counts in anemic sample with prescription of hematinics with standard treatment (-4.785, - 8.034 & - 5.387 at 95% confidence interval respectively). Control samples also show improvement of mouth opening and burning sensation with standard treatments. In conclusion, our case study favours that the use haematinics improves symptoms of patients diagnosed with OSF, however, a clinical trial is recommended for conclusive evidence.

Keywords: Oral Submucous fibrosis, Haematinics, Anemia

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Predicting the Disease Progression of CKDu Patients Based on Clinical, Environmental and Socio-Demographic Factors

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Chronic Kidney Disease of Uncertain Etiology (CKDu) has emerged as a significant global health concern in recent years and in Sri Lanka, it was first identified in 1994. The disease predominantly afflicts certain regions within the country's dry zone, encompassing key agricultural provinces like North Central, Uva, Eastern, and North Western. The causative factors of this disease are still unknown and it is not caused by the traditional risk factors. The aim of this study is to develop a predictive model for estimating the annual eGFR decline of CKDu patients using a comprehensive dataset encompassing clinical, environmental, and socio-demographic factors. The dataset included 304 patients and 45 variables which were cleaned and was split into 80:20 training and testing sets. Initially, Ridge Regression was employed, but its performance with a relatively low R-squared value (25.92%) and higher Root Mean Square Error (RMSE) (2.92) did not meet expectations, indicating the need for an alternative. Least Absolute Shrinkage and Selection Operator (LASSO) regression was then utilized, demonstrating higher accuracy and predictive performance, making it the preferred final model. The results revealed 14 significant predictor variables in the LASSO model, including water sources (public water, protected dug well water, and spring water), alcohol consumption, systolic blood pressure, baseline eGFR, weight, serum sodium and calcium levels, as well as health symptoms such as joint pain, dehydration, nausea, and fever. With an R-squared value of 65.77% and a reduced RMSE of 1.82, the LASSO model performed more predictably than Ridge Regression. The actual vs. predicted graph further highlighted the model's precision in estimating the annual eGFR decline for CKDu patients. The predictive model can be used to estimating the annual eGFR decline of CKDu patients based on identified factors and it has practical implications for healthcare professionals in understanding disease progression and making informed decisions regarding personalized interventions.

Keywords: Chronic Kidney Disease, Annual eGFR Decline, Ridge Regression, LASSO Model

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Soil-transmitted Helminth Infections among Antenatal Clinic Attendees Residing in a Resource-poor Coastal area, Sri Lanka

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Soil-transmitted helminth (STH) infections pose a notable health risk to children and pregnant mothers. Geohelminthic infections, particularly hookworm infections during pregnancy result in poor fetal outcomes. The national survey on STH infections conducted in 2017 showed a prevalence of 1% at national level. The revised Sri Lankan guideline based on these findings, recommended discontinuation of routine deworming of pregnant mothers in all districts. Since then, socio-economic circumstances in the country have deteriorated. The aim of this study was to reassess the situation among pregnant mothers in a high-risk area. A cross-sectional descriptive study was performed among pregnant women attending antenatal clinics in the Egoda Uyana, Medical Officer of Health area in Moratuwa during the month of November 2022. Faecal samples were examined using direct saline smears and Kato-Katz technique for helminth ova. Of the 480 registered clinic attendees, stool samples were provided by 246 (51.25%). The mean maternal age was 27.4 (range 16-43) years. The overall rate of STH infection was 2.4% (6/246). Mono-infections with *Ascaris lumbricoides* and *Trichuris trichiura* were 0.813% (2/246) and 0.40% (1/246) respectively while 1.28% (3/246) were co-infected with both species. No hookworm infections were seen. The faecal egg counts revealed that *A. lumbricoides* infections ranged from light to moderately heavy intensity (528-45,840 eggs per gram faeces) while all *T. trichiura* infections were of light intensity (24-672 epg faeces). Thirteen percent (32/129) of pregnant mothers had been dewormed during the pregnancy. None of the mothers with STH infections had been dewormed in the recent past. Although the national prevalence of STHs has declined to very low levels, this study provides evidence of residual transmission of STHs in unknown high-risk pockets such as this coastal community. Thus, close monitoring and targeted interventions are recommended.

Keywords: Pregnancy, Soil-transmitted helminth infections, Prevalence, Coastal community, Moratuwa

Prevalence of Smartphone Addiction and its Impact on Neck Muscle Strength, Endurance, and Handgrip Strength among Undergraduates of Faculty of Allied Health Sciences, University of Peradeniya

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Smartphone usage is rapidly increasing worldwide and has developed to a level of addiction which evolve a global issue. This addiction level is especially high among younger population and it affects their physical and psychosocial health. Smartphone addiction (SA) has a direct impact on the neck muscles and hand muscles which are mostly involved during prolong smartphone usage. There were no similar studies conducted in Sri Lanka. Hence, this study aimed to investigate the SA and its impact on neck muscle strength, endurance and handgrip strength among undergraduates. A descriptive cross-sectional study was carried out among 225 undergraduates who were using smartphones, representing four academic years in five departments of the Faculty of Allied Health Sciences, University of Peradeniya. Smartphone Addiction Scale-Short Version was used to assess SA status and standard physical tests were used to assess muscle strength and endurance of neck flexors and neck extensors and hand grip strength. The study revealed that there was 62.7% prevalence of SA among undergraduates where males (74.6%) were found to be more addicted than female (57.1%) students. Comparison of neck muscle strength and endurance between addicted and non-addicted undergraduates suggest that smartphone non-addicted students have significantly higher neck flexor ($p=0.004$) and extensor ($p<0.001$) muscle strength, neck flexor ($p=0.016$) and extensor ($p=0.007$) muscle endurance and handgrip strength (Right: $p=0.043$, Left: $p=0.023$) compared to smartphone addicted students. The study found that there is an adverse impact of SA on neck muscle strength, endurance and handgrip strength. Additionally, a significant association was observed between gender and SA. This study found a 62.7% SA prevalence among undergraduates which has a significant impact on neck muscle strength, endurance and handgrip strength. Future studies are needed to investigate the reasons for SA among university students and this information will be helpful in identifying essential measures to reduce smartphone addiction.

Keywords: Smartphone addiction, Undergraduates, Neck muscles strength, Neck muscles endurance, Handgrip strength

Evaluating the Age-wise Prevalence of Hypertension among the General Public of Sri Lanka Attended the Hypertension Screening Programme Conducted during the Open Day of the University of Peradeniya

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Hypertension is a serious and prevalent health issue with significant implications for public health and a primary contributor to cardiovascular disease and premature mortality. Screening plays a vital role in preventing hypertension and its complications. The hypertension screening programme conducted during the University of Peradeniya's Open Day on July 1st, 2023 provided an ideal setting to conduct this retrospective study aimed to evaluate the age-wise prevalence of hypertension in the Sri Lankan general public. Data from 642 participants which was already collected for administrative purposes during the screening programme was analysed using IBM SPSS software (version 26) to evaluate the age-wise prevalence of hypertension using cutoff values 140mmHg systolic and 90mmHg diastolic according to the hypertension management guidelines by the American Heart Association and was further analyzed to assess the correlation of the prevalence of hypertension with age using Pearson correlation analysis. The participants were provided a rest period of 10 minutes before blood pressure measurement. The analysis showed a positive ($r=+0.318$), statistically significant ($p<0.001$) correlation with a notable prevalence of hypertension in all age groups with a more than 30% prevalence from age 30 onwards with a drastic increase (more than 60%) after 50 years. Therefore, it is advisable to conduct proactive screening programmes from age 30 onwards to detect the individuals early and direct them to medical intervention thus reducing the likelihood of complications, resulting in the reduction of morbidity and economic burden on individuals as well as the healthcare system.

Keywords: Hypertension, Prevalence, Age-wise, Sri Lanka, General Public

Optimal Drug Usage for Cancer Treatment

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Countries grappling with dollar shortages and economic crises are encountering challenges in meeting the demand for medicines, particularly drugs used in cancer treatment. To control the spread of tumor cells, treatment should be given. When the treatments are increased the tumor cells will be reduced, but the side effects will be increased and the drug availability will be decreased. To compromise between these competing factors optimal control strategies can be used. A mathematical model was established using optimal control theories for the above scenario. Tumor density was modeled as the state variable while the side effects and drug availability were taken as the control variables. The objective is to study how to optimize the treatment where tumor density is minimized while the drug effects and the drug availability are maintained at an optimal level. While drug shortage is being an issue, overstocking of drugs is also a problem which is considered in the model. A set of necessary conditions namely the adjoint equation, transversality condition, optimality condition, and state equation were obtained via Pontryagin's principle and a function called the Hamiltonian. In the solving process, the differential equations were solved numerically. The optimal control variables with corresponding state variable that optimize the treatment were obtained. Finally, simulations were carried out to interpret the outputs. One simulation can be stated where the model suggests using less drugs with higher strength to reduce more tumor density when the weight on minimizing tumor density is increased gradually. Similarly, the weights on minimizing drug effect and drug shortage also can be varied and interpreted. The research extends the existing understanding of cancer models by incorporating the notion of control variables, allowing for a more accurate representation of real scenarios.

Keywords: Optimal control model, Drug availability, Side effects, Tumor cells

The Perspectives of the Radiography Workforce towards the Covid-19 Outbreak in Sri Lanka

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The COVID-19 pandemic has posed significant challenges to healthcare workers globally. The Radiography Work Force (RWF), being an essential part of the frontline healthcare team, plays a crucial role in diagnosing and managing COVID-19 cases. This study aimed to assess the perspectives of the RWF in Sri Lanka towards the pandemic. A cross-sectional survey was conducted, and data was collected through an online questionnaire. The study included 201 radiographers and radiotherapists, both from government and private hospitals. The demographic analysis showed a diverse representation of age, gender, and workplace settings. The majority (99.4%) of participants recognized the importance of the RWF in combating the pandemic and acknowledged the increased risk of infection, associated with their work. However, while 75.6% of participants reported that their family, friends, and partners were affected by their work-related stress, only 24.4% believed they received adequate social and psychological support at their workplace. However, concerns were raised about the availability of PPE in the workplace. The study highlighted the high levels of stress and fear experienced by the RWF due to the pandemic. The major stressors identified were the fear of contracting the virus (77.6%) and an increased workload (62.4%). Many participants (61.7%) recognized the need for professional help to cope with the stress, emphasizing the importance of addressing mental health concerns among healthcare workers. This study shed light on the perceptions of RWF in Sri Lanka towards COVID-19. The RWF acknowledges its crucial role in the healthcare system but highlights the challenges faced including stress, fear, and concerns about infection control. Addressing these concerns and providing adequate support is crucial. Further research and tailored interventions are necessary to better understand and mitigate the challenges faced by RWF during similar crises.

Keywords: RWF-Radiography Work Force, PPE – Personal Protective Equipment, COVID – Corona Virus Disease

High Occurrence of ST13 Clade C in Extraintestinal Pathogenic *Escherichia coli* (ExPEC) Isolated from Humans and Companion Animals in Sri Lanka

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Escherichia coli (*E. coli*) sequence type 131 (ST131) is a globally disseminated multidrug-resistant clone. ST131 comprises three clades named A, B, and C. Clade A consists of the O16:H5 serotype, while B and C, which differ from each other by the *fimH* allele, consist of the O25:H4 serotype. Clade C contains three subclades named C0, C1 (non-M27 & M27), and C2. The clades and subclades of ST131 exhibit variations in antimicrobial resistance profiles and geographical distribution. The aim of this study was to identify the clades and subclades of *E. coli* ST131 isolated from extraintestinal infections in humans and dogs in Kandy and Batticaloa Districts of Sri Lanka, and to determine the variation in antimicrobial profiles and biofilm-forming ability. A total of 133 *E. coli* isolates collected from 117 humans and 16 dogs with urinary tract infections, endometritis, or septicemia were confirmed as ST131 by polymerase chain reaction (PCR) and used for the study. Multiplex PCR was performed using the primer sequences and PCR conditions described previously to assign the isolates to clades and subclades. The antimicrobial resistance patterns of the isolates were also determined for 16 antimicrobials following the guidelines of the European Committee on Antimicrobial Susceptibility Testing (EUCAST). The biofilm-forming ability of ST131 isolates was assessed by their ability to produce dark black colonies on Congo red agar medium. The results of antimicrobial susceptibility testing (AST) and biofilm formation were compared with 82 non-ST131 *E. coli* isolates from humans and dogs in the same locations. The overall antimicrobial resistance score of the isolates by summing the number of antibiotics to which an organism is resistant. PCR-based subclading revealed that 126 (94.7%) of the isolates belonged to ST131-clade C, with 59 (44.3%) in clade C2, 37 (27.8%) in clade C0, 21 (15.7%) in clade C1 (non-M27), and 9 (6.7%) in clade C1 (M27). Two isolates were unclassified, and five isolates belonged to clade B. ST131 clade C isolates showed significantly higher resistance ($p = 0.001$) to ciprofloxacin (66.7%

resistance) when compared to non-ST131 isolates (50.9% resistance). When overall antimicrobial resistance scores were compared, ST131 clade C showed a significantly higher level of resistance (mean = 10) compared to non-ST131 isolates (mean = 5) ($p = 0.0001$). ST131 clade C isolates did not exhibit an increased ability to produce biofilm, as determined by the Congo red binding assay. High occurrences of ST131 clade C and increased resistance to fluoroquinolones and extended-spectrum cephalosporins in ST131-clade C were evident from the study. The recently identified ST131-C1-M27 clone is also present in Sri Lanka. Further studies are warranted to determine the distribution of ST131 and its subclades in other regions of the country.

Keywords: E.coli, ST131, Clades

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Healthcare Professionals' Perceptions towards the Role of Hospital Pharmacists in Sri Lanka: A Study Protocol

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The pharmacy profession is uniquely positioned to ensure appropriate, safe, and cost-effective use of medicines. Healthcare professionals' accepted views on the role of pharmacists will increase the level of cooperation in the delivery of healthcare. Today, the role of pharmacists is rapidly expanding; however, the expanded role of pharmacists from the perspectives of healthcare professionals in Sri Lanka has not been explored. This mixed-method study will explore the perspectives of doctors, nurses and pharmacists toward the role of hospital pharmacists in Sri Lanka. This study will consist of a survey and an exploratory qualitative study. A descriptive cross-sectional survey will be conducted online to examine the perspectives of pharmacists who are working in government hospitals in Sri Lanka towards the role of pharmacists in hospitals. A validated questionnaire, consisting of 6 sections about personal information, interaction with clinicians, role of pharmacists in Sri Lankan healthcare, experience with healthcare professionals, perception of the current pharmacy curriculum and pharmacist involvement in medicines management will be used. In data analysis, descriptive statistics will be computed. The exploratory-descriptive qualitative study consists of two parts. In the first qualitative study, pharmacists who are working in government hospitals will participate in focus group interviews or semi-structured interviews. In the second qualitative study, nurses and doctors who are working in government hospitals will participate. Data will be collected until data saturation. Two separate interview guides for pharmacists and other healthcare professionals will be used. In data analysis, inductive thematic analysis will be conducted. The consolidated criteria for reporting qualitative research checklist will be followed in reporting the findings. The findings of this study will hold significant potential for establishing standard guidelines that would align with the enhanced pharmacists' roles in Sri Lanka.

Keywords: Doctors, Hospital pharmacists, Nurses, Pharmacists, Role of the pharmacists

Assessment of Public Awareness and Understanding of Antibiotics and Antimicrobial Resistance in the Sri Lankan Population: A Descriptive Cross-Sectional Study

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Antibiotics play a pivotal role in modern medicine, saving countless lives. However, the emergence and rapid spread of antimicrobial resistance have become a significant global health concern, posing threats to the effectiveness of these life-saving drugs. The study investigated knowledge regarding antibiotics and antimicrobial resistance among the public attending four hospitals in Sri Lanka: Teaching Hospital Jaffna, Kalmunai Base-Hospital, Teaching Hospital Peradeniya, and Colombo-South Teaching Hospital. A descriptive multi-center cross-sectional study was conducted between October 2021 and November 2022, covering a range of geographic regions. A pre-tested and validated questionnaire of the World Health Organization: Antibiotic Resistance, Multi-country public awareness survey, was distributed among 1520 participants. Data analysis was performed using SPSS software (version 22.0). Knowledge scores were assigned based on correct responses: 0-40% as poor, 41-70% as moderate, and 81-100% as good. Of 1520 who completed the study, the majority were female (57.5%), 36.3% were aged 26-34 years, and half of them (48.6%) completed secondary education. Fifty percent of the participants consulted healthcare professionals while buying antibiotics. Notably, 38.9% believed they should discontinue antibiotics upon feeling better, while only 41.1% understood the concept of not utilizing antibiotics prescribed for others. We found that 10.6% of the participants exhibited poor knowledge, 70.1% demonstrated moderate knowledge, and 19.3% of the participants had good knowledge regarding antibiotic and antimicrobial resistance. Individuals with higher levels of education demonstrated better knowledge regarding antibiotics and antimicrobial resistance. Significant associations between the knowledge regarding antibiotics and antimicrobial resistance and age, gender, marital status, and higher education, ($p<0.05$) were found. Most of the participants had a moderate level of knowledge regarding antibiotics and

antimicrobial resistance. Therefore, there is a necessity to strengthen public health awareness and intervention initiatives concerning antibiotic usage in Sri Lanka.

Keywords: Antibiotics, Antimicrobial resistance, Public knowledge, Antibiotic usage

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Preliminary Study on Association between Histopathological and Clinical Characteristics of Oral Leukoplakia

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The purpose of this study is to see possible associations between various clinical appearances of OLK with histopathological characteristics. Ethical clearance was obtained from the Ethics Review Committee, Faculty of Dental Sciences, University of Peradeniya. Clinical records of the patients were retrieved from the Oral Medicine clinic and demographic and clinical information were recorded. Haematoxylin and Eosin sectioned slides of each patient were selected from the archives of the Department of Oral Pathology and the histopathological features were reassessed by an experienced Oral Pathologist. Descriptive analysis and Chi square test were performed to the preliminary data via SPSS Statistical Package. A total of 69 participants were recruited in this preliminary study and among the 73% were males, 33.9% were above the age 60 years, with the mean age of 55.26 (range 31-86, SD = 12.623). Of the total cohort, 47.8% patients are presented with white lesions, as the main complaint. Majority of the lesions were in the buccal mucosa (23.9%) followed by tongue (20.9%) and commissures (12%) in addition 57.8% lesions appeared as homogenous. Based on histopathological findings, the majority depicted the epithelial thickness of 1.1mm (17.4%), where the mean was 1.148 (range 0.3-3.2, SD=0.5335) and 55.1% exceeds 1mm. Out of all cases, 89.9% cases had keratinization, where 46.4% were Keratinized and 43.5% were hyper-keratinized. Considering the buccal mucosa, 56.3% were Keratinized and 30% were hyper-keratinized. About 50.8% cases had dysplasia of which 66.7% were mild. 21.2% showed severe dysplasia giving a higher risk in progression to malignancy. Among all, 85.5% cases were presented with inflammation. Depending on the density of the sub mucosal inflammation, majority of the cases were light (51.7%). A significant association was observed in ortho-keratinization ($p=0.014$), stage of dysplasia ($p=0.07$), risk ($p=0.008$) between age and in males. Based on clinical features, burning sensation was significantly associated with age and in females ($p=0.023$). Preliminary findings of this study demonstrate a correlation between clinical presentation and histopathological features.

Keywords: Oral Leukoplakia, Histopathological features, Clinical

Determination of Physico-Chemical Parameters, Enzyme-Inhibitory and In Vitro Antioxidant Activities of Pretreated, Dehydrated Leaves of *Amaranthus Viridis L.*

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Amaranthus viridis L., belongs to family *Amaranthaceae* is a perennial plant used in edible purposes and traditional medicine in Sri Lanka. The plant is under-investigated for its biological efficacy and there is inadequate scientific information for food use applications. The market potential for dehydrated value-added products is increasing in demand. Hence, the aim of the research was to determine the effect of pretreatments and dehydration processes on the nutritional composition, phytochemical profile, ferric reducing antioxidant activity (FRAP), alpha-glucosidase inhibitory activity and acetylcholinesterase and butyrylcholinesterase inhibitory activity of *Amaranthus* leaves. In various ratios of potassium metabisulphite, sodium bicarbonate and magnesium oxide were experimented as pretreatments. The pretreated leaves were steam blanched for five minutes, followed by dehydration at $60 \pm 1^\circ\text{C}$ for 12 hours. The best pretreatment was soaked with 0.1% magnesium oxide, 0.1% sodium bicarbonate and 0.5% potassium metabisulphite. The dry weight basis analysis revealed the following content percentages: Protein ($21.90\% \pm 1.01$), fat ($3.70\% \pm 0.02$), fibre ($5.90\% \pm 0.05$), ash ($11.30\% \pm 0.12$), and carbohydrate ($49.24\% \pm 0.08$). Data was statistically analyzed using one-way analysis of variance (ANOVA) test at a 95% confidence level ($p < 0.05$). The qualitative phytochemical analysis confirmed the presence of phenols, saponins, flavonoids, alkaloids, glycosides, steroids, amino acids, carbohydrates and reducing sugars. Methanolic extract indicated in vitro FRAP of 20.22 ± 0.45 mg Trolox equivalents per 1g of *Amaranthus* dry powder with moisture content of 5.46 ± 2.31 . The methanolic extracts demonstrated inhibitory activity levels of $25.59\% \pm 0.35$, $35.65\% \pm 2.55$, and $44.75\% \pm 2.11$ on the alpha-glucosidase enzyme at concentrations of 500 $\mu\text{g/ml}$, 1500 $\mu\text{g/ml}$, and 2000 $\mu\text{g/ml}$, respectively. No inhibitory activity was detected against acetylcholine esterase and butyrylcholinesterase enzymes. In conclusion, pretreated dehydrated leaves of *A. viridis* have retained their health-beneficial properties and can be used as a potential source of food ingredient.

Keywords: *Amaranthus viridis*, Antioxidant activity, Enzyme inhibitory activity, Phytochemical composition, Proximate composition

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Complementary and Alternative Medicine Usage among Chronic Kidney Disease Patients in a Tertiary Care Setting

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There is a growing trend of patients with Chronic Kidney Disease (CKD) seeking assistance from Complementary and Alternative Medicine (CAM) in Sri Lanka, influenced by the traditional medical history and cultural beliefs. The lack of tangible evidence of its effectiveness requires a more nuanced understanding of the area, given that there are potentially detrimental effects of certain CAM practices leading to development or worsening of the disease. This study was conducted to investigate the prevalence and patterns of CAM usage among CKD patients and identify potential associated factors among the users. A cross-sectional, observational study was performed at the CKD clinics of Teaching Hospital Peradeniya and National Hospital Kandy from June to August 2023. CKD patients were interviewed using an interviewer-based questionnaire regarding their CAM usage for the treatment of CKD. Out of the total 201 patient responses, 21.9% (n=44) patients admitted to the use of CAM for their CKD condition. Of the patients using CAMs, biologically based therapies were used by 56.8% (n=25), and 50% (n=22) used Ayurvedic medicine, while 40.9% (n=18) claimed to have used mind-body techniques. Out of the CAM users, only 20.5% (n=9) patients asserted to have discussed the use of CAM with their physician. The long duration of the disease showed a statistically significant association with the CAM usage ($p=0.03$), while gender ($p=0.87$), ethnicity ($p=0.6$), stage of the disease ($p=0.5$) didn't show a significant association. This study reveals that a considerable amount of CKD patients uses CAM alongside conventional treatment, whilst only a minority having discussed this with their physician. Also, this study highlights the trend of patients turning towards CAM as the disease progresses. Overall, this study emphasises on the importance of open discussion between patients and healthcare professionals, that may contribute to a more holistic and coordinated approach in managing CKD.

Keywords – Chronic Kidney Disease (CKD), Complementary and alternative medicine (CAM), Ayurvedic medicine, Mind- body techniques

Investigation of an Outbreak of Recurrent Subclinical Mastitis in a Dairy Goat Farm in Central Province, Sri Lanka

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Mastitis is one of the costliest diseases in dairy goat herds worldwide. An outbreak of recurrent subclinical mastitis lasting for several months in a large-scale goat farm in the Central Province was investigated in this study. The affected animals were refractory to antibiotic treatment. However, the antibiotic treatment was undertaken without antibiotic sensitivity testing. *Mycoplasma* species are significant pathogens responsible for mastitis in goats, and the infections are often refractory to conventional antibiotic therapy. Therefore, the objectives of the current study were to determine whether *Mycoplasma* species are associated with subclinical mastitis in dairy goat farm. A total of 26 milk samples were collected from dairy goat farm in Gampola Veterinary Range, Central Province, Sri Lanka during two consecutive visits within one month. The samples were analyzed using microbiological culture, biochemical tests and PCR to investigate *Mycoplasma* species. The first set of samples (10 samples in total) were negative for bacterial and fungal growth. Out of the 16 samples from the second visit, 09 yielded bacterial growths, dominated by *Klebsiella* spp, followed by *Staphylococcus aureus* and *Bacillus* species. All the samples were negative for fungal growth. Out of the 9 samples that were positive for bacterial growth, 2 were positive for *Mycoplasma* spp. by PCR specific for 16SrRNA gene. This is the first study to confirm the presence of *Mycoplasma* spp in the milk from Sri Lankan dairy goats, however, due to budgetary limitations, it was not confirmed whether it's a pathogenic species. Further studies on the phylogenetic analysis of *Mycoplasma* species in Sri Lankan goat farms are required to confirm the occurrence, epidemiology, and specific species of *Mycoplasma* involved in Sri Lanka.

Keywords: Subclinical mastitis, Dairy goats, Mycoplasma, PCR

Antibacterial Efficacy of Selected Hand Sanitizer Products Available in Local Market in Kandy, Sri Lanka

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This study aimed to evaluate the antibacterial efficacy of selected locally available hand sanitizers. Seventeen products were characterized by sterility testing and in vitro kill curve assay using *Escherichia coli* ATCC 25922, *Staphylococcus aureus* ATCC 25923, and *Pseudomonas aeruginosa* ATCC 27953. Approximately 1.5×10^8 CFU/ml bacterial suspensions were mixed with equal volumes of sanitizers and viability was assessed for 30 minutes. The reduction of culturable bacterial load on hands of 10 volunteers who were trained on hand hygiene using sanitizers were assessed using thumbprint method. According to label information 11 products contained isopropyl alcohol (IPA) 75%-80% v/v, one product contained 1% IPA with 20% "herbal extracts", another product contained undisclosed quantity of IPA. Two products contained ethyl alcohol (ETA) 75% v/v, one product was labeled as "contains IPA and ETA 75% v/v". The remaining product was labeled as "contains alcohol". Three products did not have registration from the National Medicines Regulatory Authority (NMRA). All but the product containing 1% IPA with 20% "herbal extracts" was sterile. This product was contaminated with *Pseudomonas* spp (7.1×10^4 CFU/ml), and therefore, excluded from the kill curve and thumbprint experiments. It was not registered with NMRA, but labeled as produced by "ISO 9001-2015 certified company." In the kill curve assays, 10 out of 16 products completely inactivated *E. coli* immediately, while 4 products needed 1 minute, and one product needed 5 minutes exposure to achieve complete inactivation. Thirteen products completely inactivated *S. aureus* immediately, while one product needed 1 minute, and one product needed 5 minutes exposure to achieve complete inactivation. Fifteen products completely inactivated *P. aeruginosa* immediately. The remaining product labeled "containing 75% v/v ETA and kills 99.9% germs" failed to inactivate all three bacteria tested, even after 30 minutes exposure. This product was not registered with NMRA. In the thumbprint method, only 13 out of 16 products reduced at least 50% of culturable bacteria on the hands (range 60% - 90%), despite label claims of nine products indicating "kills 99.9% germs". The lowest performing product (~10% efficacy) was the product that failed kill curve assay. The other two low performing products included the product containing undisclosed quantity of IPA and the product labeled as "contains IPA and ETA 75% v/v". The findings highlight the need for stringent regulation of the quality of the hand sanitizers in the local market.

Keywords: Antibacterial efficacy, Hand hygiene, Hand sanitizers, Kill curve assay, thumbprint method

Unusual Manifestations of Dengue: A Case Series

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Dengue fever ranges from asymptomatic infection to dengue shock syndrome. However, there are patients presenting with atypical symptoms, as highlighted in this case series. A 27-year-old male presented with clinical features suggestive of appendicitis and a positive dengue NS1 antigen test. However, the ultrasound scan revealed a normal appendix. This case highlights the possibility of dengue fever presenting with atypical abdominal signs which pose a significant diagnostic challenge. A 57-year-old female presented with one day history of fever and a positive dengue NS1 antigen test. Ultrasound scan revealed evidence of significant leaking on day one of fever; which is unusual as leaking usually occurs at three to seven days of fever. This highlights the importance of screening for fluid leakage from the initial presentation. A 35-year-old female presented with a seven days history of fever. On the day eight of fever, an ultrasound scan showed significant leaking. Her dengue NS1 antigen test was positive, but dengue IgM antibodies were not detected. This is very unusual considering the classic serological progression of the disease. Furthermore, this patient showed evidence of leaking, whilst having a positive NS1 antigen test, which is very unusual. A 59-year-old female presented with fever for four days and became irritable, somnolent and aggressive; but there was no clinical evidence of meningitis. She had a positive dengue IgM antibody test. An electroencephalogram, revealed an encephalopathy. However, CSF analysis was not performed due to profound thrombocytopenia, making it difficult to exclude any other encephalitic pathogens. Such atypical manifestations described above might be unrecognized and underreported. So, every clinician needs to have a high index of suspicion, or else these uncommon manifestations of a common disease could be easily missed, leading to devastating consequences.

Keywords: Dengue, Unusual, Atypical, Manifestations, Presentations

Awareness about Early Symptoms and Risk Factors of Myocardial Infarction among People in a Grama Niladhari Division in Anuradhapura District

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Myocardial infarction (MI) is one of the most devastating disorders under coronary heart diseases. Though many studies have been done to determine the awareness about early symptoms and risk factors of MI among general population throughout the world, no extensive studies have been reported from Sri Lanka in this regard. Aim of this study was to investigate the awareness of early symptoms and the risk factors of MI among general population in a Grama Niladhari Division in Anuradhapura District. A descriptive, cross-sectional study was conducted in a Grama Niladhari Division in Anuradhapura district among 375 participants by using systematic sampling method. Data was collected using a self-administered questionnaire. Cross-tabulations were done to explore the associations between independent and dependent variables. Of the 375 participants, 45.3% (n=170) were males and 54.7 % were females. Out of 375 participants, 144 (38.4%) had a poor awareness about early symptoms and risk factors of MI, while 131 (34.9%) of participants had average awareness. Only 100 (26.7%) had good awareness. The majority of participants had recognized central chest pain (73.3%, n=275), shortness of breath (71.2%, n=267) and pain radiating along the left arm (69.6%, n=261) as early symptoms of MI. High blood cholesterol (75.7%, n=284), high blood pressure (72.5%, n=272) and smoking (70.1%, n=263) were the most frequently mentioned risk factors. Awareness about early symptoms had a significant association with educational level ($P<0.05$). Our findings show that one-third of participants had poor awareness about early symptoms and risk factors of MI. Awareness about early symptoms had a significant association with educational level. These findings indicate that the implementation of community-related awareness programs on risk factors and early symptoms of MI among Sri Lankan general population would be important to minimize the morbidity and mortality of MI.

Keywords: Myocardial infarction, Early symptoms, Risk factors, Cardiovascular diseases

Observed Anatomical Variations in the Relationship between the Retromandibular Venous System and Facial Nerve Branches

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The retromandibular vein (RMV) as well as facial nerve (FN) are contents within the parotid gland where FN branches are running lateral to RMV. RMV holds dual importance in radiology and surgery, acting as a navigational guide and a critical anatomical landmark. Radiologically, it aids in localizing parotid gland tumors relative to FN. In surgical contexts like superficial parotidectomy, the RMV assists in dissecting the FN and its branches. This study reports of observations of the relationships between FN and the RMV among ten dissected cadavers at the Faculty of Dental Science, University of Peradeniya. There were four male and six female cadavers with a mean age of 75 years. Eight were bilaterally dissected on the parotid region and two were unilaterally dissected, having twelve sides of dissected specimens.

Three cases (25%) displayed laterally running FN branches in relation to RMV. In one case (8.3%) FN branches were medial to RMV and in another (8.3%) temporofacial (TF) branch was medial and cervicofacial (CF) was lateral to RMV. Additionally, distinct patterns included the facial nerve forming rings around the superficial temporal vein in four cases (33.3%) and around the RMV in two cases (16.6%). The RMV also formed a ring, housing facial nerve branches, in two cases (16.6%).

These variations hold significant surgical implications, shedding light on the relationship between the FN and RMV. Moreover, the identification of facial nerve rings around the superficial temporal vein and RMV suggests a need for their inclusion in existing classification systems.

In summary, this study enriches our understanding of head and neck surgical procedures by uncovering crucial anatomical insights. The acquired knowledge benefits surgeons, radiologists, and researchers, aiming to enhance patient outcomes and mitigate surgical risks hence further studies on the region and reconsidering existing classifications are recommended.

Keywords: Retromandibular vein, Facial nerve, Variation, Parotidectomy

Anatomical Variations in the Drainage of Retromandibular Venous System: A Case Study on Sri Lankan Cadavers

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Understanding the Retromandibular venous system holds significant importance in both, diagnostic and therapeutic procedures, especially in oral-maxillofacial, vascular, and plastic surgery, interventional radiology, as well as in intensive care. Retromandibular vein (RMV) is formed by the union of superficial temporal vein (STV) and maxillary vein (MV) within the parotid gland which splits into anterior and posterior divisions towards the inferior pole of the gland. The anterior division joins with the facial vein (FV), and forms Common facial vein (CFV) which drains to the internal jugular vein (IJV). The posterior division, along with the posterior auricular vein, contributes to the external jugular vein (EJV), which drains to the Subclavian vein (SCV). However, variations in venous drainage is possible due to their complexity in development. This reports such variations observed during anatomy dissection classes conducted for dental undergraduates using ten cadavers. Excluding the damaged specimens, we selected seventeen sides for the study, which includes one unilateral and eight bilateral specimens. Normal venous drainage was observed in six (35.2%) and out of these, two had double RMV after a short communication between STV and MV and in another two, RMV was forming a ring. Notably, in ten specimens (58.8%), CFV drained into EJV instead of IJV where seven EJV drained to the junction between SCV and IJV, and three drained to SCV. In one case (5.9%), FV was connected to both EJV and IJV by two branches. Such variations likely arise from the regression or retention of anastomosing venous channels formed during embryological development of the venous system. Therefore, it is recommended to confirm the venous pattern before any intervention. This study underscores the importance of understanding Retromandibular venous system variations to ensure safe and effective medical procedures.

Keywords: Retromandibular vein, Facial vein, External jugular vein, Internal jugular vein

Awareness about Modifiable Risk Factors and Adherence to Medication among Hypertensive Patients in a Tertiary Care Hospital in Kandy District

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Hypertension affects one in every four Sri Lankans over the age of 20. Adequate knowledge about the modifiable risk factors of hypertension and medication adherence is imperative in achieving good blood pressure control in patients. This study aims to assess the awareness about modifiable risk factors, and adherence to the medication among hypertensive patients attending follow-up clinics at the Teaching Hospital Peradeniya. This descriptive cross-sectional study was carried out on 354 hypertensive patients above 40 years of age, attending the hypertensive clinic at Teaching Hospital Peradeniya. The subjects were recruited through a systematic sampling method. Statistical analysis was done by using SPSS version 26. Descriptive statistics were presented as frequency, percentages, and as mean \pm standard deviation for continuous variables (SD). Cross tabulations were done to explore the associations between socio-demographic characteristics and knowledge about modifiable risk factors and medication adherence of the patients by the chi-square test. P value < 0.05 was considered statistically significant. Of the assessed, 36.7% had average, 29.9% had good and 33.3% had poor levels of awareness about modifiable risk factors. A significant association was observed between knowledge and the duration of disease ($P < 0.05$), educational status ($p = <0.001$), and occupation ($p = <0.001$). A significant relationship was observed between the medication adherence level and duration of disease ($P = 0.005$), and occupation ($p < 0.05$). 52.0% medication adherence was at an intermediate level. Forgetfulness and interruptions of daily routine were common reasons for non-adherence. Hypertensive patients' knowledge about modifiable risk factors was at an average level and medication adherence was at an intermediate level. Targeted health education strategies are needed to improve the patients' knowledge about modifiable risk factors of hypertension and increase medication compliance to achieve blood pressure control and prevent adverse consequences.

Keywords – Hypertension, Modifiable risk factors, Medication adherence, Teaching hospital Peradeniya

Gender Evaluation using Frontal Sinus Morphometry By Means of Computed Tomography

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Gender evaluation is essential in forensic personal identification. Frontal Sinus (FS) was chosen as the gender discrimination tool in this study to evaluate the relationships between gender and FS morphometry using Computed Tomography (CT) owing to the uniqueness and high trauma resistivity of FS.

A retrospective, quantitative study was conducted using 288 brain and paranasal sinus CT images of male (144) and female (144) patients available at the Department of Radiology, National Hospital, Kandy, Sri Lanka. Images were analyzed using RadiAnt DICOM viewer software. The presence or absence of the FS, the number of chambers, and the presence or absence of the septum were investigated as FS features. Maximum height, width, antero-posterior (AP) diameter and volume of the both left and right FS were investigated as FS measurements. Data were analyzed using SPSS statistical software. According to the study female group had statistically significant lower values for mean values of all measurements obtained in comparison to the male group. In both groups, the mean values of the left side were greater than the right side for FS maximum AP diameter, height, width, and volume. According to the results accuracy of determination of male patients through the FS measurements, highest accuracy was seen through total volume of FS 66.0%. Although there were lot of similarities in the findings compared to the results of similar studies carried out in different countries in the world, some discrepancies were also there which might be due to anatomical variations in different ethnicities.

Significant associations of several FS parameters such as the height and width of the right FS, AP diameter and volumes of both FS with gender were identified and relatively good precision in the determination of gender could be attained in this study. Therefore, FS morphometry could be used as an effective method to determine the gender.

Keywords: Frontal sinus morphometry, Gender evaluation, Computed Tomography

A Study on the Effect of Coconut Lipids on Glucose Metabolism in Rats and Cell Culture Models

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High prevalence of diabetes mellitus demands novel measures to alleviate this condition. Therefore, this study was aimed to elucidate the effect of virgin coconut oil (VCO) or soya oil (SO) on glucose tolerance in diabetic (D) and non-diabetic (ND) rats. Three groups of Sprague Dawley male rats (6 each) were in the ND state and another three in the D state, induced using alloxan. The animals received, either water, VCO or SO, orally at 7.5ml/1000g each. Oral glucose tolerance test (OGTT) results on Day 45 and 90 of treatment were analyzed by one-way-ANOVA. In D group, test treatments did not show significant difference in the results. However, in ND animals there was a statistically significant difference in the glucose tolerance, between the animals fed with water and the animals fed with VCO, and with the animals fed with SO, with a very high significance level ($p < 0.001$). These results clearly show that VCO and SO were capable of improving the glucose tolerance when insulin was available, but not in its absence as seen with the alloxan treated diabetic animals. Red cell fragility of the above groups of animals was tested by suspending the red cells in saline solutions of varying NaCl concentrations (0 - 0.9 g/dL), and the released hemoglobin measured by spectrophotometry. In both ND and D groups, VCO fed animals showed a lesser red cell fragility than the other groups – indicating that VCO has a cell membrane stabilizing effect. Glucose uptake by the MCF-7 cells in the presence of varying concentrations of VCO hydrolysate and SO hydrolysate, with and without insulin was analyzed, using αMEM and ‘Glucose uptake colorimetric assay kit’. Increasing the concentration of the hydrolysates of both oils to an extent (0.3μl / 100 μl medium), increased the glucose uptake in a dose dependent manner.

Keywords: Diabetes, Glucose tolerance, Virgin coconut oil, Soya oil

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Adaptation and Validation of The Strengths and Weaknesses of ADHD Symptoms and Normal Behavior Scale (SWAN) among 5 - 12 Year Old Children in Colombo District

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Attention Deficit Hyperactivity Disorder (ADHD) is a neurodevelopmental disorder and is characterized by persistent age-inappropriate core symptoms of inattention, hyperactivity, and impulsiveness that could result impairment in one's major life activities and wellbeing. Hence, early identification, and prompt treatment are essential. Screening tools are commonly used by clinicians and researchers to assess ADHD, however lack of culturally adapted and validated screening tools in Sri Lankan context hinders the early identification of ADHD in children. The Strengths and Weaknesses of ADHD symptoms and Normal behavior (SWAN) rating scale assesses the symptoms of ADHD and has 18 items with a 7-point rating. The aim of this study was to adapt and translate the SWAN scale to Sinhala language by establishing content and consensual validity and measure the construct, criterion validity along with assessing the reliability. This is a cross-sectional and correlational study. The psychometric properties of the SWAN Sinhala scale were established using a community sample of 220 parents of school children who were between 5 and 12 years old in Colombo district and a clinical sample of 50 parents of children that were diagnosed with ADHD at Lady Ridgway Hospital (LRH), Colombo. The reliability of the SWAN scale was measured using the community sample and the achieved internal consistency reliability Cronbach's alpha value plus the test-retest reliability stability were 0.96, and 0.96, indicating as excellent. The clinical utility of the Sinhala SWAN scale was examined by executing criterion validity through resulting good concurrent validity. Further, convergent validity in the community sample was agreeable and the obtained Principal Component Analysis factor loadings and structures were adequate. In conclusion, the SWAN Sinhala version retains sound psychometric properties as of the original SWAN and will be a valuable instrument to screen ADHD among 5 to 12 year old children in Sri Lankan context.

Keywords: SWAN English, SWAN Sinhala version, ADHD, Children, Validity

Anterior Extensions of Parotid Gland and its Relationship with the Buccal Branch of Facial Nerve: a Case Study

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Variant anterior extensions (AEx) of the parotid gland (PG) is observed such as accessory parotid gland (APG) and facial process (FP), which are in close proximity with the parotid duct over the lateral side of the masseter muscle. APG is a collection of salivary tissue separated from the main PG, whereas FP maintains the continuity. All pathologies occur in main PG including cancer can affects AEx as well. Single or multiple buccal branches (BB) of facial nerve (FN) also runs parallel to parotid duct. However the relationship of the BB with AEx of PG is not well reported in literature. During dissection classes carried out for first year Dental undergraduates, AEx of PG were observed and bilateral dissection of the lateral face of ten cadavers were done. There were four males and six female cadavers with a mean age of 75 years. Nine FP (45%) and 3 APG (15%) were observed out of the 20 sides examined making the incidence of AEx as 60%. Emergence of a single BB (15%) as well as double branches (45%) were observed. The double branches were running separately as well as making connections across the duct. The superior branch was deeply located and the inferior branch was emerging more superficially from PG. In all APG, BB was passing through the glandular mass. In relation to FP, double BB were running in the inferior and superior borders of the mass. In literature, occurrence of the FP was reported increasing with age where as APG was reducing, supporting our observations. However the relationship of FN branches with APG is not well reported in literature. Occurrence of AEx of PG should be considered in clinical practice as well as the BB relationship. Therefore further studies are recommended on the region.

Keywords: Accessory parotid gland, Facial process, Facial nerve, Parotid duct

Awareness and Competence in Managing Common Medical Emergencies in a Dental Clinic by Dental Nurses at the University Dental Hospital, Peradeniya

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The role of a dental nurse is vital in managing unanticipated medical emergencies (MEs) that could arise in a dental clinic. This audit aimed to assess the basic competency standards (knowledge, skills, and confidence) in the management of MEs in dental practice among dental nurses. The study was conducted among all dental nurses at a University Dental Hospital (n=35), using a structured interviewer-administered questionnaire. Short video clips were used to demonstrate the possible emergencies while the skills were assessed using mannequins. Response rate was 57.14%. The mean age of the participants was 37.13 years (SD=19.75) and all were females. Although, excessive bleeding (by 95% of participants), angina (70%) and hypoglycaemia (65%) were known to them as MEs, out of the given list, only 15% selected angina as a common ME which could occur in a dental practice. All participants (100%) selected excessive bleeding followed by asthma (65%), seizures (60%), hypoglycaemia (50%), vasovagal syncope (50%) and anaphylaxis (40%) as common MEs. Yet, cardiac arrest/cerebrovascular accident were not selected by any. No participant was accurate in identifying all the signs and symptoms of vasovagal syncope, hypoglycaemia, and anaphylaxis. Regarding emergency management, participants scored low in managing a fainted patient (mean score =46.26±29.25) and seizures (mean score =33.75±30.65). Younger age group (\leq 35years) had significantly higher mean scores for the faint and seizure management (mean score=60±27.09, P=0.04; mean score=70.6±7.20, P=0.001) than those aged \geq 35years. Approximately, 60% of the participants expressed very low confidence in performing Basic Life Support (BLS) during emergencies and only 40% demonstrated knowledge of normal vital measures. Notably, no participant accurately demonstrated BLS or manual blood pressure monitoring. Urgent attention is required to address the gaps in identifying possible emergencies, BLS and improving the basic competency levels in managing medical emergencies.

Keywords: Basic Life Support (BLS), Dental nurses, Medical emergencies, Vasovagal syncope

Bacterial Profile and Associated Factors with Pus Culture Positivity from Pus Samples

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Introduction: Pus is caused by bacterial infection that can be developed anywhere in the body. Several factors are associated with the prevalence of pyogenic infections caused by bacterial etiologies. The current study aimed to assess bacterial profile of pus culture isolates and associated factors with pus culture positivity. A total of 210 pus culture samples were collected from Base Hospital Gampola over the period from March to June 2023. The ethical approval was obtained from the ethical review committee, National Hospital, Kandy. Following type of samples were included such as wound swab, pus and Lower Vaginal swab (LVS). Collected pus samples were processed to identify the causative bacterial pathogens and antibiogram according to the international guidelines provided by Sri Lanka College of Microbiologists. Frequencies of the variables entered into an excel sheet. Chi-Square test was employed to compare the association between variables. Among 210 pus culture samples, various types of organisms were observed such as Coliforms (75,35.7%), *Staphylococcus aureus* (43,20.5%), *Pseudomonas* spp (29,13.8%), Coagulase Negative Staphylococci (CNS) (14,6.7%) and Gram-Negative Coccobacilli (GNCB) (6,2.9%). Coliform was the most common isolate. 43.84% of coliforms isolated as ESBL while 41.86% were isolated as MRSA. In the present study, a significant relationship ($p=0.003$) was noted between the isolated organisms with IPD and OPD. There was a significant relationship observed ($p=0.042$) between the type of samples and the microorganisms isolated. The current study indicated the significant relationship between age groups and MRSA isolates ($p=0.034$), gender and ESBL isolates ($p=0.028$), type of samples and MRSA isolates ($p=0.029$). There was no significant relationship between ABST patterns of isolates with respect to the defined variables in the current study. The present study revealed the most prevalent pathogen on pus culture samples. This investigation can be used for identifying the high-risk individuals related to pyogenic infections.

Keywords: Bacterial profile, Pus culture isolates, Associated factors, Pus samples.

Acknowledgement: We wish to express our thanks to our supervisor and other staff.

Antibiotic Sensitivity Pattern of Pus Isolates at Base Hospital, Gampola

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Introduction: Antibiotic Sensitivity Pattern should be determined prior to prescribing medicines in order to treat the suppurative infections. Multiple studies have been carried out to determine the prevalence of microbes in pus samples and its ABST pattern. Considerable variations in bacterial profiles found in pus samples emphasize the importance of determining the prevalence of microbes and the ABST pattern. Therefore, the current study aimed to assess the prevalence of pus culture isolates and its ABST pattern in Base hospital, Gampola. This cross-sectional study was carried out between March to June 2023. The ethical clearance was obtained from ethical review committee, National Hospital Kandy. All the pus samples were processed on arrival to the microbiology laboratory without delay. The laboratory manual in microbiology published by the Sri Lanka College of Microbiologist (SLMC 2012) was used as the reference material for microbiological procedures of pus samples. In the present study among 210 pus culture samples, microorganisms such as Coliforms, *Staphylococcus aureus*, *Pseudomonas* spp, Coagulase Negative Staphylococci and Gram-Negative Coccobacilli were detected. Coliform was the most common isolate. Coliform showed 100% sensitivity to Meropenem, 95.89% and 91.78% to Amikacin and Gentamicin respectively. 43.84% of coliforms isolated as ESBL. *Staphylococcus aureus* exhibited 100% sensitivity to Vancomycin, out of 43 samples and 41.86% were MRSA isolates. *Pseudomonas* spp showed 100% sensitivity to Ceftazidime followed by Gentamicin, Piperacillin Tazo-bactam accounting for 82.76% respectively. In this investigation the most prevalent antibiotic sensitivity pattern for coliform was Meropenem, Gentamicin and Amikacin. According to this current study, a number of antibiotics are effective against organisms without having to use of Carbapenems. *Pseudomonas* spp showed sensitivity to Ceftazidime. Cefaperazone-Sulbactams and Piperacillin-Tazobactam were alternative drugs used in place of Carbapenems (Meropenem).

Keywords: ABST pattern, Pus isolates, Study, Base hospital

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Determination of Microbial Contamination of Commercially Available Generic and Branded Oral Antibiotic Suspensions in Galle, Sri Lanka

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Antimicrobials are widely used for the control and management of various infectious diseases. Oral liquid pharmaceuticals are one of the most suitable dosage forms for paediatric usage. Upon opening, these pharmaceuticals are susceptible to contamination. The product quality and stability are degraded by microbial contamination. Thus, the aim of this study was to investigate the microbial contamination of commercially available generic and branded oral antibiotic suspensions in Galle, Sri Lanka during their consumption period. Branded and generic products of amoxicillin with clavulanate, clarithromycin, and azithromycin oral suspensions were selected and manufacturers' advice was followed when preparing the suspension. One millilitre of the sample was evaluated for each product. Samples were diluted at 1:10 in each sterile Mueller Hinton Agar (MHA). The sample aliquot was transferred to MHA and spread evenly using L shaped glass spreader. The antimicrobial property of each sample was eliminated using neutralizing agents (0.1 M Ammonium hydroxide) and these samples were incubated at 35 ± 2 °C for 16-18 hours in an incubator at the faculty. Then, colonies were recovered from each plate and enumerated them. The arithmetic means count was used for calculating the total viable count of the test sample and they were analysed at the opening. The procedure repeated after 7th, 14th, 21th, and 28th days. Minute levels of microbial contamination of the suspensions were observed. The contamination percentages were 0%, 14%, 14%, 64%, and 73% corresponding to 7, 14, 21, and 28 days after opening. None of the samples exceed the level 10^3 CFU ml⁻¹, which meets the USP microbial limit. Oral antibiotic suspensions can be contaminated when kept for more than 7 days after reconstitution, even though they have preservatives. Adequate physicochemical properties and microbial quality of oral antibiotic suspension can be preserved through meticulous handling and storage practices

Keywords: Contamination, Microbial, Suspensions, Quality

Zoom Fatigue and Burnout among Primary School Teachers in the Mawanella Education Zone

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The COVID-19 pandemic necessitated the virtualization of education, leading to an unprecedented increase in using video conferencing for teaching-learning activities across the globe. However, there is a dearth of local studies assessing the impact of this virtualization on the mental health of teachers. This cross-sectional study with an analytical component was conducted to assess Zoom fatigue, burnout, and their associations among primary school teachers in the Mawanella education zone. All primary school teachers in the setting were invited to complete a self-administered questionnaire (in all three languages), including Zoom Exhaustion and Fatigue Scale (ZEF) and Oldenburg Burnout Inventory (OLBI), circulated as a Google form. Data were analyzed using the SPSS version 22.0. Zoom fatigue was described using the mean (SD) ZEF score. Independent-samples t-test was conducted to compare the mean ZEF scores between different sub-groups. Pearson correlation was used to assess the relationship between ZEF and burnout scores. The final sample comprised of 342 teachers. The majority were females (n=263, 76.9%). The mean (SD) age was 40.2 (8.5) years. The ZEF score ranged from 15.0 to 65.0 with a mean (SD) of 34.6 (8.7). Teachers who; were currently not married, had to learn Zoom technology from school, had poor family support for teaching, reported statistically significantly higher mean ZEF scores than their counterparts ($p<0.05$). Teachers who; were excessively self-conscious, found multitasking difficult, stressed to use multiple features in Zoom and learn advanced technology, reported significantly higher ZEF scores than their counterparts ($p<0.05$). There was a statistically significant positive relationship between ZEF and burnout scores ($r=0.254$, $p<0.001$). Hence, it was concluded that the scores of Zoom fatigue among primary school teachers in the Mawanella education zone are high. Providing more support to learn the novel Zoom technology would be beneficial to reduce Zoom fatigue among teachers.

Keywords: Zoom fatigue, Burnout, Teachers, Education, Schools

Estimating Species Richness from Virome Data Accounting for Variations within the Virus Population

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Species richness is a key species diversity measure. It corresponds to the number of species in an environmental sample. Estimating species richness of a metagenome of viruses (i.e., a virome) based on the reference data is challenging because of the limited amount of sequence data of viruses available in reference databases. A limitation identified with the methods that do not rely on reference sequence data in estimating species richness while being based on the contig spectrum is the assumption of equal genome length for all the species in the sample. This work aims to formulate a mathematical model to estimate species richness from a virome considering the variability of the genome lengths of species in the sample in contrast to the mentioned methods. A model is derived for the expected contig spectrum and the parameters of the model including the species richness is estimated through optimization for the least error between expected and observed contig spectra. Genetic Algorithm is used as the optimization algorithm in parameter estimation. The optimisation procedure incorporated in the proposed approach is shown to be robust based on the results with simulated data. This work enables inference of genome lengths distribution from the metagenomic sequence data in addition to estimating the species richness and can be applied to virome originating from any environmental sample.

Keywords: Metagenomics, Phages, Species Richness, Optimisation

Acknowledgement: Financial assistance given by the University of Peradeniya - University Research Grant (Grant No. URG/2021/15/E) is acknowledged.

Development of an Immobilizer for Pediatrics during Chest Radiography

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Radiographers have to pay much attention towards paediatric imaging to obtain good quality images considering the accuracy of the final diagnosis of diseases while avoiding unnecessary radiation exposure to the patient. Unexpected results in image quality may arise from the mobilization of patients during the exposure. Therefore, ensuring patient immobilization is paramount importance. As the current practice of immobilization has many disadvantages, an effective method of immobilization for pediatrics is essential. Chest radiography is the most common examination performed in the radiology department. This study was designed to develop an immobilizer for paediatrics during chest radiography. As the initial step, an immobilizer was designed with seating and head resting area, velcro strips as immobilizers and small lead shields as protective devices. Sixty (60) paediatric patients at the age range of birth to two years, who attended for chest radiography examination to radiology unit at Specialized Children's Hospital in the Central Province were selected as the study population. Chest radiographs (CXRs) those were taken applying the new immobilizer were considered as Experimental Group (EG) and CXRs those were taken without applying the new immobilizer were considered as the Control Group (CG). Quality of the final radiographic images was graded as good, poor and very poor based on the evaluation report given by two senior qualified radiographers considering the recommended image evaluation criteria that are used to assess the quality of the chest radiograph. The incidences of "good" "poor" and "very poor" quality radiographs were 60%, 33.3% and 0% respectively for the experimental group, whereas 43.3%, 43.3% and 13% for the control group. The results showed incidence of good quality radiographs is higher, as well as no very poor quality radiographs were reported among the experimental group.

The study concluded that newly produced immobilizer improves the quality of the final chest radiograph.

Keywords: Pediatrics, Chest radiography, Immobilizer, Image quality

Determination of Reference Ranges for Full Blood Count Parameters for Healthy Adults in Kandy, Sri Lanka

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Full blood count (FBC) reference values vary among different population groups and in different geographical areas. Several studies have shown significant differences between and within populations, indicating the need for population-specific reference ranges. Lack of standard local reference values has been a problem facing hematological practice in Sri Lanka while normal standards of western countries are being referred to. Hence, this research, part of an extended study carrying out across the country, was aimed at establishing reference values for FBC parameters of healthy individuals in Kandy district. A total of 503 healthy participants (252 males and 251 females) aged between 18-60 years were recruited for this cross-sectional study. The methodology of the study was developed according to the CLSI.[EP28].[A3c] guidelines. Haemoglobin concentration (Hb), red cell count (RCC), mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH), mean corpuscular haemoglobin concentration (MCHC), haematocrit ratio (HCT), red cell distribution width (RDW), white cell count (WBC), differential WBC and platelet (PLT) count were determined within 6 hours of collection using Mythic 22 OT-5 part automated haematology analyzer. Reference values derived from the study were compared with Caucasian values. Hb, RCC, MCV, MCH and HCT were lower than those of Caucasian values, where 11.1%, 31.3%, 7.1%, 17.1% and 24.2% of males and 23.9%, 13.1%, 13.1%, 12.7% and 34.6% of females were outside the western reference values, respectively. The maximum percentage of outliers was identified in MCHC values (43.6% of males; 21.9% of females), followed by HCT (24.2% of males; 34.6% of females). The WBC and PLT did not show a significant difference compared to the western literature. Statistically significant gender-based differences ($p<0.05$) in the means were observed for all the RBC parameters, WBC, monocytes % and PLT. In conclusion, western reference intervals are not compatible with those of the study cohort. Thus, the establishment of population-specific reference ranges for the entire country is highly recommended.

Keywords: Full blood count parameters, Haematological parameters, Reference ranges, Kandy

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Effect of Pregnancy on HbA2 Level and its Possible Clinical Relevance for Diagnosis of β-thalassaemia Traits

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Epidemiological studies have identified that 2.2% of the population in Sri Lanka are carriers for β-thalassaemia. Detection of the β-thalassaemia carrier state (BTT) is done using HPLC or CE technology, and a cut-off value of Hb A2 >3.5% is considered to be diagnostic. Hb A2 level which is crucial for the diagnosis of BTT, is however affected by many “unrelated” factors. Iron deficiency anaemia, hyperthyroidism and antiretroviral therapy, are known to affect Hb A2 levels. Whether pregnancy affects Hb A2 level has not been widely described. The current study was designed to determine the effect of pregnancy on Hb A2 level and its possible effects on the accurate diagnosis of BTT in antenatal clinics. This was a case-control study including 120 women in four age-matched groups (30 in each), namely, “BTT pregnant”, “BTT non-pregnant”, “Normal pregnant,” and “Normal non-pregnant”. All pregnant women with and without BTT were recruited from the antenatal clinics at the teaching hospital Kurunegala during the end of the second trimester. Non-pregnant women were recruited from the routine screenings at Ragama and Kurunegala thalassaemia centers. FBC and Capillary Electrophoresis (CE) were performed in all participants, while serum ferritin was determined only when necessary to exclude IDA. Hyperthyroidism was excluded by an interviewer-administered questionnaire. According to the results, there was a statistically significant difference ($P<0.05$) in Hb A2 level between pregnant (mean; 2.45%) and non-pregnant (mean; 2.26%) women without BTT. Contrarily, there were no significant differences in Hb A2 between BTT pregnant (mean; 4.73%) and BTT non-pregnant (mean; 4.88%) women. In conclusion, there is a tendency for a slight increase in HbA2 level in pregnancy, but its effect on BTT diagnosis at the antenatal clinic is minimal.

Keywords: Beta-thalassaemia trait, Pregnancy, HbA2, Laboratory diagnosis

Predictors of Delivering Large-for-Gestational Age Babies: Pre-pregnancy Body Mass Index Versus Gestational Weight Gain

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Pre-pregnancy body mass index (PP-BMI) and gestational weight gain (GWG) are anthropometric tools, reflecting the balance between maternal and foetal metabolism. With increase global prevalence of delivering large-for-gestational age (LGA) babies, recognizing factors that anticipate this outcome becomes crucial. Possibility of delivering LGA babies by mothers from overweight and obese PP-BMI categories, based on their GWG was therefore evaluated. A nested case-control study was conducted at Teaching Hospital, Peradeniya, recruiting 512 pregnant mothers. Maternal PP-BMI and GWG were calculated and categorized based on National Guidelines. Birth weight >3.5kg at 37-40 weeks gestation was defined as LGA. Associations of PP-BMI and GWG with LGA babies were assessed by chi-square test and p<0.05 considered significant. The odds of delivering LGA babies by overweight and obese mothers were assessed by their GWG, within a case-control sample. Prevalence of overweight and obesity were 22.3% and 5.0%, respectively. Prevalence of LGA babies was 17.8%, and 27% of pregnant mothers had excess GWG. Statistically significant association was observed between delivering LGA babies with overweight ($\chi^2=38.3$, p<0.001) and obese ($\chi^2=33.3$, p<0.001) PP-BMI categories. Possibility of delivering LGA babies was 3.2 times higher among mothers with overweight PP-BMI and excess GWG (95% CI-1.8-7.2), with compared to mothers with normal PP-BMI and excess GWG. The odds of delivering LGA babies was 3.4 times higher among mothers who had obese PP-BMI with excess GWG (95% CI-1.6-7.3), with compared to normal PP-BMI mothers with excess GWG. Also, likelihoods of delivering LGA babies was 5.0 times higher among mothers who had obese PP-BMI and adequate GWG (95% CI-2.0-12.3), with compared to mothers with normal PP-BMI and adequate GWG. Therefore, in studied cohort, possibility of delivering LGA babies was higher among mothers with adequate or excess GWG and obese PP-BMI. Similarly, excess GWG by overweight PP-BMI increases possibilities of delivering LGA babies.

Keywords: Body mass index, Pregnancy nutrition, Birth weight, Anthropometry

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Perceived Supervisor Support on Job Satisfaction (With Special Reference to Healthcare Sector Employees)

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Healthcare organizations are the most important social systems in which human resources are the wealth and central factor. When employees have a negative perception of their organization, they will leave the job or work carelessly. So, employees' job satisfaction is highly important for the success of the healthcare industry. The satisfaction that people receive from their work has been the subject of study for many researchers and, numerous academics have studied the factors that affect job satisfaction. The perceived supervisor support brings improvements to the employees' physical and mental capabilities in performing their daily routines. There are, however, few studies that examine the relationship between perceived supervisor support and job satisfaction, particularly in the healthcare sector. Hence, the objective of the study was to investigate the impact of perceived supervisor support on job satisfaction with special reference to the non-executive employees at a private hospital. This study adopted quantitative methodology to achieve the aim of the study and deductive approach was used as the research approach of the study. The survey strategy was used as it is associated with the deductive approach. One hundred seventy-eight non-executive employees were selected using a simple random sampling technique. Primary data was collected through a self-administered questionnaire. Job satisfaction was measured using the 12-items scale developed by Alemnew (2014) & perceived supervisor support was measured using the 8-items scale developed by Vann (2017). A simple linear regression analysis was conducted and, the results revealed that perceived supervisor support positively impacts job satisfaction. According to the study findings, maintaining healthy relationships, lowering workplace stress, preserving job happiness, and creating a favorable work atmosphere are all important. This study was limited only to an organization in the healthcare sector. Therefore, future researchers might concentrate on different organizations and conduct their research. Additionally, this study only allows for quantitative analysis, freeing up researchers to concentrate on qualitative analysis.

Keywords: Perceived supervisor support, Satisfaction, Non-executive employee

Isolation of Actinomycetes with Antibacterial Activity from Soils in Dunumadala wa and Gannoruwa Forest Reserves, Kandy Sri Lanka

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Infectious diseases are increasingly challenging to treat due to the rapid emergence of multi-drug-resistant pathogenic strains, particularly multi-drug-resistant bacteria. Therefore, the development of novel, effective antibiotics is a timely and urgent need. Most of the commercially available antibiotics are originally isolated from actinomycetes and soil is a rich source of actinomycetes. Hence, the isolation of soil actinomycetes from unexplored, niche habitats like natural forests are attractive sources for novel antibiotics. The current study was carried out to isolate and screen antibiotic-producing actinomycetes strains from soils in Dunumadalawa and Gannoruwa natural forest reserves, Kandy, Sri Lanka. Two soil samples were collected from each site and bulked and homogenized to obtain a composite sample. Soil samples were analyzed for physicochemical parameters (PH and temperature). Each sample was pretreated, serially diluted, and grown in Actinomycetes Isolation Agar (AIA) medium, incubated at 28 °C for 48 hours. Gram staining and morphological identification were performed. The perpendicular streak method was used to check the initial inhibitory activity of isolated actinomycetes against test organisms *E. coli*, *S. aureus* and *P. aeruginosa*. Isolates that showed activity during perpendicular screening were subjected to the secondary screening by performing an agar well diffusion assay. The soils of both sites were acidic in nature. A total of 13 actinomycetes isolates were isolated. Out of these 13 isolates, two isolates showed antibacterial activity against *E. coli* while one isolate showed antibacterial activity against *S. aureus*. Interestingly one isolate showed activity against both *E. coli* and *S. aureus* exhibiting broad-spectrum activity. Inhibitory activity against *P. aeruginosa* was not observed from any isolates. It can be concluded that the exploration of natural forest reserves with higher biodiversity contributes to the development of new antibiotics and the isolates with antibacterial activity from this preliminary study should be further investigated in the future.

Keywords: Actinomycetes, Soil, Antibiotic resistance, Isolation, Screening

Toxicity Analysis of Intensity Modulated Radiotherapy for Prostate Cancer

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Prostate cancer is one of the most common cancers among world male population. Intensity Modulated Radiotherapy (IMRT) is commonly used in treating prostate cancer. During this treatment, rectum is considered as an organ at risk (OAR). Therefore, this study aims to assess the acute rectal side effects with rectal dose in IMRT for prostate cancer. This is a retrospective cohort study that used dosimetric data in IMRT treatments of males who had undergone radiotherapy treatment for prostate cancer at Department of Radiation therapy, National Cancer Institute, Maharagama (NICM). The mean V50 value was calculated and compared with the dose/volume quantitative analysis of normal tissue effects in clinics (QUANTEC) criteria for the rectum. The patients were divided into groups based on the mean dose of rectum as Group A (≤ 60 Gy) and Group B (> 60 Gy), and the presence of side effects were compared for the two groups. In a sample size of 63, the mean value for V50 was 44.87% and the maximum V50 value among the participants was 50.0%. All the participants had received a V50 value $=< 50\%$ which is within the QUANTEC criteria. The most common side effect observed was constipation (49.2%). Others were rectal bleeding - 27.0%, abdominal pain, 17.5% and loose motion - 12.7%. There was a significant association between presence of rectal bleeding between two groups ($p=0.049$). Also, there is a significant difference in mean V50 value of patients with mean rectal dose ≤ 60 Gy (43.143 ± 5.031) and patients with mean rectal dose > 60 Gy (46.266 ± 5.639) (p value= 0.026). All patients had received a V50 value equal to or less than 50% which is within the QUANTEC criteria. No significant association was observed between occurrences of side effects and the mean rectal dose.

Keywords: Prostate cancer, IMRT, Rectal dose, Rectal toxicity

Senescence Associated Stemness in the Epithelium of Oral Submucous Fibrosis

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Cellular senescence and stemness play a key role in the pathogenesis and malignant transformation (MT) of oral submucous fibrosis (OSF), a fibrotic disease of the mouth found among betel chewers in Asia. Senescence is a long term, stable cell cycle arrest while stemness refers to the degree at which cells possess the ability to self-renew, differentiate, and proliferate. The aim of the present study was to evaluate the expression of senescence and stemness in the OSF epithelium. One hundred and six formalin fixed-paraffin embedded OSF tissue samples were selected from the Oral Pathology archives, Faculty of Dental Sciences. Serial sections of the tissues were immunostained with the senescent marker, DEP-1 and the stem cell marker Bmi-1 antibodies separately. To analyze the relationship between DEP-1 and Bmi-1, the marker intensity in the OSF epithelium was recorded as negative or positive. The effect of epithelial senescence on epithelial stemness was analyzed using binary logistic regression. Statistical analysis was performed considering $p < 0.05$. Twenty-eight cases were negative for both markers, 32 cases were positive for both markers, 11 cases were positive for Bmi-1 and negative for DEP-1 and 35 cases were positive for DEP-1 and negative for Bmi-1. OSF cases expressing epithelial senescence had 2.3 times higher odds (95% CI [0.998, 5.425], Wald $\chi^2(1) = 3.827$, $p=0.05$) to express stemness than the OSF lesions that did not express epithelial senescence, indicating that senescence may elicit stemness. It was also observed that OSF with atrophic epithelium expressed DEP-1 but not Bmi-1. There were 30.2% ($n=32/106$) of OSF lesions which showed positivity in epithelial cells for both senescence and stemness. In conclusion, it is reasonable to speculate that stemness in the epithelium could be induced by senescence which should be explored further to elucidate the MT mechanism of OSF.

Keywords: Oral Submucous Fibrosis, Senescence Associated Stemness

Acknowledgement: Financial assistance from National Science Foundation (RG/HS/2017/001) is gratefully acknowledged.

Analysis of Factors Associated with Treatment Response of Different Fractionation Regimens of High Dose Rate Intracavitary Brachytherapy in Treatment of Carcinoma of Uterine Cervix

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Cancer of uterine cervix is the fourth most common cancer in women worldwide, responsible for 3.3 % of cancer deaths in women. Cervical cancer is the second commonest gynaecological malignancy in Sri Lanka among women and the second commonest cancer in developing countries. Locally advanced cervical cancer is treated with External Beam Radiotherapy (EBRT) along with the concomitant chemoradiotherapy (CCRT), followed by High Dose Rate- Intracavitary Brachytherapy (HDR-ICBT). Objective of this study was to analysis the factors associated with treatment response of different dose fractionation regimens of CCRT and HDR-ICBT. A prospective observational study was conducted among 60 patients who registered for definitive CCRT and HDR- ICBT as a treatment of locally advanced cervical cancer at the Department of Radiotherapy and Oncology, National Cancer Institute, Maharagama (NCIM). Patients were categorized into two groups based on calculated minimum Equivalent Dose in 2Gy (EQD2) according to their prescribed dose fractionation schedules. Treatment response was assessed in terms of complete remission and local failure for both groups of patients in 3 months duration. 60% of patients achieved complete remission with $\text{EQD2} \geq 80 \text{ Gy}$ while 33.33% with $\text{EQD2} < 80 \text{ Gy}$. 23.33% of patients had local failure with $\text{EQD2} \geq 80 \text{ Gy}$ while 56.67% of patients had local failure with lower EQD2. EQD2 and age at diagnosis were found to be associated factors in terms of complete remission and local failure in locally advanced cervical cancer treated with CCRT and HDR-ICBT. Treatment duration was not found to be an associated factor with treatment response in terms of complete remission and local failure.

Keywords: Cancer of uterine cervix, External Beam Radiotherapy, Concomitant chemoradiotherapy, High Dose Rate- Intracavitory Brachytherapy, Equivalent Dose in 2Gy, Complete remission, Local failure

SARS-CoV-2 Variants in the Central Province of Sri Lanka: Detection and Surveillance with an Economical and Scalable Molecular Protocol

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Emergence of SARS-CoV-2 variants sharing common mutations, like N501Y, E484K and L452R, is a threat to public health. Increasing number of infected cases and cost and resource-intensive nature of sequencing assays necessitate a real time monitoring strategy to complement whole genome sequencing. The objective of the study was to detect mutations (N501Y, E484K and L452R) associated with variants of concern (VOC) and variants of interest (VOI) using single nucleotide polymorphism real-time RT-PCR (SNP-rtRT-PCR). SARS-CoV-2 samples ($n = 325$) positive by real-time RT-PCR ($C_t < 30$) for COVID-19 diagnosis were randomly selected from November 2020 to 2021 from selected areas of the Central Province of Sri Lanka. An in-house SNP-rtRT-PCR targeting N501Y, E484K and L452R was conducted using a maximum of 30 samples per month. For November 2020, March 2021 and October 2021, the samples tested were 25, 12 and 6, respectively due to less number of positive samples based on our inclusion criteria. From November 2020 to March 2021, no SNPs were detected in the samples tested. N501Y was detected in the samples from April (29/30), May (30/30) and June (30/30) 2021. One sample with both, N501Y and E484K, mutations were identified in April 2021. From July to November 2021, L452R was the predominantly identified mutation in the samples tested. Based on the SNP surveillance, the mutations associated with VOCs and VOIs have been circulating in the study areas of the Central Province of Sri Lanka since April 2021. L452R mutation has been predominantly present from July 2021.

Keywords: Single nucleotide polymorphism, SARS-CoV-2 variants, Central Province, Sri Lanka

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A Case Study Based on the Clients of the National Dangerous Drugs Control Board in Kandy Methsevana Rehabilitation Centre

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The main objective of the study is to examine the basic life information of clients who addicted to drugs, the nature of drugs and to suggest remedial methods. The case study method was adopted in this study. Using random sampling method ten clients who represent different provinces, and undergo drug addiction treatment of a selected rehabilitation center in Kandy district, which operates under the national dangerous drugs control board of Sri Lanka were selected. The data were collected using observation, documents and discussions. The ecological system theory of Bronfenbrenner was used as the theoretical basis of this study as this theory was intended to be applied when there is not a single mechanism for clients to become addicted to drug use, but multiple cause factors. Therefore, five systems were analyzed under this theory including, micro system, Microsystems, Eco system macro system and Chrono system. The finding of the study are the family factors environmental factors, biological factors, economic factors, level of education legal factors, personality factors poor self-concepts and peer group impacted on drug addiction. On the other hand, there is a relationship between drug use and sexually transmitted, disease and sexual crimes, drugs and the underworld activities, drugs use and mental problems, domestic violence and drug use, drug use and criminal behavior and weak enforcement of the law has led to drug abuse and the decrease in the social role played by the religious organizations have become a factor in turning children to drug use. It could be suggested that Cognitive Behavior Therapy, Family counseling school counseling and Rational Emotive Behavior Therapy can be used to prevent drug addiction. Development of creating positive outlook on life helping to build self-esteem, developing self-concept to find out the abilities and talents of the clients and refer them to the proper vocational training courses can be recommended.

Keywords: Drug, Rehabilitation, Therapy, Addiction.

Detection of *Megalocytivirus* in Guppy (*Poecilia reticulata*) in the Western, North-Western and Central Provinces of Sri Lanka

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The genus Megalocytivirus of the family *Iridoviridae* are double stranded DNA viruses that affect a broad range of fish species including freshwater ornamental fish. Megalocytiviral infections are a significant threat to the ornamental fish industry in South-East Asia, causing serious economic losses. Infected fish show non-specific clinical signs making early diagnosis difficult. Sri Lanka shares 3-4% of the global demand for ornamental fish. However, the occurrence of megalocytivirus infection in guppies, a major ornamental fish species cultured in Sri Lanka for the export market is largely unknown. The objective of this study was to detect the presence of megalocytivirus in guppy fish (*Poecilia reticulata*) collected from major ornamental fish producing areas of the country. 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 [28% (7/25)-WP; 16.67% (4/24)-NWP; 10.52% (2/19)-CP] guppy samples were found to be PCR positive for megalocytivirus. The highest occurrence of the virus was observed in guppy collected from the WP. This study confirms the presence of megalocytivirus among apparently healthy guppies cultured in Sri Lanka. Free movement of megalocytivirus-infected fish 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 and other ornamental fish. Effective preventive strategies should be developed to minimize further spread of the disease.

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

Acknowledgement: URG/2022/66/V

Assessment of Parotid Gland Related Acute Side Effects after 3-D Conformal Radiotherapy and Intensity Modulated Radiotherapy in Head and Neck Radiotherapy

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Radiotherapy for patients with head and neck cancer is extremely complex and has evolved as a result of the introduction of conformal and intensity-modulated radiotherapy techniques. The primary goal of radiotherapy is to achieve local tumor control while minimizing damage to vital organs. Exceeding the tolerance dose of the parotid gland during radiotherapy to head and neck tumors can lead to many side effects. This study aimed to assess the parotid gland related acute side effects of the techniques named Three-Dimensional Conformal Radiation Therapy (3DCRT) and Intensity Modulated Radiation Therapy (IMRT) used to treat patients with Head and Neck Cancer. A retrospective study was conducted with 120 patients who received radiotherapy for head and neck cancers between March 2022 and November 2022 at major radiotherapy units in Sri Lanka. Side effects due to irradiation of the parotid gland were assessed through a questionnaire. Moreover, the prevalence of parotid-related acute side effects among different diagnoses of head and neck cancers was analyzed using descriptive statistics. An additional sub analysis was conducted to compare the side effects among these participants in both groups. No significant association for the presence of any of the three side effects was indicated with either of the two techniques. The association for the presence of any of the three side effects with the radiotherapy technique was not significant. Xerostomia and dysphagia were reported by a higher percentage of patients with carcinoma of the tongue and buccal mucosa. Both 3DCRT and IMRT demonstrated similar abilities to spare the parotid gland. The occurrence of acute side effects related to the parotid gland did not show a significant dependency on the radiotherapy technique used. However, xerostomia was reported by a large number of patients with carcinoma of buccal mucosa and cheek in both IMRT and 3DCRT groups.

Keywords: Head and Neck cancer, Parotid gland, Intensity-modulated Radiotherapy, Conformal radiotherapy

A Comparative Analysis of Four Major Alkaloids in *Areca catechu* (Areca nut) Varieties Based on Different Preparation Methods in Sri Lanka

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Different varieties of *Areca catechu* (Areca nut) are widely distributed in Sri Lanka. *A. catechu* seed has been a principle ingredient among betel quid chewers since ancient times. The four major areca alkaloids are explicitly, Arecoline, Arecaidine, Guvacoline and Guvacine and these areca alkaloids prompt oral carcinogenesis. *A. catechu* is classified as a group 1 carcinogen. The purpose of this study is to compare the alkaloid content of water extracts of *A. catechu* varieties in Sri Lanka. The six varieties of *A. catechu* samples were subjected to different preparation methods, such as fresh, water fermented (*mada puwak*) and sundried (*karunka*). A selected amount of samples were water fermented for a period of 10 months and selected amount of samples were sundried for a period of 6 months. Fresh, water fermented and sundried *A. catechu* preparations were finely grounded and 5 mg of fine powder was extracted with 50mg of distilled water. The samples were then injected to the Liquid chromatography - Mass spectrometry (LC-MS) for the spectrophotometric quantification. The data of the water extracts were statistically analysed using Microsoft Excel and Minitab 17 Statistical Software. Of fresh *A. catechu* water extracts, the highest concentration was reported in Guvacine of Hamban puwak variety (17mg/g) and the lowest alkaloid was reported as Arecaidine of Matale Chathura variety (0.7mg/g). In water fermented preparation, the highest

was reported in Guvacine of Rata Puwak variety (17 mg/g) and the lowest was Arecaidine content in Hamban Puwak (0.75mg/g). The highest areca alkaloid for the sun-dried preparation was Arecoline of Hamban Puwak variety (15.75mg/g) and the lowest was obtained by Arecaidine of Matale Chathura (0.5mg/g). In comparison to a similar study, the most abundant alkaloid of *A.catechu*, was Guvacine and this result supported all preparation methods of this study. However, the results of Arecoline, Arecaidine and Guvacoline alkaloid abundancy did not match the current study as the composition levels deviated.

Keywords: Areca nut, Areca alkaloids, Oral cancer, LC-MS analysis

Surveillance of Common Respiratory Viruses Including Respiratory Syncytial Virus among COVID-19 Suspected Patients in the Central Province of Sri Lanka

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Acute respiratory tract infections (ARTI) caused by respiratory viruses particularly respiratory syncytial virus (RSV), are an important cause of hospitalization and mortality. During the COVID-19 pandemic, etiological diagnosis was only focused on SARS-CoV-2. This study aimed to assess the prevalence of other respiratory viruses including RSV among COVID-19 suspected patients in the Central Province of Sri Lanka. A total of 608 respiratory samples received to the National Hospital, Kandy, Sri Lanka were tested for respiratory pathogens including RSV from 1st of January 2021 to 31st of October 2022. Among the patients tested 9.4% (57/608) patients with suspected COVID-19 were confirmed to have SARS-CoV-2 infection. The overall detection rate of other respiratory pathogens was 43.5% (296/608). Among the participants, 11.5% were diagnosed with RSV infection. The prevalence rates for other respiratory pathogens were as follows: Rhino/Enterovirus at 13.5%, human coronaviruses (hCoV C229E, NL63, HKU1) at 8.7%, human parainfluenza virus at 6.7%, influenza virus at 6.4%, human bocavirus at 5.9%, human adenovirus at 3.8%, human metapneumovirus at 1.3%, and atypical bacteria at 0.8%. Of the patients infected with RSV, RSV-A, RSV-B subtypes were noted in 55.7% and 8.6% respectively. Mixed infection with subtypes A and B was present in 35.6% patients. Age of the patients ranged from 14 days to 82 years; 87% children and 13% adults were infected with RSV. RSV infected patients had fever, cough, cold and shortness of breath as the predominant symptoms. Sore throat and diarrhea were less common in RSV infected patients. Thirteen RSV co- infections were identified including two with SARS-CoV-2. RSV was the second commonest pathogen identified among COVID-19 suspected patients. This underscores the importance of diagnosing not only suspected viruses but also other respiratory viruses, including RSV. Such comprehensive diagnostics can aid in initiating appropriate management and treatment plans for patients.

Keywords: Respiratory viruses, RSV, Covid-19, Central Province, Sri Lanka

Assessment of Dietary Folate Consumption and Serum Folate Level Among β-thalassaemia Traits

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There is no consensus among clinicians regarding the necessity of regular folic acid replacement for individuals with heterozygous β-thalassemia (BTT). The increased ineffective erythropoiesis, albeit to a mild degree, could make them vulnerable to folate deficiency, especially if there is an associated dietary deficiency. Community-based studies in Sri Lanka have previously shown a high prevalence of folate deficiency in the community, reaching even 43%; very likely suggestive of dietary deficiency. This study was designed to assess dietary folate consumption and serum folate levels in those with BTT viz a viz healthy matched controls. This case-control study includes 100 sets of samples, including a β-thalassaemia trait and an age, sex and BMI-matched normal individual from the same household in each set, aged between 5 to 25 years. Serum folate levels were determined using a fully automated Cobas immunoassay analyzer. The dietary intake of each participant was determined by recording 24-hour dietary recall on three consecutive days. Based on the results, 33 out of 98 (34%) cases had serum folate deficiency with a mean of 4.88 ng/mL, while 24 out of 99 (24%) controls had serum folate deficiency (defined as <3 ng/mL) with a mean of 4.76 ng/mL. Additionally, 37% (36/98) of cases and 49% (48/99) of controls were at risk of deficiency (defined as 3-5.9 ng/mL). Statistical analysis did not reveal any significant differences ($p>0.05$) in serum folate levels between cases and controls. Dietary folate intake was low but not significantly different between those with BTT (mean 181 µg; 96% <RDA) and controls (mean; 182 µg; 97%<RDA). There was no significant correlation between serum folate or dietary folate levels among cases ($r= 0.097$) or controls ($r=0.098$). In conclusion, there were high levels of folate deficiency in both controls and those with BTT (>24% and 34%), but those with BTT were no more likely to be folate deficient than the controls.

Keywords: β-thalassaemia trait, Serum folate, Dietary folate, Folate deficiency

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Quality of a Commonly Manipulated Oral Dosage Form Given to Children

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Manipulation of dosage forms is done due to a lack of commercially available child friendly formulations and required doses. The quality of the manipulated oral dosage form will affect the safety of the child. Hence, this study focused to assess the quality of a commonly manipulated oral dosage form. A detailed literature search was carried out to identify the commonly manipulated medicines, their available dosage forms and the methods used to manipulate them. All brands of the selected medicine currently available in Colombo district were collected and split by hand, knife, and tablet cutter. The whole dosage forms and the fragments were tested for their uniformity of weight, disintegration time, friability (BP 2012), assay (BP 2002) and dissolution (USP 42). Thickness, hardness and diameter were tested only for whole tablets. Tablet splitting was found to be the most common manipulation method. Carbamazepine tablets were selected for the study. The weight variation tests for all the fragments of the three tested brands did not comply with the BP specifications. No significant difference was seen in half tablets ($P=0.666$) and quarter tablets ($P=0.18$) split by tablet cutter and knife. All assay tests failed for hand split tablet fragments. When considering tablet halves, only 50% of fragments split by knife and 33.33% of fragments split by cutter passed the assay test. Only 16.66% of quarter tablets split by knife and tablet cutter passed the assay test and none of the one eighth fragments split by all the splitting methods passed the assay test. Except for the half tablets of one brand all others failed the friability test. The mean disintegration times of the fragments were less than the whole tablets. The correlation coefficient between the weight of the fragment and the percentage of drug release was 0.4168. The quality of the manipulated dosage form was not satisfactory. The quality of fragments split by a kitchen knife was better than fragments obtained from hand splitting and a tablet cutter.

Keywords: Manipulation, Split tablets, Tablet cutter, Dosage forms, Quality, Oral dosage form, Children

Comparative Assessment of Biological and Chemical Hazards Associated with Fresh and Frozen Chicken Meat at the Retail Level

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Both frozen branded chicken and fresh chicken meat is popular among Sri Lankan consumers but the biological and chemical hazards associated with those products are not investigated adequately. This study aims to assess the occurrence of such hazards in fresh and branded chicken on the aspects of the presence of foodborne bacterial pathogens, their antimicrobial resistance (AMR) and the presence of antimicrobial residues. Sixty-seven meat samples: 46 on-request produced fresh chicken meat and 21 branded frozen chicken meat samples (7 different brands) were purchased from retail shops and supermarkets respectively in Kurunegala Municipality and Pradeshiya Sabha area. Samples were tested to determine the presence of common foodborne bacterial pathogens, AMR and residues adopting to standard methods. The isolation rates of *E. coli*, *Salmonella* spp., and *Campylobacter* spp. in fresh chicken meat compared to frozen chicken were as follows: *E. coli*: 63% (29/46) in fresh chicken vs. 85.71% (18/21) in frozen chicken. *Salmonella* spp.: 54.3% (25/46) in fresh chicken vs. 14.28% (3/21) in frozen chicken. *Campylobacter* spp.: 4.3% (2/46) in fresh chicken vs. 19% (4/21) in frozen chicken. Even though both sample types were positive for *Staphylococcus* spp., coagulase positive *Staphylococci* were detected only in branded frozen chicken samples with the rate of 33.3% (7/21). Majority of isolated *E. coli* and *Salmonella* spp. from both fresh and branded frozen chicken were multidrug resistant (MDR) with resistance to ≥ 3 classes of antimicrobials. Considering *E. coli*, in fresh vs frozen chicken MDR isolates were 93% (27/29) and 72.2% (13/18) respectively. Occurrence of MDR *Salmonella* is 52% (13/25) and 100% respectively. MDR was reported in only one pathogenic *Staphylococcus* spp. from frozen chicken. None of the meat samples were positive for antimicrobial residues. The study findings indicated inadequate microbiological quality in both fresh and frozen chicken. This underscores the urgent need for the implementation and ongoing monitoring of good hygienic practices throughout the food chain, supported by robust quality control systems.

Keywords: Food borne pathogens, MDR, Antimicrobial residues, Fresh chicken, Branded frozen chicken

Knowledge on Home-care Plaque Control Methods in Patients with Periodontal Disease: Findings from a Periodontal Clinic

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Plaque control is essential in the prevention of periodontal disease. The mainstay of plaque control is mechanical plaque removal. This signifies the important duty of dental professionals in educating patients on effective mechanical plaque removal on daily basis at home. This study assessed the knowledge of home-care plaque control methods in new patients attending the clinic, comparing the knowledge of those who had received some form of periodontal treatment within the last six months (test group) from any other dental clinic with those who had never received any periodontal care before (control). An interviewer-administered questionnaire was used to collect data which was analyzed using SPSS software. Descriptive statistics were expressed by means of number, frequency and percentage. The level of statistical significance was considered at $p<0.05$. The study included 81 patients. Test ($n=34$) and Control ($n=47$) subjects were comparable in terms of age, sex and education level. Majority used a toothbrush to clean the teeth (98.8%). 53% ($n=18$) in the test group had received previous treatment at private clinics while 29.4% of them mentioned that they didn't receive brushing instructions. Among those who received brushing instructions, a majority has had chair-side brushing demonstrations. Yet, none reported that they received education on supplementary plaque control tools. Although the test group had slightly higher knowledge mean score, the difference was not statistically significant. Among those who underwent periodontal treatment, a significant relationship was found between the knowledge mean score and the educational level ($p=0.031$). Within limitations of the study, the findings demonstrated gaps in patient instruction/patients' knowledge-acquisition. A patient's level of education may influence the knowledge-acquisition and retention of facts regarding plaque control instructions. Dental professionals would need to take effective measures to deliver adequate plaque control instructions to individual patients and recommend supplementary plaque control tools whenever necessary.

Keywords: Knowledge, Awareness, Plaque control, Oral health education

The Flavonoid and Cytotoxicity Potential of Six Single Medicinal Herbs and its Formula against MCF-7 Breast Cancer Cells

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The burden of cancer is rising globally, this is also reflected in breast and gynecological cancers among women. Treatment resistance remains a serious concern, which can lead to therapeutic failure in cancer. Medicinal herbs have demonstrated good anti-cancer activity. Thus, in this research, an ancient traditional recipe from Sri Lanka, with six herbs was scientifically evaluated which is currently given to treat cancers that women are affected. The single herbs and its formula were analysed by various *in vitro* experiments and all extracts and the formula with all six herbs, were prepared as same as the traditional method using water. The phytochemical analysis was studied by Folin Ciocalteu's method to determine the total phenolic content (TPC) and aluminum chloride colorimetric method to determine the total flavonoid content (TFC). The antioxidant properties were studied using the 2,2-diphenyl-1-picrylhydrazyl (DPPH) and (2,2'-azino-bis (3-ethylbenzothiazoline-6-sulfonic acid)) (ABTS) assays. The present study investigated the cytotoxicity effect of the extracts by 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) assay using human breast cancer cells (MCF7) and Vero cells. The phytochemical analysis revealed that the highest concentration tested:1mg/ml, of *P. alatum* (single herb) showed the highest TPC value of 0.087 ± 0.001 mg/ml Gallic Acid equivalent g, in comparison the formula showed a value of 0.035 ± 0.001 mg/ml Galic Acid equivalent g for TPC. The formula extract showed the highest TFC value out of all extracts: 0.023 ± 0.0002 mg/ml Quercetin equivalent g. The DPPH assay exhibited an inhibition of $40.13 \pm 1.27\%$ for the formula, while the formula reported an inhibition activity of $31.43 \pm 0.082\%$ for the ABTS assay. The cytotoxicity effect of the highest concentration:1mg/ml tested showed an inhibition of $73.22 \pm 4.13\%$ and $67.76 \pm 1.13\%$ by the formula extract against MCF7 and Vero cells respectively. The high TFC and cytotoxicity results may suggest that the formula might be able to decrease oxidative damage in cancers. More experiments will be conducted in the future.

Keywords: Traditional formula, MCF7 breast cancer cells, Total flavonoid content, Cytotoxicity.

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What is the Influence of Patient Education and Compliance on Medication for the Prevention of Diabetic Nephropathy?

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Diabetic nephropathy is the leading cause of end-stage renal failure. To control long-term complications of diabetes, hyperglycemia, and hypertension should be controlled. For this patients should have proper knowledge about the disease, relevant tests, and drugs. Non-compliance with medication is the principal cause of complications related to diabetes including kidney failure. Diabetic nephropathy can be prevented with close dietary management, exercise, and the use of appropriate medications. Therefore, knowledge of the disease, tests, medications, and their usage is a critical factor in renal impaired patients. This research was supposed to determine the knowledge level on disease, tests, medications, and usage of such medications of renal impaired patients 100 patients were selected from the diabetic nephropathy clinic, in the General Hospital Kandy. A pre-validated interviewer-administer type questionnaire was given to the selected random sample. It contains 25 questions including open-ended and indirect questions. Marks (1%-100%) were given to each question, final marks were analyzed to decide whether the sample had adequate knowledge and compliance on medication to prevent diabetic nephropathy or not. This research reveals that most of the patients don't have adequate knowledge about their disease, tests, and drug therapy and a positive physician-patient relationship is the most important factor in improving compliance. Statistical Analysis showed that there exists a linear relationship between compliance and gender/age/education/marital status. To improve patient knowledge and compliance on medication have to increase patient education. Compliance with medication is poor. To alleviate this situation nurses and other health care professionals in clinics and pharmacies have to educate patients about the drugs they are receiving. Pharmacists have a major responsibility to improve patient compliance with medication. Healthcare administrators must recruit enough qualified nurses, pharmacists, and other health care professionals for proper management of patients with diabetic nephropathy.

Keywords: Diabetic nephropathy, Questionnaire, Education, Compliance

Connection between Dance and Neuroscience: An Analysis through the Practice of Kandyan Dance

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This paper examines the connection between dance and neuroscience based on the experiences of Kandyan dance. Kandyan dance of Sri Lanka has been widely studied as an aesthetic expression and national cultural heritage. Its historical emergence and political role have also been studied. Analyzing Kandyan dance through neuroscience has not been done. This study is a basic attempt to understand the Kandyan dance through the concepts of body and movements in neuroscience. This is a qualitative study. Data comes from our experience as Kandyan dancers, personal reflections, observations, interviews with traditional dancers and bodily experiences. International research reports on brain activity tests, Physical-mental space tests, articles and books were referred to analyze data. Kandyan dance training and the role of the ritualist in dance rituals were analyzed. When grasping the connection between dance and neuroscience three concepts namely, perception, sensation, and emotions were useful. Richard Shusterman's aesthetics theory of the body was used to understand the neurological reflections of the body on culture and the culture on the body, particularly focusing on Kandyan dance. As a result of this study, a Sinhala language vocabulary and glossary was developed to analyze the connection between dance and neuroscience. Kandyan dance cannot be reduced to a physical activity. It is a connected activity of the body, movement and the culture. Because of their neurological system, Kandyan dancers are aware about the capacities and the limitations of their bodies at any given moment in the dance which they describe as "pattiyan wenawa" in Sinhala. Even when they are not dancing, dancers also feel that they are dancing in their bodies (*aenga ethulen natanawa*) while they are watching a dance. Concepts of neuroscience helps to explain experiences of Kandyan dancers' and the finding of this research can help future studies on Kandyan dance and neuroscience.

Keywords: Kandyan Dance, Perception, Sensation, Feelings, Neuroscience, Somaesthetics

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RESEARCH SESSIONS

INNOVATIONS FOR SUSTAINABLE CITIES AND SOCIETIES

Photocatalytic Activity of Sol-gel Synthesized Fe₃O₄/MgO Nanocomposites for Methylene Blue Dye Degradation

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Water pollution from industrial effluents with organic dyes is an urgent environmental concern. Methylene blue (MB) is particularly problematic due to its wide industrial use and known persistence and toxicity. Photocatalysis offers promise for organic dye degradation, and incorporating magnetic materials allows easy separation and recyclability. We focused on synthesizing Fe₃O₄/MgO nanocomposites and evaluating their photocatalytic activity for MB dye degradation. Fe₃O₄/MgO nanocomposites (particle size = 82.9 nm) were successfully synthesized via a controlled sol-gel method, featuring unique aloe vera stem-like structures with granular particle morphology, indicating a high surface area for enhanced photocatalytic activity. Powder X-ray diffraction confirmed cubic Fe₃O₄ and MgO structures. For photocatalytic degradation, the Fe₃O₄/MgO photocatalyst was dispersed in a 50 ml MB solution and exposed to direct sunlight. Over time, MB concentration progressively decreased, with the characteristic absorption peak vanishing after 2.5 hours. Kinetic analysis yielded an optimum rate constant of $1.55 \times 10^{-4} \text{ s}^{-1}$, resulting in 99% degradation after 2.5 hours. Dark adsorption studies established equilibrium with minimal dye concentration variation. In the presence of the catalyst and light, significant degradation occurred, highlighting the catalyst's importance. Control experiments without the catalyst showed no self-degradation of dyes under sunlight (optimum rate constant of $0.95 \times 10^{-4} \text{ s}^{-1}$). The sol-gel-synthesized Fe₃O₄/MgO nanocomposites exhibited excellent photocatalytic efficiency under sunlight, making them promising for organic pollutant treatment in wastewater. Magnetic properties coupled with photocatalytic performance offer an effective and sustainable solution for water pollution from organic dyes. Utilizing these nanocomposites can safeguard the environment and public health from harmful industrial pollution.

Keywords: Degradation, Organic dyes, Photocatalysis, Sol-gel synthesis, Water pollution

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Influence of Chrysotile Fibers on Drying Shrinkage of Cement Paste

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Different types of fibers are used in building construction to enhance strength and to reduce cracks in structural and non-structural concrete components. Among the fiber cement (FC) composites, FC thin sheets are extensively used as a building material, mainly in ceilings, siding, and flooring. FC thin sheets are lightweight and demonstrate a high strength-to-weight ratio. However, dimensional changes in the sheets and consequent warping are significant issues in these thin FC components. It is noted that drying shrinkage is a notable concern in cement-based materials, particularly in thin components with high surface-to-volume ratios. Hence, it is crucial to investigate the influence of fibers on the drying shrinkage of cement components. This study was conducted to identify the effect of chrysotile fibers on the drying shrinkage of cement paste. The testing mixes comprised chrysotile fibers and ordinary Portland cement (OPC). The chrysotile fibers and OPC were combined in a 1:7 ratio, and water was added to achieve a water/cement of 0.42, mirroring the production of commercial fiber cement thin sheets. Similarly, a control mixture was prepared using the same process without adding chrysotile fibers. Samples were subjected to drying at 25°C and relative humidity of 50% and the drying shrinkage of both samples, with and without fiber addition, was observed to be 0.203% and 0.198%, respectively, at the age of 28 days. It was determined that the incorporation of chrysotile fibers did not result in any significant increase or decrease in drying shrinkage. Hence, the influence of chrysotile fibers on drying shrinkage was found to be insignificant. Further investigations could explore alternative approaches to mitigate shrinkage in fiber cement products, such as the incorporation of shrinkage-reducing admixtures.

Keywords: Fiber cement, Cement paste, Chrysotile fiber, Drying shrinkage

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A Survey of Loss Functions for SegNet for Mosquito Breeding Site Detection

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In recent years, computer vision has witnessed significant advancements, revolutionizing various domains. A critical application we consider, especially in the context of Sri Lanka, is the surveillance of mosquito breeding sites and detection. Efficient and accurate identification of these sites plays a crucial role in effective mosquito vector control programs. SegNet is a deep neural network architecture, successfully applied to many semantic segmentation tasks, making it a compelling choice for mosquito breeding site detection. One of the key parameters which controls the performance of the SegNet is the loss function. Hence, this paper present a comprehensive study on selecting a suitable loss function for SegNet for stagnant water detection application, starting with a systematic empirical comparison of different loss functions. To achieve this objective, first, we created a custom drone image dataset. Using this dataset, we built and trained customized SegNet models using five well-known loss functions, namely Categorical cross-entropy, Binary cross-entropy, Focal Tversky loss, IoU loss, and Dice loss. During the training phase, the model underwent transfer learning-based domain adaptation. I.e. initially, the model was trained on a publicly available large water area dataset, comprising 1,052 RGB images. Thereafter, the model was fine-tuned using locally collected task-specific drone dataset, in the framework of transfer learning. The performance of each 5 cases was compared using Dice Score and Sensitivity, which are popular matrices for segmentation tasks, and the Binary cross-entropy outperformed the others in the test setting. The Dice Score for binary cross-entropy was 0.8334 while the sensitivity was 0.8203. One possible explanation of this is that Binary cross-entropy measures the dissimilarity between the predicted probabilities and the ground truth labels for each pixel independently, and it handles class imbalance well by assigning appropriate importance to each class during the optimization process, effectively preventing dominance by the majority class.

Keywords: Misquito vector surveillance, Drone images, Deep learning, Loss functions, SegNet

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Development of a Flood Warning System for Smart Spongy Cities

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The Sponge City idea has been pushed as a significant work programme to address growing flood danger in metropolitan areas, as well as broader advantages for water resources and urban revitalization. Nevertheless, implementation of the notion necessitates collaboration with a diverse variety of experts as well as impacted populations. Visualization might be beneficial in this process. Flood warning systems may help to mitigate these consequences by assisting in the evacuation of individuals from likely vulnerable regions during peak flash flood periods. As a result, this study presents a conceptual approach to an automated flood warning mobile App. It was examined the issues that sponge city construction faced, as well as potential answers. The flood warning system was developed considering the frequently used permeable pavement materials such as permeable asphalt concrete, permeable cement concrete, permeable brick, and innovative pavement materials. Porous pavement materials were created to satisfy the needs of "infiltration, retention, purification, evaporation, and drainage". Pore properties, such as porosity and pore size. Flow-through the porous medium analysis was done by viewing the media as a continuum using the ABAQUS Darcy's equation model. Finally, these finite element analysis results are integrated to a mobile App which is called "Flood warning APP" for faster communication of flood status among road and city users considering the future growth of pavement materials in sponge city to improve the hydrological performances such as infiltration, runoff and absorbance.

Keywords: Flood warning system, Finite Element Analysis, Smart sponge cities, Smart App

Sustainable Concrete Incorporated with Recycled Polypropylene Plastic Waste as Coarse Aggregate

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The huge worldwide consumption of concrete and plastic creates environmental problems. For instance, overconsumption of concrete mainly increases CO₂ emissions during cement production and causes natural resource exploitation, energy consumption and harmful pollutants. Furthermore, the majority of plastic waste generated in Sri Lanka is openly dumped in landfills without any precautions. It badly affects the soil, water, human beings and the natural habitat. Hence, using recycled plastic waste as an alternative material for concrete constituents is emerging as an effective sustainable development technique in construction sectors. Even though broad research study has been done in this area all over the world, more experimental verification is essential to implement it in Sri Lanka using available own materials. The current study focuses on small-scale recycling centres where Polypropylene (PP) type plastic waste is mostly recycled. In this study suitability of PP-type recycled plastic waste as a partial replacement for natural coarse aggregate (NCA) in concrete is investigated through experimental work. Priority was given to major concrete properties such as workability and compressive strength. For this purpose, two series of concrete batches were cast with two different types of NCA having maximum nominal sizes of 8mm and 12.5mm. Each series contains one conventional concrete batch and another batch with 20% PP plastic aggregates (PPA) as partial replacement for NCA. Results showed that the compressive strength reduction in PPA concrete batches was almost same regardless of the NCA types used and the reduction percentage is approximately 11%. Further, it was found that the application of PPA concrete in non-structural construction is feasible.

Keywords: Compressive strength, Concrete, Natural coarse aggregate, Plastic coarse aggregate, Recycled polypropylene plastic

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Comparative Assessment of Methodologies for Quantifying Lateral Distortional Buckling Capacity in Steel-Concrete Composite Beams

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Steel-Concrete Composite Beams (SCCBs) employed within interior supports undergo negative moments, leading to compression on the bottom flange and a portion of the steel web. If the web of the steel profile lacks sufficient stiffness to resist lateral bending, it will deform, allowing the compressed flange to displace laterally and twist. This buckling mode is referred to as Lateral Distortional Buckling (LDB). Numerous publications have attempted to explain the behavior of LDB in SCCBs, which can be categorized into two research streams. The first stream focuses on exploring the elastic behavior of LDB by employing bifurcation equilibrium analyses to determine the critical moment at which elastic instability occurs. The second stream investigates the LDB strength of SCCBs through experimental studies or non-linear numerical analyses. However, there are discrepancies in the formulas presented in the literature for calculating the elastic critical moment and different approaches used to estimate LDB strength, deviating from standard procedures. These variations highlight the fact that LDB is still not fully understood by the structural engineering research and design community. Therefore, the main aim of this study is to examine the behavior of SCCBs and compare the theoretical and standard procedures for assessing LDB strength. Finite element (FE) models of SCCBs were developed using ABAQUS software, considering geometric imperfections and material non-linearity. The developed FE models exhibited a strong correlation with experimental results, precisely predicting the ultimate moment capacity of SCCBs with a maximum relative error of less than 2%. Substantial deviations were observed in the elastic critical moment and the ultimate moment when comparing the findings against established approaches. The significance of these insights lies in their ability to guide future research efforts and facilitate comprehensive specification reviews.

Keywords: Lateral distortional buckling, Negative moments, Nonlinear FE analysis, Steel-concrete composite beams

Lateral Performance of Thin-Walled Steel Box Piers under Uniaxial and Biaxial Bending

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Usage of steel structures for bridges and viaducts has been the recent trend in the highway construction industry. Steel has been identified as a construction material with long service life, high recoverability, less energy consumption and therefore more sustainable than concrete. Steel structures such as piers (columns) are preferred over their counterpart concrete piers due to their easy and fast construction and minimal disruption to the construction site. Thin-walled steel piers used in these constructions are subjected to various static as well as dynamic loads such as traffic loads, dead loads and seismic loads depending on the region. When it comes to earthquakes, it is important to analyse the piers laterally in both directions. These piers are vulnerable to local buckling due to their low width to thickness ratios and high slenderness ratios. Therefore, they are manufactured with internal stiffener arrangements to provide more resistance towards buckling failures. The focus of this study is to examine the effects of uniaxial and biaxial bending towards the lateral performance of thin-walled steel box piers numerically. Six specimens were created with different width to thickness ratios, slenderness ratios and stiffeners, uniaxial and biaxial cyclic loads were applied on top of the piers and resultant envelope curves were obtained. Results revealed that the models are more vulnerable to overall buckling under biaxial loading conditions. So, this study emphasizes the importance of analysing thin-walled piers under bidirectional loading pattern over the unidirectional loading pattern for structural designs.

Keywords: Box piers, Biaxial bending, Cyclic loads, Finite-element modeling, Steel structures

Non-Linear Damping Identification for Damage Prediction of Concrete Beams

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Damping behavior has been proven sensitive to even small, visually undetectable damages. It is known that when a concrete structure is undamaged, damping behavior is modelled by constant damping model. When the structure is damaged, the damping behavior is best described by nonlinear damping model. Thus, by identifying the presence of nonlinearity in damping behavior could reveal the presence of damage in structure. Damping behavior is identified by studying the decay envelope of free vibration in Log-Amplitude scale. Where, constant damping model should best fit to a straight line and common nonlinear damping models, Coulomb and Quadratic damping models, should resemble to concave and convex lines respectively. This decay curve shape characteristic is used to distinguish the nonlinearity in damping behavior of reinforced concrete beam and predict the existence of damage. The experimental study was conducted using flexural free vibration of simply supported reinforced concrete beam. The beam was 200x150mm in cross section and 2700mm in length. The damping behavior of free vibration of beam was investigated at undamaged state (D0) and after different level of flexural damage by loading in four-point bending configuration. Damage states D1-appearance of first crack, D2-appearance of five cracks, D3-appearance of seven cracks, D4-appearance of thirteen cracks, D5-appearance of fifteen cracks. The acceleration time history obtained from the tests were processed using Fast Fourier Analysis and band pass filtering. Then the oscillation peaks were extracted to obtain the decay envelopes and plotted in Log amplitude scale. Then the results were compared with decay curves of ideal damping models described above. It was observed that the constant damping model describes the undamaged beam (D0 state) very well. The decay envelope comparison after each damage states D1, D2, D3, D4, D5 are resembled to convex line depicting quadratic damping behavior. It is seen that rate of decay has significantly increased after the appearance of first crack (D1 state) indicating the potential of damping in portraying even a small damage. This will lead to the suggestion that the damping behavior of the undamaged RCC beam is resemble to constant damping model, and after damage, the damping behavior become nonlinear and distinguishing nonlinearity in decay envelope could portray the existence if damage. It is also important to note that this method is applicable when a single dominant mode is activated, and modes are well separated. Severity of damage in RCC beam may not be characterized by identifying the nonlinearity.

Keywords: Damping, Nonlinear damping, Damage detection, Reinforced concrete beam

The Surface Morphology and Variation of Removal of Heavy Metals from Urban Runoff using Biochar-Based Cement Paste Adsorbent

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Many studies have reported that Cu, Zn, and Pb, are the most common heavy metals found in urban runoff and they have strong mobility and toxicity. Biochar-containing materials are used for the in-situ removal of heavy metals. However, the effect of cement addition to biochar on heavy metal removal has not been studied in the available literature. Additionally, these studies used biochar synthesized under controlled laboratory conditions using muffle furnaces. The biochar used in this study was prepared using a double chamber draft-down pyrolysis reactor with a residence time of 25 ±5 minutes and pyrolysis temperature of 350-450 °C with paddy husk. Ordinary Portland cement and paddy husk biochar were mixed with an initial water/binder ratio of 0.40. The mixture was packed into Polyvinyl Chloride sections of 50 mm x 100 mm size and column removal experiments were carried out to determine Cu, Pb and Zn removal. Through Scanning Electron Microscopy (SEM) images, hydrated cement products were observed covering parts of the biochar surface and inside the pores of the biochar particle. Thus, the surface area of the biochar available for interaction with heavy metals had decreased. However, the addition of cement 1.5% (v/v) into biochar increased removal capacity approximately 2 times for Cu removal, 3 times for Pb removal and Zn removal. This is due to cement having a higher removal potential of heavy metals compared to plain biochar. The effect of the initial pH on the removal efficiencies of heavy metals was significant for plain biochar but, was negligible for the cement-modified biochar. Hence, the results of this research opened a new pathway in biochar modification. However, the effluent pH was above 11 after cement modification. Thus, the effluent needs to be neutralized before discharge into the environment.

Keywords: Industrial biochar, Cement, Heavy metals, Stormwater, Removal

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Enhancing Rural Industrial Development in Sri Lanka through Biogas Compression and Storage System: A Sustainable Power Solution

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Biogas, an environmentally friendly power source created from organic waste through anaerobic processing, holds enormous potential for meeting the country's energy needs. However, its low energy density, and ineffective storage options hinder biogas utilisation. Low-pressure gas storage tanks are one of the most common ways to store biogas, although they have shortcomings in safety, transportability, and storage capacity. Biogas is compressed by reducing its volume while raising its pressure, which increases its energy density. This paper analyses the compressing of biogas in LPG cylinders to increase energy generation. Moreover, this paper examines the feasibility of using compressed biogas in rural industries. Firstly, Impurities were removed from the biogas before entering the compression system. Carbon dioxide and moisture were removed using a water scrubber, and the biogas was passed through a Hydrogen sulphide separation unit to extract hydrogen sulphide using the catalyst iron oxide. Then, the purified biogas was compressed in liquefied petroleum gas cylinders weighing 12.5 Kg and 5 kg. Biogas samples from different sources of feed materials, such as pure cow dung and a mix of cow dung and poultry excreta from which the biogas was generated, were used at various cylinder pressures to understand the performance efficiency of internal combustion engines. The average time to run a 3 HP engine is around 40 minutes when using a 12.5 Kg LPG cylinder filled with compressed biogas at 10 Bar. Hence, it is evident that machines powered by compressed biogas can be used for rural industrial activities like coconut oil extraction, brooder houses for chickens, and lifting water for drip and sprinkler irrigation systems. The study reveals that compressed biogas is a viable solution for boosting green rural economic development, and further research is essential to determine the ways and means to run automobiles cost-effectively in Sri Lanka.

Keywords: Compressed biogas, Energy density, Rural industries, Automobiles, Cow dung

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Analysis and Improvement of Compressive Strength in Self-Healing Concrete by Using Bacteria

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This research focuses on the impact of bacterial activity, specifically the direct addition of *Bacillus subtilis*, *Bacillus megaterium*, and their combination, on the compressive strength of self-healing concrete, to address the issue of concrete's inherent micro-cracks, which can lead to structural degradation and the infiltration of harmful substances. This causes steel corrosion, carbonation, chloride ion erosion, and sulfate erosion, resulting in structural deterioration. Previous researchers have introduced urease-producing bacteria and added a calcium source to the concrete mix, resulting in calcite precipitation. This bacterial biomineratization by utilizing *Bacillus* bacteria can prevent and repair micro-cracks in concrete structures. This study aims to develop sustainable self-healing concrete by controlling micro-cracks using *Bacillus* bacteria by analyzing the mechanisms of which *Bacillus* bacteria enhance compressive strength, microstructural changes, CaCO_3 precipitation, and bacterial growth impact. The compressive strength test, SEM analysis, and water absorption test were conducted to investigate the natural ability of *Bacillus* bacteria to produce CaCO_3 and heal concrete cracks. The results show that *Bacillus subtilis* concrete exhibits the highest increase in compressive strength at 25%, followed by the combination of bacterial concrete with a 23.4% improvement, and *Bacillus megaterium* concrete with a 16.2% increase in compressive strength compared to conventional concrete. Additionally, bacterial concrete exhibited low water absorptivity, indicating a high healing capability compared to conventional concrete. In the combination bacterial concrete, SEM analysis indicates that extending the curing duration enhances the healing efficiency. The combination bacterial concrete exhibited slightly lower compressive strength and healing efficiency compared to *Bacillus subtilis* alone but higher than *Bacillus megaterium* alone and significant improvements compared to conventional concrete. Therefore, the combination bacterial concrete appears to strike a balance between compressive strength enhancement and healing capabilities. This can be used in high-strength concrete structures to reduce the costs and challenges associated with external intervention in harsh environments.

Keywords: Self-healing concrete, Compressive strength, *Bacillus subtilis*, *Bacillus megaterium*, Healing efficiency

Innovation Capabilities of Creative Industries-In case of Pottery Industries in Kurunegala District

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The pottery industry is a traditional industry with archaeological values, covering small industries and entrepreneurs, having remarkable contributions to the economy. Previous studies have shown that the pottery industry is considered the creative and cultural industry. Over the last two decades, new technology has aided the pottery industry enabling its possibilities and making pottery items more innovative. According to the Oslo manual (2018), innovation is crucial for survival in a dynamic environment. The Oslo manual is the key international reference for defining and evaluating innovations. According to the Oslo Manual, a business innovation is a new or enhanced product or business process, or a combination of the two, that differs significantly from the firm's previous products or business processes and has been established on the market or brought into use. Therefore, this research aims to explore the innovation capabilities of pottery industries in the Kurunegala district by considering the Oslo manual publication. A qualitative design was adopted to achieve research objectives. The study sample consists of 7 pottery industry people from the Kurunegala district who have heterogeneous characteristics in their industry. The data were gathered through face-to-face interviews using a pre-determined interview guide. The analysis of the data was done using thematically and a purposive sampling method was used. The findings revealed that the pottery industry in Kurunegala increasingly adapts to different types of innovations. The pottery industry in Kurunegala has practiced product innovations, business process innovations, and distribution and logistics innovations. Researchers questioned pottery people on these three types of innovations and all of the pottery owners agreed with this fact. However, business process innovations were highly practiced compared to the other two innovations in the pottery industry. Modernized business processes, modernized facilities, and customer-based production processes are the major types of business process innovations by considering the interviewees' responses. As a result, in the pottery business, combining the artistic urge with new technologies enhances both the production processes and the overall design.

Keywords: Pottery industry, Innovation capabilities, Kurunegala district, Oslo manual (2018) publication

Coal ash Derived Zeolite X for Cationic Dye Removal from Textile Wastewater

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Textile wastewater has been identified as a source of environmental pollution mainly due to the presence of synthetic dyes. Adsorption technology is considered a promising solution for treating textile wastewater. In the present study, Zeolite-X was synthesized from fly and bottom ashes generated in a coal-fired boiler. The alkaline fusion method used for the synthesis and processed Zeolite-X was characterized by FTIR, SEM, and XRD. Synthesized zeolite was subsequently employed for the adsorption of Methylene Blue dye from a synthetic dye solution. Adsorption conditions were optimized to obtain maximum dye removal efficiency using Response Surface Methodology combined with Central Composite Design. The influence of the independent variables on the percentage elimination was evaluated, focusing primarily on the solution pH (3-11), temperature (20-60 °C), adsorbent mass (2.5 -4.5 g/l), and initial dye concentration (10-50 mg/L). Maximum dye removal efficiencies of 93.01% and 98.15% were obtained for fly ash and bottom ash derived zeolite-X respectively at the same optimum condition (pH 9; temperature 50 °C; initial dye concentration 40 ppm; and solid to liquid ratio 4 g per 1L). Adsorption isotherms were developed at the optimum conditions and the data were fitted to Langmuir and Freundlich isotherm models. The potential of the adsorbent for dye removal was further evaluated by kinetic studies. FAZ data fitted the Langmuir model implying a favorable monolayer adsorption, while BAZ data aligned with the Freundlich model indicating that multilayer adsorption is favorable.

Keywords: Adsorption, Coal fly ash, Coal bottom ash, Textile dyes, Ultrasound-assisted method, Zeolite-X

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Determination of Accurate Camera Tilt and Altitude of “DJI Mavic 2 Enterprise Dual” Unmanned Aerial Vehicle for surveying Horizontal and Vertical Surfaces

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At present, total stations and level instruments are used for collecting data more accurately. And those instruments can be used for different surfaces accurately. Surveyors also use modern technologies like Unmanned Aerial Vehicle (UAV) surveying to collect data. When conducting UAV surveys in areas with considerable terrain variations, it is important to consider the tilt angle of the camera and the altitude of the UAV to get the highest accuracy possible when considering the data set. Before the UAV is flown, Ground Control Points and checkpoints will be established accurately. The UAV will be flown at different camera tilt angles and altitudes on Horizontal and Vertical surfaces. Observed images will be processed by using Pix4Dmapper software. After data collection, images will be adjusted by using Ground Control Points and check the accuracy of images by using Control Points. In this research expected outcome was selecting the suitable camera tilt angle and altitude of the UAV for collecting data accurately on various surfaces. When determining the camera tilt angle and the altitude the required number of Ground Control Points for surveying various terrain surfaces should be determined as well. In this study was found that five Ground Control Points were enough for a 2500m² area. Also, the most suitable tilt angle and altitude for UAV surveying is 60° tilt angle with 40m altitude respectively for surveying a horizontal surface. Likewise, the most suitable tilt angles and altitudes for UAV surveying are 3m distance from the wall with a 10° tilt angle and 6m distance from the wall with a 10° tilt angle respectively for surveying a vertical surface.

Keywords: UAV, Tilt angle, Altitude, Ground control points

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Challenges for Implementing an Integrated Environmental Management for Sustainable Development in Attanagalu Oya River Basin

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Attanagalu Oya River Basin can be recognized as an area with a number of environmental issues since the distant past. Such as environmental pollution, resource depletion, deforestation, disasters (floods and drought), land use and land cover changes, and geomorphological landform changes. The previous research that has been done regarding this area explained the weakness of the existing management strategies as the main reason for not managing this situation and importance of effective environmental management. The concept of integrated environmental management (IEM) is a new concept that can be used for an effective environmental management and sustainable development. This research is mainly based on secondary data that was obtained from research papers, reports, and institutional documents. To explore key challenges and solutions to establish an IEM framework in Attanagalu oya river basin a literature review was performed. The finding of the study was interpreted using analytical diagrams and flow charts. According to the findings, there are eight key challenges were identified. Such as [1] problems in identifying environmental legislation, [2] communication issues, [3] lack of awareness of cost-effective methods, [4] process disruption, [5] prevailing socio-economic and political climate, [6] challenges associated with population growth, [7] globalized environmental issues, and [8] achieving national sustainable development goals (NSDGs). Further, it investigates the appropriate solutions that were made in order to overcome those identified challenges. Rising the awareness, environmental education, enhancing communication through new technologies, Cost Benefit Analysis (CBA), Environmental Impact Assessment (EIA), conducting new research, increasing community-based responsibilities and solutions, and proper NSDGs achieving techniques were identified as solutions for those challenges. There are many challenges in establishing an IEM framework for this area. But it is possible to propose solutions for these challenges by examining the factors influencing the emergence of these challenges. This theoretical study will help to enhance the understanding of the challenges in implementing the IEM framework for sustainable development in the Attanagalu Oya River Basin Area. It will create a better pathway for sustainable development in the river basin.

Keywords: Environmental management, Sustainable development, Integrated environmental management, Environmental impact assessment, Cost benefit analysis

Addressing System and Geocoding Challenges in Sri Lanka: A Case Study of Dengue Incidence Mapping in Kandy Municipal Council Area

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The address system is a fundamental unit for development initiatives and service delivery. A systematic address system is essential for effective geocoding in Geographic Information System (GIS) which leads to better decision-making. The current address system of Sri Lanka has created many challenges for geocoding which is the process of converting addresses into geographic coordinate systems. This study discusses the challenges related to the present address system of Sri Lanka through an experimental study conducted through three scenarios. The dataset encompassed a record of 280 reported dengue cases within the administrative area of the Kandy municipal council. As the first scenario, unstructured addresses of dengue cases were plotted using the available tools of the QGIS software package. In the second scenario, the study arranged the available addresses in a logical order and processed the geocoding query using the same software package. In the third scenario, the researcher used focus group discussions to identify the locations of dengue cases. The identification of the correct location using these three scenarios was not feasible in a geocoding process of GIS. This situation was led by the unstructured addressing system of the country. The study proposes that it is necessary to develop a unique code to identify the exact point of an address in Sri Lanka, without relying on traditional address methods. The new addressing system can be facilitated by the available data collected for the Bimsavia land deed system.

Keywords: Address System, Dengue, Geocoding, GIS, Sri Lanka

Acknowledgement: To PHI officers of Kandy Municipal Council for their assistance in collecting and compiling the data that was necessary for this study.

Optimum Cycle Clusters to Create Net-zero Transport Sector within University of Peradeniya (UOP)

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Many green environments are affected by the use of motorized vehicles. Considering the University premises as a case study this research proposed a bicycle sharing system so as to reduce the carbon emission from the vehicles and to facilitate pedestrian commuting. In achieving this, the locations of the bicycle parking stations, and the number of bicycles needed at each parking station needed to be obtained while optimizing the available resources and minimizing the waiting of the users. The methodology for this research involves collecting data using Google Maps, and two GPS trajectory tracking applications. Multiple clustering algorithms were used to analyze GPS data to identify optimal parking stations for the bicycle sharing system. The data was used to develop a computer simulation model which simulates a bicycle sharing system. The model was designed to simulate various scenarios to minimize waiting for users and maximize bicycle utilization. The collected data, simulation results, and probability curves were analyzed using descriptive statistics and data visualization techniques. The research offered recommendations for the optimal number of parking stations and bicycles to be deployed in each parking station, considering the potential scalability of the system. In conclusion, this project showcases the successful integration of data collection, parameters, and analysis to optimize the bicycle sharing system. Through data-driven insights and heuristic guidance, the system achieves an efficient number of bicycle parking stations and bicycle allocation for each parking station, enhancing sustainability and user satisfaction.

Keywords: Bicycle sharing system, GPS trajectory analysis, Cluster analysis, Simulation model

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Numerical Investigation of Wind Interference Effects on Tall Buildings

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As structures grow taller, their response to wind becomes significantly more pronounced. A particularly noteworthy aspect to consider is the phenomenon of the "interfering effect." This effect, integral to wind engineering, materializes when an upstream structure alters the wind loading on a downstream building. The Computational Fluid Dynamics (CFD) simulation proves to be an effective tool in comprehending this phenomenon. Consequently, the principal objective of this study is to use CFD to qualitatively and quantitatively determine how an upstream building's configuration impacts a downstream building. First, the chosen building structure from the literature was modeled using CFD software. The accuracy of the findings was verified by comparing them with wind tunnel test results published for the same building. Within CFD simulations for wind analysis, three primary approaches are commonly employed: RANS, LES, and DNS. While DNS is acknowledged for its higher accuracy, it demands more computational power. On the other hand, RANS yields reasonably accurate results while utilizing fewer computational resources. Given the constraints of available computing facilities, this study employs the RANS approach to simulate turbulent flow. The validated CFD model was then employed to examine the interference effect on a principal square-shaped building resulting from an upstream building with varying shapes, orientations, and heights. This investigation predominantly focuses on assessing the impact of interfering effects by analyzing the base moment, base shear, and pressure fluctuation of the principal building. The CFD numerical simulations were conducted using the Midas NFX software. Noteworthy outcomes from the investigation's analysis of base moment and base shear underscore the imperative of accounting for a safety factor when designing building structures within urban environments to counter the effects of interference, specifically recommending a factor of 1.3 for worst-case scenarios. Furthermore, the study emphasizes the significance of meticulously designing the cladding system's connection to accommodate both compression and tension forces, as elucidated by the pressure fluctuation results. The discoveries presented in this paper will play a pivotal role in ensuring the stability and safety of building structures for wind load, particularly when these structures are developing within densely populated urban environments.

Keywords: CFD simulations, Interfering effect, Turbulence model, Wind response, Wind tunnel test

Development of an Electronic Differential Drive Platform for Off-Road Unmanned Vehicle Under Rapid Changing of Road Friction

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This research project represents the development of an electronic differential drive platform for off-road unmanned vehicles to improve their mobility under rapidly changing road friction conditions. The platform we have proposed utilises a Disturbance Observer (DOB) and a Reaction Torque Observer (RTOB) to deal with sudden and repeated changes in road friction and slope changes. To evaluate the effectiveness, we conducted simulations through MATLAB-Simulink and ROS-Gazebo. The Simulink simulation involved testing the wheels' speed changes on inclined and uneven surfaces. The ROS-Gazebo simulation provided a more realistic environment, creating off-road conditions. The ROS simulation involved navigating the robot through off-road terrain with varying friction conditions, and the same Simulink block diagram can be used in the ROS simulation. The ROS-Gazebo simulation made it easier to illustrate the effectiveness of the proposed platform in real-world situations. The DOB controller was employed to estimate and mitigate the disturbance caused by the changes in friction or slope by providing counteractive feedback response to those disturbances. The RTOB detected the resistance or torque encountered by the wheels. Its primary function was to monitor and estimate the reaction torque or rotational forces acting on the vehicle's wheels or drivetrain. Overall, the simulations in both Simulink and ROS-Gazebo demonstrated the effectiveness of these two controllers in maintaining stability and robust control while navigating uneven or challenging terrains. In summary, our research findings have the potential to enhance the sustainability of cities through the development of more robust and efficient unmanned vehicles for off-road applications.

Keywords: DOB, RTOB, ROS, Gazebo, Simulink

Acknowledgement: Dr. Maleen Jayasuriya, a temporary lecturer in the Department of Manufacturing and Industrial Engineering, is acknowledged for the invaluable support in ROS simulations.

Co-Composting of Sewage Sludge with Biochar as a Bulking Agent in Aerated Bin Composters

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Biochar is considered an effective bulking agent which enhances the compostability of sewage sludge. Many studies recommended that biochar is a good bulking agent for sewage sludge composting to improve the quality of the final product. The present work proposes forced aerated composting supported by co-digestion for improving the rate of composting. The proposed method introduced a bin composting system with a continuous temperature recording facility which was fabricated for the study. The impact of operating parameters such as aeration rate and the mass ratio of sewage sludge to biochar were studied. Nine composter bins were placed in a 3x3 matrix. Each bin were filled with sewage sludge, mixed with sawdust, and different amounts of wood biochar varying from 0 to 9% were added. The bins were supplied the continuous flow of air at rates of 0, 0.3 and 0.6 l/min/kg. Further, temperature sensing probes were inserted at the middle of every reactor and the temperature variation was intermittently measured for 7 weeks under 24/7 in each minute continuously. The results showed that the aeration rate and the particle size of biochar strongly influenced the temperature increase of the pile. The bin with 5% biochar and 0.3 l/min/kg air flow rate has recorded the highest temperature during the composting period and the appearance of the final product became closer to the commercially available compost products, which realizes the effectiveness of the proposed approach and methodology.

Keywords: Aerated bin composting, Aeration rate, Biochar, Co-Composting, Sewage sludge

Adaptive Reuse of Historical Buildings as A Sustainable Spatial Solution: A Case Study of Kandy Grid City, Sri Lanka

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The intertwining of historical significance, architectural heritage, and urban development presents a complex tapestry in the context of Kandy Grid City, Sri Lanka. This paper focuses on the imperative of adaptive reuse as a sustainable spatial solution within this historical urban fabric. The ever-growing need for modern amenities and the economic challenges underscore the urgency of a pragmatic approach that harmonizes preservation with progress. Kandy Grid City's distinctive character, embellished with world heritage buildings, is a poignant backdrop to explore adaptive reuse's potential. The research embarks on a comprehensive case study analysis, scrutinizing chosen historical buildings through architectural, economic, environmental, and cultural lenses. By unraveling the feasibility and implications of adaptive reuse, this study contributes insights applicable to the preservation of historical legacies while catering to contemporary demands. The study includes 110 historical buildings in the city of Kandy as primary data and value addition of the property and the space as a monetary comparative parameter. The paper engages with the discourse surrounding sustainable urban development, intertwining it with the intricacies of historical preservation. Drawing on primary and secondary research, the study aspires to highlight the symbiotic relationship between the city's heritage and its future. Findings indicate that 90 % of historical buildings can be preserved and turned into economic gainers with an adaptive reuse process. Moreover, it suggests an understanding of urban context and its strengths, a business plan for functional adaptation, and favorable spatial requirements to create a more sustainable urban environment.

Keywords: Adaptive reuse, Economic sustainability, Historical buildings, Kandy grid city, Urban economy

Assessing the Impact of Leaf Morphological Traits of Urban Green Infrastructure on Capturing Atmospheric PM10.5, PM2.5 and Carbon

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Incorporation of strategic green infrastructure to urban settings can efficiently clean the polluted atmosphere. Macro and micro morphological traits in leaves play an important role in immobilizing atmospheric PM and carbon. This study explores if there is a relationship between the selected morphological traits like; hairs, trichomes, epi-cuticular waxes, leaf texture and leaf size and the amount of PM and carbon accumulated in leaves. To understand this phenomenon in a tropical urban setting, 11 abundant street tree species; *Tectona grandis*, *Cassia fistula*, *Terminalia catappa*, *Polyalthia longifolia*, *Plumeria obtusa*, *Madhuca longifolia*, *Ficus benjamina* var. *benjamina*, *Mangifera indica*, *Pongamia pinnata*, *Ficus religiosa*, and *Acacia pycnantha* in Colombo, Sri Lanka were selected. PM10.5 and PM2.5 trapped on both surface and wax layer of leaves were measured using a gravimetric method. Carbon content of each species were estimated using an oven drying method. The leaf surface morphology was examined using the SEM (Scanning Electron Microscope). Standard MANOVA was followed to identify the relationship among the variables. An index for their relationship was built using Principal Component Analysis (PCA). The index showed that, *Madhuca longifolia* is the best species while *Pongamia pinnata* as the least able species to capture surface and in-wax PM10.5 and PM2.5. In conclusion, leaf size and leaf shape were the major determinants of capturing PM from the atmosphere. Although micro structures showed positive relationship it can be concluded that they are not crucial properties in immobilizing PM. In terms of carbon accumulation, *Polyalthia longifolia* showed highest percentage while *Tectona grandis* showed the least. All species showed significant difference among each other in sequestering carbon. Unlike PM when it comes to sequestering atmospheric carbon, morphological traits affect differently.

Keywords: Atmospheric PM10.5, Atmospheric PM2.5, Carbon content, Leaf Micro-morphological traits, SEM images

Acknowledgement: This study was financially supported by the Department of Zoology and Environmental Management, University of Kelaniya in the course of data collection and data analysis.

Reduced Graphene Oxide Counter Electrode for Dye Sensitized Solar Cells

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Dye sensitized solar cells (DSSCs) have received great attention due to their low manufacturing cost, simple fabrication technology and relatively high efficiency. In DSSCs, Platinum (Pt)-based electrodes have been widely employed as counter electrodes (CEs) due to their high conductivity, superior electrocatalytic activity and high chemical stability. However, its use for large-scale industrial production is limited due to high cost, limited availability, and corrosion in the electrolyte. Recently, carbon materials have emerged as promising candidates for CEs due to their availability and high conductivity. In this study, we designed and fabricated DSSCs using reduced Graphene Oxide (rGO) as CEs. Graphene Oxide (GO) films were fabricated on a stainless steel substrate by electrophoretic deposition (EPD) of an aqueous GO electrolyte. Reduced Graphene Oxide (rGO) electrode was prepared by thermal reduction of GO films. To study the effect of the thermal reduction temperature of rGO on the photovoltaic performance of DSSCs, a series of rGO films was fabricated by varying the reduction temperature of rGO. DSSCs with rGO CEs reduced at 300 °C showed the maximum power conversion efficiency of 2.29 %. The synthesized rGO films were characterized by Raman spectroscopy. The results suggest that, with further modifications, the synthesized rGO films can be used as substitutes for Pt as the CEs in DSSC applications.

Keywords: Dye sensitized solar cells (DSSCs), Electrophoretic deposition, Graphene Oxide, Raman spectroscopy, Reduced Graphene Oxide.

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A Comparative Assessment of Soil properties in *Pinus caribaea* Plantation and Semi-natural Montane Eco-system of Tropical Sri Lanka

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Inappropriate forestry practices have been identified as a foremost reason that prevents the soil from performing its services to society and ecosystems at a maximum. Certain species established under forestry practices cause severe soil degradation in natural ecosystems, particularly in tropical countries. Hence, this study was aimed at investigating the changes in soil properties caused by forest plantations with exotic species; *Pinus caribaea* in the tropical highlands of Sri Lanka, referring to the semi-natural forest ecosystems. Representative soil samples were collected randomly from established transects; 12 from *Pinus caribaea* plantations and 12 from semi-natural forests along the northwest altitudinal gradient in the Hantana Mountain range, at 15cm - 30 cm depth. Two vegetation types have been grown on the same soil type, Red Yellow Podzolic, and the transects were selected at the same altitude. Soil properties were analyzed by laboratory testing of collected samples. Compared to *Pinus caribaea* plantation, the mean soil organic matter content was comparatively greater in semi-natural forests, which was 8.11 % and 11.78 % respectively. Mean soil gravimetric moisture content was slightly higher in semi-natural forests (15.65%) compared to *Pinus caribaea* plantation (12.49%). There was no significant difference in mean soil porosity in each land-use type. It was 30.51% in *Pinus caribaea* plantation and 33.85% in semi-natural forests. Higher soil acidity was observed in *Pinus caribaea* plantation (mean pH-5.67) than in semi-natural forest (mean pH-6.29). Mean electrical conductivity of soil under two vegetation types did not show a significant difference. It was 13.68 ($\mu\text{S}/\text{cm}$) in *Pinus caribaea* plantation, and 15.36 ($\mu\text{S}/\text{cm}$) in semi-natural forests. This study reveals that organic matter content, pH and moisture retention in soil are comparatively different between *Pinus caribaea* plantations and semi-natural forests, which highlights the impact that species selection for reforestation programs could have on ecosystem services of a forest.

Keywords: *Pinus caribaea*, Semi-natural forests, Vegetation, Soil properties

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A Pathway for Industry 4.0 Implementation in a Lean Environment: With Special Reference to the Sri Lankan Apparel Sector

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The foundation of the fourth industrial revolution (I4.0) was built on several technological pillars that were established over the years. The adoption of these technologies by organizations is expected for them to benefit from I4.0. However, manufacturing organizations that have improved their operations through lean management philosophies need a clear roadmap to embrace the I4.0 technologies without disrupting the current business practices. In addition, to the extent we know, only a few studies in the literature empirically investigate how I4.0 can be implemented in a lean environment in a developing economy. Hence, the objective of this study is to devise a much-needed roadmap for implementing I4.0 technologies in a Lean environment. To achieve that, we conducted focused group interviews with ten respondents from four Sri Lankan apparel industries that have implemented I4.0 technologies in a lean environment. The collected data was analyzed through thematic analysis, allowing the identification of different themes. Our findings suggest that such a roadmap involves four steps: (1) setting a lean base, (2) strategic management, (3) human resource development, and (4) getting external support. We also found that higher implementation costs and resistance of the people are the major challenges in implementing I4.0 technologies in a Lean environment. Our recommendation for the organizations that have mastered Lean is to start their I4.0 journey by introducing a few technologies such as cloud computing, the Internet of Things, Automation, and Industrial Robotics. Since the implementation of I4.0 technologies in a lean environment is a relatively recent phenomenon, our study provides a better understanding of how lean manufacturing can support the implementation of I4.0 technologies, allowing companies undergoing I4.0 technology implementation to better manage their change process and prioritize their efforts and narrow their attention more objectively to the proper mix of technologies while moving towards the lean manufacturing.

Keywords: Lean manufacturing, Industry 4.0, Technology implementation roadmap, Apparel industry

Fabrication of Natural Dye-Sensitized Solar Cells Using Barbados Cherry Fruit and Purple Shamrock Leaves

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Dye-sensitized solar cells (DSSCs) have received a significant attraction due to their simple structure and low manufacturing cost. Generally, ruthenium-based compounds are used as the effective sensitizers in DSSCs due to their higher absorption and efficient metal-to-ligand charge transfer. However, ruthenium-based compounds are relatively expensive and rare. In recent years, natural dyes have gained attention due to non-toxicity, low cost, environmental friendliness, and availability. In this work, DSSCs were fabricated using natural dyes extracted from Barbados cherry fruit (*Malpighia emarginata*), and purple shamrock leaves (*Oxalis triangularis*). These extracted dyes were characterized by UV–VIS absorption spectra and FTIR spectroscopy. The photovoltaic parameters of the DSSC using Barbados cherry dye recorded with a power conversion efficiency of 0.936% along with an open circuit voltage (V_{OC}) of 429 mV, a short circuit current density (J_{SC}) of 4.258 mA cm⁻² and a fill factor of 0.512. DSSC using purple shamrock leaves recorded as 372 mV of V_{OC} , 1.624 mA cm⁻² of J_{SC} and a fill factor of 0.561 with a power conversion efficiency of 0.339%. A DSSC formed with a Ruthenium-based dye under the same conditions obtained 588 mV of V_{OC} , 20.120 mA cm⁻² of J_{SC} and 0.352 fill factor along with 4.162% power conversion efficiency. This research highlights the potential of natural dyes as viable alternatives to ruthenium-based dyes in DSSCs.

Keywords: Barbados cherry (*Malpighia emarginata*), Dye-sensitized solar cells, Purple shamrock (*Oxalis triangularis*)

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Analysis of Land Use Change in Trincomalee using NDVI and NDBI from 2013 to 2023

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Land use changes have a profound impact on both natural ecosystems and human settlements. As the world undergoes rapid urbanization and shifts in land management practices, monitoring and analysing these changes is vital. This study focuses on Trincomalee, a region in Sri Lanka that has experienced notable land use transformations due to various historical, geographical, and socio-economic factors. Remote sensing and GIS technology are effective tools for analysing changes in land use and cover at a spatial and temporal scale. To comprehensively analyse these changes, the study utilizes the Normalized Difference Vegetation Index (NDVI) and Normalized Difference Building Index (NDBI) from 2013 to 2023. The results reveal a significant expansion of built-up areas, totalling 324.11 km² (12%) by 2023, and a major change in forest cover area, with a degradation of 459.2 km² (17%) and an increase of 428.54 km² (16%) in grasslands. These changes have occurred in specific regions that have undergone substantial transformations. The study's findings have significant implications for urban planning, conservation, and sustainable land management. By understanding how these changes affect the environment, policymakers and stakeholders can address the challenges that come with urbanization while protecting essential ecosystems. The study's comprehensive methodology, which uses satellite imagery and NDVI and NDBI analysis, provides a strong foundation for future research aimed at addressing similar land use trends and their impacts.

Keywords: Land use change, NDVI, NDBI, Urbanization

Experimental Investigation on Porous Concrete for Sustainable Drainage Systems

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Urban flooding caused by unpredictable high-intensity rainstorm events due to insufficient drainage infrastructure has become a major problem nowadays. Urbanization and climate changes in urban cities have made drainage systems overflow, which results in urban floods. Introducing a sustainable urban drainage system is an effective solution to control urban floods. Furthermore, it will control downstream flooding and it will reduce the deterioration of river water quality. Porous concrete drainages can be a good alternative in urban areas as they can infiltrate excess runoff into the soil. In many countries, construction debris has become a severe environmental issue. So, it is an environmentally friendly approach to reuse or recycle construction wastes for the manufacturing of porous concrete. Porous concrete has already been used to create pavements, parking lots, cover slabs etc. However, limited studies have been conducted in investigating different mix designs for porous concrete and permeabilities. This study investigated the material and hydraulic properties of porous concrete with recycled aggregate based on eight mix designs. The first four mix designs involve variations in the weight of coarse aggregates with a size range of 12.5 - 25 mm without fine aggregate. The remaining three mix designs incorporate different ratios of fine aggregates at 10%, 20%, and 30%. The eighth mix design is constructed using recycled construction waste materials. When the coarse aggregate percentages changed from 15% to 75%, infiltration rates increased from 339.3 cm/hr to 1138 cm/hr per/hr and the seven-day compressive strength varied from 14.3 MPa to 12.1 MPa. When fine aggregates were introduced from 10% to 30%, the compressive strength increased from 16.5 MPa to 18.21 MPa and the infiltration rates decreased from 1524 cm/hr to 812.8 cm/hr. Test with construction waste yielded 16.28 MPa strength and 3550 cm/hr infiltration after 28 days showing its potential to be used in urban areas.

Keywords: Sustainable drainage systems, Porous concrete, Infiltration rate

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Kandy City Centre as a Public Space

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Kandy City Centre (KCC) is a modern commercial complex in Kandy, Sri Lanka. It is the only shopping complex in Kandy and an important public space in the city. This study discusses the significance of studying Kandy City Centre as a public space. This study develops around the two research questions: How Kandy City Centre has been developed as a situated space and lived space and how Kandy City Centre challenges the Kandyan landscape. A public space is a space that is open to and accessible to the public. A situated space is a space that is experienced and understood in a particular way by the people who use it. A lived space is a space that is shaped by the everyday practices of the people who use it. The conceptual framework is based on two approaches from study of Geographies of public space (2020): public space as assemblage and public space between inclusion and exclusion. Primary data was collected through interviews and observations of people who visited the Kandy City Centre. Secondary data was collected from research articles, web contents, books, and newspapers. Content analysis was used to analyze the qualitative data. In addition, Carl Sauer's morphological approach to landscape studies and James Duncan's "landscape as a text" concept were important in studying how KCC challenges the Kandyan landscape. Easily accessible location and assemblage of services were causes to KCC developed as lived and situated space. In addition, the KCC building exterior reflects Kandyan architecture, but the interior is modern. According to the findings, studying Kandy City Centre as a public space can provide valuable insights into the ways in which public spaces can be developed to be more inclusive and accessible to all.

Keywords: Exclusion, Inclusion, Lived space, Public space, Situated space

Correlation Between Literature and Experimental Findings - A Comparative Analysis of Mechanical Properties in Bamboo

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This study gives a detailed comparative investigation of bamboo's mechanical properties, analyzing the relationship between information acquired from the literature and experimental data. Bamboo, known for its ecological sustainability and mechanical adaptability, has acquired widespread acceptance in a variety of technical applications. The goal of this research is to analyze the coherence of existing literature data and contribute to a better understanding of the mechanical behavior of bamboo. A detailed literature review addresses the tensile strength, compressive strength, shear strength, flexural strength, and modulus of elasticity of bamboo. The study goes on to examine how characteristics like species, age, and moisture content affect bamboo's mechanical performance, identifying potential causes of variation under different situations. Empirical tests involve carefully testing *dendrocalamus giganteus* bamboo samples, which is found from Peradeniya university premises, using a Universal Testing Machine (UTM) for compressive, shear, and flexural tests. Moisture content is measured for each specimen, ensuring precise findings. Statistical analysis connects experimental results to literature data, revealing similarities and differences in diverse contexts. Analyzing the test results average density 796.67[576-1 100] kgm⁻³, compressive strength 49.875[29.33-108.2] MPa, flexural strength 60.01[40.05-99.74] MPa, and shear strength 9.53[7.39-29.12] MPa were calculated and compared with the literature (Literature results are shown inside the brackets). The findings of the study shed light on the veracity of current literature data on bamboo's mechanical properties and improve understanding of bamboo's mechanical behavior. This study supports in making informed decisions about using bamboo in engineering applications, while also supporting sustainable and ecologically sensitive practices. The combination of scientific findings and empirical assessments leads to a full understanding of bamboo's mechanical properties, providing useful insights for future research and application.

Keywords: Bamboo, Mechanical properties, Comparative analysis, Experimental findings, Sustainable engineering.

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A Multi-scale Risk Assessment of Social Vulnerability to Flood Hazard Based on the Lower Catchment Area of the Aththanagalla River Basin, Sri Lanka

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Flood is the most frequent and destructive disaster in Sri Lanka. Most of the people's lives and property are affected by the flood drastically and have seen significant growth of vulnerability in recent decades. The social vulnerability of the flood is vital however most responsible institutions consider the physical impact of them. Therefore investigating the social vulnerability to flood hazards is significant to realize the root causes of social vulnerability and achieve efficient preparedness, response, and recovery. The study's primary aim is to create a Multi-Facet Social Vulnerability Index to assess social vulnerability to flood inundation. The assessment is based on selected 6 local administrative units in the Gampaha District and covered 56 flood-affected households through a survey. The different vulnerability indexes on 5 main components including social-demographic, physical, financial, health, and social connectedness relate to social capital factors and considered 34 variables under the key components. Furthermore, the study applied the AHP weight method to compare the survey data highlighting the preciousness of this assessment. The results demonstrate households in rural areas are significantly vulnerable to inundation among financial vulnerability critically impacts their livelihood. Moreover, all administrative units have the same effect on the physical vulnerability index. Social connectedness related to social capital is crucial in all HHs of urban areas. The study combined vulnerability maps to imply the index results that are significant to efficient and speedy recovery. The study is worth reducing the impact of the flood on people and their property furthermore building up the sustainable city and society of future Sri Lanka.

Keywords: Flood, Social vulnerability, Multi-facet composite social vulnerability index, Vulnerability mapping

Determination of Unreachable Cracks on Concrete Structures and Plasters Utilizing an Unmanned Aerial Vehicle

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Concrete structures and plasters are exposed to the formation of cracks over time. If they are not properly treated, the existence, safety, and durability of the concrete structures will be affected. However, conventional techniques like crack meters, joint meters, visual inspection, etc. are not appropriate since they take a long time, and lots of effort, and can be risky when used to find cracks in locations that are difficult to access. To circumvent the limitations of manual methods and visual examination, Unmanned Aerial Vehicle (UAV) technology has recently been deployed to crack evaluation. This paper presents a complete method for identifying the locations of cracks and their length, width, and permeability in an unreachable place of concrete structures and plasters using a Three-dimensional (3D) model. The primary data was gathered by field observations conducted in the front part of a single building with three walls. Grid coordinates for the Ground Control Points (GCP) were measured by classic methods (Total Station and Levelling). For inspections of cracks, UAVs offer a low-cost, open-source, and customizable technique. The Mavic 2 enterprise dual was utilized for data collection. To generate a 3D model, all the images were processed through Pix4D Mapper software. Furthermore, evaluation of the findings, grid coordinates, manual tape measurements, and pixel inspector were used. In this study, many cracks were detected and from them, a serious crack was identified with 87 cm length and 5 cm width which needed immediate action. The depth of some two cracks was obtained by closely inspecting the 3D model. The findings and evaluations indicated that the presented methodology facilitates the precise identification of cracks accurately even in an unreachable place.

Keywords: Crack, Unmanned aerial vehicle, Pix4D, Pixel inspector

Acknowledgement: The authors pay their sincere appreciation to the Faculty of Built Environment and Spatial Sciences of General Sir John Kotelawala Defence University for the support provided for the successful completion of the study.

Analyzing the Changes of Shoreline Morphology: Cases in Western Coast of Sri Lanka

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The shoreline has emerged as a highly critical linear feature, due to its morphological shifts. Therefore, continues monitoring the changes of shoreline is a subject of great concern in recent years. Coastal erosion in western coast of Sri Lanka has endured as a long-standing issue. This research aimed to examine the shifts in shoreline positions and their impact on shoreline dynamics between 2012/13 and 2021. The study involved a comparative analysis of NEM and SWM in 2012/13 and 2021, focusing specifically on the Kapungoda and Mount Lavinia areas, known for their wider beaches and minimal engineering interventions. The Digital Shoreline Analysis System (DSAS) tool in ArcGIS was employed to calculate the net shoreline movement (NSM) and end point rate (EPR) using WorldView-2 satellite images with a resolution of 70 cm. Both cases reveal positive NSM and EPR accretion in both periods. Kapungoda exhibits NEM averages of NSM 11.16 m and 1.4 m/yr EPR and SWM averages of 7.4 m NSM and 0.93 m/yr EPR. The maximum positive shoreline changes (MPSC) during NEM and maximum negative shoreline changes (MNSC) during SWM, positioned southerly and northerly of the breakwater respectively, in Kapungoda. The Mount Lavinia beach indicates NEM averages of NSM 11.08 m and 1.24 m/yr EPR and SWM averages of 5.52 m NSM and 0.61 m/yr EPR. Further, a substantial increase in erosion and accretion is apparent during SWM in 2021. Particularly MPSC in 2013 and 2021 in both seasons and MNSC in NEM can be observed in north and MNSC in SWM have found in south of the headland. However, it is possible that the break water constructed in Kapungoda and beach nourishment, taken place in Mount Lavinia, might be influenced significantly on such pattern of shoreline changes. Finally, despite the positive NSM along with average EPR accretion in both locations, significant level of accretion could be identified in Kapungoda. While, Mount Lavinia has some potential for erosion in some places. Therefore continues shoreline monitoring is imperative to identify real trend of shoreline changes in these locations.

Keywords: Shoreline changes, Erosion, DSAS, Beach nourishment, Western coast

Acknowledgement: Financial assistance from the University Research Grant (Grant No. URG/2022/20/A) is acknowledged.

Lessons from the Roman Architect Vitruvius to Overcome Urban Development Failures in Sri Lanka

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At present 56% of the world population is living in urban settings and the number is expected to double by 2050. In Sri Lanka, postwar development has brought rapid transformation. A main focus of scholarship on recent urban development is the negative impact of accelerated development due to ignorance, lack of reason, foresight, scale in planning, political interference and erratic decision-making. These have resulted in environmental, economic and public health problems in cities such as Hambantota, Colombo, Kandy, Nuwara Eliya, and Negombo in spite of the presence of ancient and modern wisdom, both Sri Lankan and western. *De Architectura*, the work by the Roman architect Marcus Vitruvius Pollio (1st century BCE-1st Century ACE) is a practical guide to architecture and the architect from the principle (*ratio*) of *firmitas* (durability), *utilitas* (usefulness), and *venustas* (beauty). Scholarship acknowledges the practical usefulness of Vitruvius' work to civil engineering today. The objective of this study is to use the urban development project in Hambantota, Sri Lanka, as a case study to highlight the contemporary value of Vitruvius' wisdom. Through a close reading of the relevant sections of *De Architectura*, the study reinforces the applicability of Vitruvius's wisdom to the Hambantota Urban Development Project (2005-2030). It reveals that useful, beautiful, sustainable structures and cities are necessary for private and public use, that they are self-sufficient and sustainable because the architect is guided by reason, knowledge, and training to follow the fundamental principles of architecture based on theory and practice. The study concludes that the wisdom of Vitruvius may have prevented the initial failures of the ongoing Hambantota Urban Development Project traceable to lack of knowledge, and ignorant, illogical planning and design. Therefore, the study recommends Vitruvius as an invaluable guide to political, social and economic success in current and future urban development undertakings.

Keywords: Urban development, Architecture, Urban planning, Vitruvius

Developing 3D Modeling for a Virtual Patient Simulator for Skill Training in Dental Patient Assessment

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Patient assessment is an essential basic skill that needs to be developed by a dental student. With the issues faced during the pandemic, the trend is to develop more innovative, learner-centered approaches to provide such skills. Traditional dental training, rooted in hands-on patient experience and physical models, has limitations such as limited exposure to diverse dental issues and potential real-world consequences from mistakes. In contrast, our 3D virtual patient simulator offers diverse clinical scenarios and safety from real-world mistakes. Although virtual simulation is a possible option, 3D modeling to simulate different clinical presentations is challenging as well as could be costly. The goal of this project is to propose an affordable, and realistic approach in developing a 3D virtual patient simulator with the use of Unity game engine and Blender. The Unity game engine was used to add interactivity, and Blender was used for exact 3D modeling. A comprehensive 3D dental clinic model was developed which allows students to switch from an extraoral to an intraoral perspective, simulating real-world dental examination. Furthermore, to enhance the authenticity, various dental instruments were incorporated thoroughly designed in Blender to replicate their real-world counterparts. The application is also equipped with different investigations including radiographs corresponding to different clinical cases. In the next phase, the system will be designed to work with haptic technology, transitioning the simulator to a Virtual Reality (VR) environment enabling students to gain tangible feedback. Evaluation metrics have been integrated to grade students based on their interaction within the application. Preliminary results show that the 3D modeling used offer an affordable, and realistic approach to develop a virtual patient simulator which could facilitate in bridging the gaps in current dental training methods, with the potential of providing a cost-effective and realistic training platform. The introduction of such technologies in the dental education sector could revolutionize the learning experience and better equipped students for real-world practices.

Keywords: Dental training, 3D Modelling, Virtual patient simulator, Learner centered approach

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An Analysis of the Greek-Egyptian Memorandum of Understanding (MoU) 2022 – A Reminiscence of Ancient Bilateral Relations and the Imperatives of Modern Cooperation

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Greece and Egypt signed a Memorandum of Understanding (MoU) on Cooperation in the Fields of Aeronautics and Maritime Search & Rescue in November 2022, at Cairo. The aim of the Memorandum of Understanding (MoU) is to establish a collaborative framework between authorities in Egypt and Greece. The agreement further delves into implementing finance policies and mechanisms to develop technical cooperation between both countries. The significance lies in the continuation of bilateral agreements signed specifically between Greece and Egypt exclusive from the other countries in the Mediterranean basin. The terms in the agreement stress on the diversity of foreign relations between Greece and Egypt in the political, economic, security, and military fields while recalling the ancient ties between the two countries that go back to the ancient prehistoric ages of the Minoan periods and how they developed to extended foreign relations during the 5th century BCE of Greece. Thereby, the research mainly follows an analytical approach under the qualitative methodology and use a historical method to collect data to examine the development of ancient ties between Greece and Egypt using available historical literary and archaeological evidence. The Mediterranean basin consists of many countries that have developed foreign affairs on different levels throughout the years. The bilateral relations between Greece and Egypt stand out from other Mediterranean countries, as throughout history they have remained loyal to each other due to mutually beneficial factors, irrespective of the cultural development of both countries. The history of Greece and Egypt reveals many instances where they have extended their relations in times of need. This research delves into the implications of the memorandum on the diplomatic ties of the two nations, its effects on the security dynamics in the Mediterranean region, and any broader regional or international consequences resulting from this MoU.

Keywords: Egypt, Foreign relations, Greece, Historical ties, MoU 2022.

Community-Centric Design of Flood Evacuation Route Suggestion Engine for Rathnapura District, Sri Lanka

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Hydrometeorological hazards have claimed many lives and destroyed assets and livelihoods in Sri Lanka. Amid such disasters, the lack of situational awareness exacerbates the damage inflicted. Civilian evacuation, coordination of rescue operations and medical services, planning supply chains, and ameliorating the living standards of evacuees require situational awareness to effectively minimize further damages to society. This study develops a conceptual framework that can be deployed as a web application that suggests the shortest route avoiding flood-prone roads, with simplified versions for general users and full functionality to create situational awareness. The district of Rathnapura was selected based on several factors such as the socio-economic conditions of urbanization and the population density, and the mode of flood occurrence frequency in Sri Lanka during the period of 2009-2018. Data was sourced from the Disaster Management Centre (DMC) of Sri Lanka which included soil profiles, land use/land cover, slope, and rainfall. These were used as parameters for flood susceptibility analysis along with topographic data. Historic flood data records from DMC were also used in identifying inundation patterns of past floods through SAR-enabled satellite imagery. Finally, the Dijkstra's algorithm was used to suggest the optimum route from point A to B, factoring in areas prone to flooding. OpenStreetMap API was used as the base for this engine, with emergency evacuation centres in Rathnapura. This was developed as a web application, which is currently deployed on a local server with improvements underway to better serve the public and authorities. As a Decision Support System, it will help civilians to evacuate to the nearest shelter circumventing roads inaccessible due to flooding, and help authorities coordinate their operations in rescuing stranded civilians using multiple transportation modes.

Keywords: Disaster resilience, Evacuation, Flood susceptibility analysis, Route suggestion, Situational awareness

A Call for Strengthening Environmental Laws to Re-envision a Circular Economy in the Coastal Built Environment of Sri Lanka

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Sri Lanka, with a coastline of 1620 km, is home to numerous natural resources and important habitats across its coastal belt. It has achieved significant development and urbanisation in the recent past, especially due to the outward focused trade policies of the country. One outcome of such developments is the emergence of a circular economy in these areas, which is crucial in protecting the coastal environment while achieving sustainable economic growth. In light of that, the present study critically analyses the existing Sri Lankan legal frameworks and policies on environmental protection, interrogating their strength to address rampant environmental concerns in the coastal environment such as climate change and sea-bed pollution. It also intends to analyse the role such laws could play in assisting the process of transitioning into circular economic policies in the production and consumption sectors of the Sri Lankan coastal built environment. After conducting 3 semi-structured interviews with academics/researchers in the fields of environmental law and circular economy, and reviewing the related legal and policy frameworks, independent reports, case laws and news bulletins, the researcher has found that the policies surrounding the coastal environment remain legally unenforceable which can be resolved by merging them with the environmental law jurisdiction of Sri Lanka. However, it argues, *inter alia*, the absence of constitutional guarantees for a clean and healthy environment, procedural drawbacks, delays of adjudication, disequilibrium of the functions of judiciary and executive may either prevent or hinder the outcomes of such a merger. Further study suggests that new avenues of adjudication should be promoted through judicial activism. Furthermore, advocating public participation in safeguarding the coastal environment through public interest litigation demands attention, while incorporating international legal standards to the domestic system. Therefore, the study concludes that a robust legal framework on environmental law will assist in the process of transitioning to a circular economy ecosystem in the coastal environment of Sri Lanka.

Keywords: Sri Lanka, Environmental law, Coastal built environment, Public interest litigation, Circular economy ecosystems, Sustainable architecture

Compressive Strength Estimation of Ultra-High Performance Fiber Reinforced Concrete (UHPFRC) for Retrofitting of Reinforced Concrete Elements

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Over the years, concrete structures have played a pivotal role in shaping urban landscapes. However, one critical concern in recent times is that most concrete structures may undergo premature deterioration as a combined effect of significantly increased live loads and aggressive environmental conditions. As the traditional and primal method of demolishing and rebuilding structures is detrimental to the environment and a massively expensive process, the introduction and implementation of innovative and cost-effective methods are required to extend the service life of reinforced concrete structures. Ultra-high Performance Fiber Reinforced Concrete (UHPFRC) has been identified as one of the most promising retrofitting materials due to its remarkable mechanical properties, low permeability, and durability. Selecting the optimum mix design is a pivotal factor in conducting effective retrofitting of concrete structures. Given the inherent complexity of UHPFRC due to the involvement of numerous constituents, comprehending the influence of each parameter on the compressive strength of the material is essential. Therefore, in this research, a comprehensive sensitivity analysis was conducted to investigate the key influential parameters of the compressive strength of UHPFRC. A database comprising 200 datasets from previous experiments was developed and the Random Forest Regression technique was selected as a suitable machine learning approach to predict the compressive strength of different UHPFRC mixes. Performance evaluation was carried out using three statistical parameters: determination coefficient (R^2), Mean Square Error (MSE), and Mean Absolute Error (MAE). R^2 , MSE, and MAE for the model were calculated as 97.90, 7.13, and 0.866, respectively. The results of the sensitivity analysis highlighted that the water-to-binder ratio was the most influencing parameter to the compressive strength of UHPFRC. Superplasticizers, supplementary cementitious materials, cement, and fiber volume also showed high feature importance values while fiber type, fillers, and aspect ratio were found to have comparatively lower influence on compressive strength.

Keywords: UHPFRC, Compressive strength, Sensitivity analysis, Random forest regression

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Present and Future of the Northern Muslim and Tamil Returnees in Post-war Sri Lanka

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The main objective of this study is to examine the status of the livelihood of the returnees who were once forcefully evicted from their ancestral homes in the Northern Province. This research is predominantly a qualitative study based on both primary and secondary data. The data collection consists of two stages. In the first stage, a thorough review of the literature is done in order to understand the background of the research problem. In the second stage, data is collected from IDP returnees through a purposive sampling technique. Semi-Structured interviews and focused group discussions have been conducted to collect data. To accommodate different aspects of the lives of the IDP returnees, data is collected from samples. One sample consists of Muslim returnees living in the Moor Street North (J/87) GN division in the Jaffna province while the other sample consists of the Tamil returnees living in Myliddythurai North (J/251). The questions are aimed at exploring the main reasons for their decision to return to their ancestral homes and exploring the challenges they face as IDP returnees. As far as the findings are concerned, both Muslim and Tamil returnees continue to face challenges in terms of finding equal opportunities as IDP returnees. However, while the Muslim returnees have a positive opinion of their return to their ancestral hometowns, people in Myliddythurai hold a negative perspective. For instance, most of the respondents mentioned that they often or frequently face discrimination or challenges in finding work as a returnee. Furthermore, they do not believe that the country has made significant progress in promoting the quality of life of the returnees.

Keywords: IDP returnees, Civil conflict, Economic stability, Discrimination, Sri Lanka

Infrared Image-Based Condition Assessment of Lightning Surge Arresters

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Lightning surge arresters are key components for protection and reliability of power systems. During service, surge arresters are aged by deteriorating their properties. It is important to monitor conditions periodically in order to avoid failures and damages in the power apparatus. A surge arrester consisting of arrester material (ZnO) housed by insulation (silicone rubber/porcelain) is usually exposed to electro-environmental stresses. Therefore, the condition of internal arrester material cannot be assessed directly. However, with aging, leakage current inside the arrester increases resulting increasing in temperature. This study proposes an online based condition monitoring method for surge arresters by statistical analysis and thermal image processing of infrared images captured from energized 33 kV lightning surge arresters which are used in distribution network of Sri Lanka and validation by FEM based modeling. Samples of (20) 33 kV silicon rubber insulated ZnO surge arresters with service years from 0-20 years were selected for the study from Peradeniya area having high keraunic level in Sri Lanka. Recommended Thermal imager is used for capturing. Temperature profiles and statistical information (central tendency, box plot, violin plot) of the arresters were obtained by thermal image processing methods. The results of the above observations were compared with the built model from COMSOL Multiphysics software. COMSOL model is validated to obtain any defects within surge arrester. Different kind of surface defects were observed from the visual scrutiny and captured images. Relationships between age, defects and analyzed parameters including the effect of sun irradiation for measurements is determined. As the result, physical properties of surge arrester that will affect the temperature variations were identified under different conditions.

Keywords: 33 kV surge arresters, Thermal imaging, FEM, COMSOL

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The Importance of Implication of Right to Culture in Right to Environment: An avenue leading to Environmental Sustainability

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Culture encompasses social behaviours, values, knowledge, laws, customs, capabilities, and attitudes in human societies. Environment can be defined as the set of conditions that surrounds us at a given point of time and place. Environment constitutes interacting systems of physical, biological and cultural elements. Although the definition of the environment contains a cultural element, in everyday understanding, environment is referred to as the biological environment that surrounds us. Referring to the same by ‘right to environment’ in this paper, the author aspires to affirm the nexus that exists between right to natural environment and culture. This linkage can be categorized in three ways according to Jon Hawkes. Firstly, the culture shall be considered to be created by the environment. Culture is built based on where and in which conditions humans live. For instance, in island countries, fishing is a significant way of livelihood and culture where ocean forms a part of the people’s everyday life. Secondly, culture shall be considered a part of our environment. The environment we live in is just more than trees, rivers and valleys but includes memories from the past, attitudes, ancestral stories and much more that make us all humans. The third connection is where culture affects the environment. The environmental destructions are cultural challenges as much as they are environmental, social and economic; through which we land upon the idea of sustainability. No amount of laws work effectively to safeguard the environment, unless there is a culture that engages all its citizens being guardians of nature. Therefore, destruction of the environment is necessarily a violation of right to culture. Thereby, the author argues, the incorporation of environmental rights into the regime of right to culture leads a path towards sustainability, since an anthropocentric and inherent cultural sense in humans can enhance environmental protection.

Keywords: Culture, Environment, Sustainability, Human rights, Environmental laws

Post-War Urban Development in Jaffna Municipal Council Area

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The city of Jaffna is the main administrative and commercial centre of the Northern Province of Sri Lanka. The recent urban development in Jaffna city is often regarded as a reflection of the end of the civil war. Due to the three decades of war, the infrastructure was severely damaged. After the official end of the civil war in 2009, social and economic infrastructure needed to be reconstructed and developed in the war-affected areas of Sri Lanka since they had been grievously affected by the 30 years of civil war. Therefore, the Sri Lankan government had paid great attention to fulfilling this task in the Northern Province with the help of foreign governments and institutions. Many of the projects were connected to the overall national development program as well. The immediate areas of focus included roads, agriculture and irrigation, power and energy, and livelihood support in the region. This study was mainly based on a qualitative methodology consisting of field discussions. Under that, both primary and secondary data were used. Primary data were collected through field discussions with the public and the Urban Development Authority Director. Jaffna city is linked to the capital and other parts of Sri Lanka by the narrow roads of A-9 and A-32, a single railway line called the North Line, sea routes that are based at KKS port, and air lines that function based in Palaly domestic airport. The opening of the Kandy-Jaffna Road (A9-Road) had a significant impact on the availability of materials and development activities. After the reopening of the A9 Road, lots of development took place in the Jaffna Municipal Council area, such as education, healthcare, commercial and other transportations like railways.

Keywords: Post-war, Urbanization, Urban development, Development projects.



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Field Evaluation of a Biofertilizer Targeting to Reduce TSP Application in Paddy Cultivation

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Sustainable solutions to reduce dependence on chemical fertilizer imports is a current need for Sri Lanka. A study was conducted to evaluate the effect of a phosphate solubilizing bacteria (PSB) based biofertilizer targeting paddy cultivation in the Dry and Intermediate Zones of Sri Lanka under farmer's field conditions. Triple super phosphate (TSP) was used as the P fertilizer at the rate recommended (55 kg/ha) by the Department of agriculture (TSP_{100%}), at 75% or 66% of the recommended rate (TSP_{75%} and TSP_{66%}, respectively) together with PSB. Field studies were conducted in three consecutive *Maha* seasons (2020/21, 2021/22 and 2022/23) in different farm fields spread in the Dry and Intermediate Zones of Sri Lanka. Soils collected before establishing the crop and at harvesting stage were subjected to characterization. Abundance of PSB in the plant rhizosphere was determined at panicle initiation stage. Rice yield and yield components, and grain P levels were determined at harvest. Mehlich-3 extractable P content was ranged from 0.6 to 34 mg/kg. Abundance of PSB in the rice rhizosphere was significantly higher when PSB was applied with TSP compared to TSP_{100%}. Applying a PSB with reduced TSP fertilizer resulted in significantly higher yields compared to TSP_{100%} during *Maha* 2020/21 and *Maha* 2021/22 (average increase of 15% and 13%, respectively). Significantly high P concentration and P uptake in grains was observed under the TSP_{66%}+PSB treatment indicating improved P nutrition. The findings support the effectiveness of the PSB-based biofertilizers as a sustainable supplement to reduce TSP application by 25 to 33% in irrigated paddy cultivation without compromising the yield.

Keywords: Dry and intermediate zones, Phosphate solubilizing bacteria, Rice,

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Coconut Water-Based Isotonic Beverage Development and Physicochemical Evaluation

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During exercises, athletes expend considerable energy, electrolytes, and water through sweat resulting in their performance reduction. Water, carbohydrates, and electrolytes that have been lost can be restored with the aid of an appropriate beverage. To suit this requirement isotonic sports beverage has occupied a significant role in sports nutrition through its primary attribute being rehydration. The objective of this research is to develop new isotonic beverage formulations that are economically and commercially viable by using natural ingredients that are underutilized. Two natural formulas based on coconut water were developed, one with bee honey and another with artificial sweetener in combination with other ingredients. Through a series of trials for osmolality and sensory evaluation, derived final samples were examined for mineral content and physicochemical properties. Final formulas were in the required ranges of osmolality and sodium content as per the international guidelines (osmolality between 270-330 mOsmol/kg, sodium levels between 460-1,150 mg/L, and at least 75% of its calories from carbohydrates). Natural formula with artificial sweetener and natural formula with bee honey were detected an osmolality of 317±1, 305±1 (mOsmol/kg) respectively. Sodium, potassium, magnesium and calcium contents were 723.7±14.8: 715.5±43.5, 633.3±11.6: 740.0±0, 39.0±5.3: 37.8±6.9, 213.5±8.0: 189.9±3.8 (mg/L) and pH, Brix (B°), color (PCU), titratable acidity (%) were 2.4±0.0: 2.6±0.0, 5.1±0.0: 5.0±0.1, 413.0±15.3: 356.0±20.8, 6.0±0.0: 6.0±0.0 and significant different ($\alpha<0.05$): no significant different ($\alpha>0.05$) observed among treatments at each sensory test for the natural formula with artificial sweetener and natural formula with bee honey respectively. All data were analysed using SPSS software. As conclusions, developed formulas adhere to the requirements of an isotonic beverage and there is a high potential to use coconut water and bee honey in Sri Lanka, as rich mineral and energy sources to formulate isotonic beverages.

Keywords: Dehydration, Electrolytes, Energy, Underutilized

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Bioassay to Detect the Allelopathic Effects of a Concentration Gradient of Plant Extracts of Some Forest Pioneer Species

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Reforestation programmes are currently being organized worldwide as a remedy to mitigate climate change effects, and to enhance biodiversity and ecosystem processes. Selection of appropriate plant species for restoration programmes is thus a national need. *Bauhinia racemosa*, *Cassia fistula*, *Macaranga peltata* and *Tamarindus indica* are among the plant species that are commonly used in reforestation programs in Sri Lanka. The present study aims to detect seed germination and their initial growth under increased concentrations of different plant extracts of above four species based on *Brassica juncea* (L.) Czern. (Mustard – E.) seed germination bioassay. Germination of Mustard seeds and their initial growth in 0% (distilled water- control experiment) and in 1%, 5% and 10% aqueous extracts of healthy intact leaves, fallen senesced leaves and roots of above four species were examined ($n=5$, 20 mustard seeds per replicate) in completely randomized experimental design over 14 days. Of the examined species, senesced leaf and root extracts of *C. fistula* significantly retarded the germination of Mustard seeds ($P=0.002$, $P<0.004$ respectively) compared to the control experiment. Also, live leaf extracts of *M. peltata* retard the seed germination but only at $\alpha = 0.1$ significance level. However, 10% senesced leaf extract of *B. racemosa* ($P=0.007$) and *T. indica* ($P=0.047$), and live leaf extract of *T. indica* ($P=0.028$) significantly enhanced seed germination. Further, the senesced leaf extracts of *C. fistula* significantly retarded the growth of the radicle of Mustard seeds ($P<0.001$) but the rest of the species tended to enhance the hypocotyle or radicle growth to varying levels, especially at high (10%) concentrations of plant extracts. These imply that *C. fistula* could adversely affect the seed germination and early seedling growth of other species and therefore it is better to avoid planting the species in high densities, during restoration programmes. Further, live leaves of *M. peltata* should not be used as mulches if enhancing natural regeneration of other species is a restoration objective. However, further experiments are required to reveal the impact of these species on other native plant species under field conditions.

Keywords: Bioassay, Hypocotyle growth, Radicle growth, Reforestation, Seed germination

Isolation of Microorganisms with the Potential of Degrading Polythene

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Polythene is an ethylene polymer used to make bags, food containers, and textiles. Polythene can take 12 - 32 years to break down, producing toxic chemicals in the soil. When burned, this polymer releases toxic fumes and pollutes the air. This study aimed to isolate a microorganism that can degrade polythene. Degraded polythene that was buried under the soil was collected. A microbial suspension was prepared by soaking them in sterile saline. A tenfold dilution series in sterile saline was prepared using this suspension. From the suspensions, 10^{-4} and 10^{-5} , were inoculated on Sabouraud agar, Mac Conkey agar, and Blood agar using the spread plate method. The plates were incubated at 27 °C and 37 °C for 24 h. Eighteen Organisms responsible for morphologically different colonies were isolated and microbial suspensions were prepared using each organism in sterile brain heart infusion broth. New polythene pieces were cut, sterilized, and selected based on weight. A polythene piece was introduced to each bottle of suspension and the bottles were incubated at 27 °C and 37 °C with a control (pure broth and polythene piece). After 3 months, the final weight of the polythene pieces was measured after washing the remaining piece with soap and water to remove contaminants. Finally, the percentages of degraded amounts of polythene were calculated. To identify the organisms, Gram staining and oxidase test was performed. The weight reduction at 27 °C by two-Gram positive bacilli was 0.0925% and 0.3828%, and at 37 °C, 2.2658% and 0.6409%. The Gram-negative bacilli which showed the highest weight reduction, 3.0114% at 27 °C and 4.1632% at 37 °C was identified as *Pseudomonas aeruginosa*. Therefore, *Pseudomonas aeruginosa* has the ability to degrade polythene.

Keywords: Polythene, Degradation, *Pseudomonas aeruginosa*

The Effect of pH and Initial Concentration on the Degradation Kinetics of Glyphosate in Biotic and Abiotic waters

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Glyphosate is one of the most commonly used herbicides globally. Microorganisms degrade Glyphosate into small molecules during its biodegradation. Biodegradation lowers its toxicity and reduces persistence in aquatic environments. The degradation kinetics of a pollutant is an important factor influencing its environmental fate. Therefore, in this study, the degradation kinetics of Glyphosate in waters was evaluated with respect to the zeroth and first-order models. Deionized water and well water samples were buffered to prepare abiotic and biotic waters at pH 4.5, 7.0 and 8.5, respectively, to cover the typical pH range of inland waters in Sri Lanka. pH-modified well water samples were separately spiked at 2, 10, and 100 mg L⁻¹ with Glyphosate reference standard and glyphosate-based formulation. In low spiked levels in well water samples, the rates of degradation are given by the first-order rate constants with the same order of magnitude for both reference standard and commercial formulation. However, the 50% (DT 50) and the 90% (DT 90) degradation kinetics of formulation are comparatively higher than that of the reference standard. Although the microbial composition of the identical biotic well water samples is supposed to be constant; different microbial reactions may take place depending on the concentration. Therefore, different rate constants may be observed. Further, in the absence of microbes, significantly lower degradation rates were observed in the control study and all spiked levels followed the zeroth order. Moreover, the degradation of Glyphosate in water is independent of the pH in both abiotic and biotic waters. Further, the degradation rate depends on the initial concentration of Glyphosate in higher concentrations with no impact of the inert surfactant. However, the DT 50 and DT 90 are affected by the inert surfactant.

Keywords: Biodegradation, Glyphosate, Kinetics, Microorganisms, Pollutant

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Morphological Characterization of Prioritized Weed Species at Seedling Stage in Export-ready Coir Samples

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Novel weed introductions have raised with the increased movements of goods and people. Hence, it is essential to detect and prevent the movement of weeds across borders. In Sri Lanka, the National Plant Quarantine Service (NPQS) is the main body that is responsible for regulate the movement of invasive weeds. Coir is one of the largest export commodities in Sri Lanka. Many countries are importing coir as a potting medium for soilless cultivation; thus, the free of certain weed species is a main concern. The NPQS uses grow-out tests for 21 days to check the presence of weed seeds in export-ready coir samples. However, the current practice is inadequate to accurately identify the weed contaminants. Therefore, rejection of coir consignments due to the presence of unconcerned weed species is a problem leading to a considerable economic loss. Seedling Identification Guides (SIG) are useful to identify key morphological characters at the seedling stage for some species and enable species identification. Thus, the main objective of the present study was to prepare a SIG for weed species [*Crotalaria juncea* L., *Mimosa pudica* L., *Mimosa pigra* L., *Leucaena leucocephala* (Lam.) de Wit, *Lantana camera* L., *Convolvulus arvensis* L., and *Rumex* sp.] frequently found in coir samples. Five seeds from each species were planted in four-inch-diameter plastic pots and kept in a contained space to prevent accidental weed escape. Fifteen morphological characteristics were recorded until true leaves arose. Among the observed characters, shape of the cotyledons and true leaves, and leaf texture were the most useful. *Mimosa pigra* and *M. pudica* can be distinguished by their cotyledon shape, leaf apex, and leaf base. Cotyledon shape, leaf apex, and leaf base are useful characters for distinguishing *C. arvensis* and *Rumex* sp. For quick and reliable identification, we recommend a suitable molecular approach.

Keywords: Seedling guide, Weeds, Coir, Morphological identification

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Enhancement of Cold-pressed Thymoquinone Extraction from Black Seed (*Nigella sativa L.*) using Freeze-thaw Pretreatment

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Quality attributes of the black seed oil depend on various extraction methods. Conventional methods, including cold pressing, provide high quality oil but low in yield and reduced bioactive compound content. To address this, the use of innovative seed pre-treatment procedures has been investigated in order to improve oil extraction efficiency, oil yield, and bioactive compounds recovery. Thymoquinone is the main active compound extract of black seed oil which has antioxidant, anti-diabetic, anti-inflammatory, anti-cancer, anti-viral and anti-microbial properties due to its phenolic compounds. In this study, freeze-thaw pre-treatment was employed on black seeds prior to extracting oil through the cold pressing method, with the primary goal of increasing the thymoquinone content. Black seed samples were subjected to freeze at -17 °C 24 hours and thaw at 50 °C hot water bath for 1 hour and the process was repeated for 1, 2, and 3 cycles at the same temperature and times. The subsequent oil extraction was carried out using the cold-pressing technique. The study encompassed the assessment of thymoquinone content, quantification of the extract yield, and the undertaking of physical and chemical evaluations on the obtained oil. Thymoquinone content in the black seed oil was determined using UV-Visible spectroscopy and this value (1.46%) from 3 cycles freeze-thaw seeds were stated as 73.81% increased than untreated black seeds (0.84%). Other quality parameters, including moisture content, specific gravity, acid value, peroxide value, and iodine value, exhibited comparable properties between untreated and freeze-thaw pre-treated black seed oil ($p < 0.05$). Based on the analysis of thymoquinone content, black seed oil yield, and other related metrics, the 3-cycle freeze-thaw pretreatment emerged as the optimal method for enhancing cold-pressed thymoquinone content in black seed oil.

Keywords: Black seed oil, Cold pressing, Extraction, Freeze-thaw, Thymoquinone

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Monitoring Regional Differences in Forest Cover Changes in Sri Lanka

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Forests play a vital role in the ecosystem services provisions. There is a substantial loss in forest cover. In this context, the main objective of this study is to monitor the forest cover changes in Sri Lanka from 2001 to 2021 using remote sensing data. This forest data has been developed using the Landsat data at a 30-meter spatial resolution, which was published by Hansen et al (2013). Using JavaScript API, Those data have been analyzed through Google Earth Engine (GEE). The forest area and non-forest area of Sri Lanka were identified at the initial stage of the analysis. Subsequently, forest loss and gain which were identified from 2001 to 2021 through the transition from forest to non-forest and non-forest to forest were detected using GEE and GIS software packages. The results revealed a rapid loss in forest cover occurred during the period of postwar in the country (after 2009), driven by developmental activities in various sectors. Meanwhile, the highest forest loss was identified in 2016, which could be associated with policy changes following the establishment of a new government in 2015. The emergence of COVID-19 has slowed down deforestation during the pandemic period, the year 2019, which is connected to the decline in economic growth. According to the district-level analysis, the districts with the highest forest loss are located in the dry zone—Mullativu, Monaragala, Ampara, Polonnaruwa, Trincomalee, and Vavuniya. Those regions are widely known for their extensive utilization of agricultural land while experiencing limited growth in terms of economic development. In contrast, urban areas like Colombo, Gampaha, and Kaluthara showed low levels of forest loss as they have very little forest cover. The results highlight the urgency of protecting the forest ecosystem and the policy implementation necessity for sustainable forest management for the country.

Keywords: Forest loss, Sri Lanka, Remote sensing, Sustainable development, Forest management

Bioactivity Prediction of Phytochemicals Against Aminoglycoside Resistance Using QSAR Modelling

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Aminoglycoside (AG) resistance in bacteria is an international crisis that is estimated to have 10 million infections annually by the year 2050. With the widespread of multidrug resistance bacteria, AGs are becoming useless along with the novel drugs. Many studies have determined that the fastest route to identify treatment for AG resistance is restoring the effectiveness of existing AGs by combining them with compounds with antimicrobial properties. The main purpose of this study was to identify such compounds by predicting their bioactivity against the AG resistance in bacteria using a Quantitative Structure Activity Relationship (QSAR) model. Bioactivity data of 24 AGs and 2000 phytochemicals were retrieved from ChEMBL site. Several software was used: QSARINS; to build the model, PaDEL- Descriptor for the generation of molecular descriptors. The best QSAR model obtained using Genetic Algorithm (GA) with correlation coefficient (R^2) of 0.6969 and root mean-squared error (RMSE) of 0.7795. Based on that model, the QSAR equation used to predict the pIC50 values of the phytochemicals can be given as: $pIC50 = -27.7308 + [50.8350 * (AATS5p)] + [-14.7553 * (GATS5e)] + [3.8896 * (\text{minssCH}_2)] + [-1.5777 * (\text{maxwHBA})]$. Total 14 phytochemicals had predicted bioactivity against AG resistance. They are Alpha-pinene, Miltefosine, Tilarginine, Kojic acid, Isoniazid, Gallic acid, Deacetylasperuloside, Citrifolinin B, 4-Aminobenzamidine, 2-(dodecylamino)butan-1-ol, 2-Diisopropylamino-Ethanol, 2-Diisopropylamino-Ethanol, and 1-ethyl-3-pyridin-2-ylurea. As many of them are known for their antimicrobial activity against different species, they can be considered in combining with AGs to increase the antibiotic effect. With the developed model, a large volume of phytochemicals can be screened prior to the laboratory experiments and reduce the sample number, resources, cost and time taken.

Keywords: Aminoglycosides, Antibiotic resistance, QSAR, Ligand based, Drug discovery

Development of a Fish Powder Incorporated Instant Noodles

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Instant noodles are consumed worldwide, but instant noodles are often unhealthy. Therefore, aim of this study was to produce a healthy instant noodle by the incorporation of fish powder as a protein, vitamin and mineral source and evaluate the effects of the physicochemical and sensory properties of the noodles. Instant noodles were produced with wheat flour incorporated with fish powder from four fish species; Indian anchovy (*Stolephorus indicus*), kelee shad (*Hilsa kelee*), milk shark (*Rhizoprionodon acutus*) and titan triggerfish (*Balistoides viridescens*) in proportions of 0, 10, 15 and 20%. Cooking qualities (optimum cooking time, cook loss, cooking yield, swelling index and water absorption index) among fish powder incorporated noodles were not significantly ($P < 0.05$) different, hence 15% fish powder incorporated formulations were selected based on cost factors and nutritional quality, for textural (hardness, adhesiveness, elastic recovery and firmness) analysis, colour analysis and for conducting the final sensory evaluation. Among the four type of 15% fish powder fortified instant noodles, titan triggerfish and milk shark fish powder incorporated instant noodles are the best-formulated noodles in this study, owing to its highest consumer preference in sensory evaluation hedonic test. The fortification of noodles with fish powder improved the protein, ash, and energy contents significantly. But the type of fish powder used does not affect the cooking or textural parameters of the end products. Milk shark fish powder (15%) incorporated into noodles has a protein content of 26.10%, while sea chicken fish powder (15%) incorporated into noodles has a protein content of 27.40%. Thus, fish powder added to instant noodles has the potential to be a technological advancement for the food sector to produce instant noodles that are nutritionally enhanced. Further it can be utilized to overcome protein and energy malnutrition among people.

Keywords: Fish powder, Fortification, Instant noodles, Sensory evaluation

Development of a Non-Dairy Mix Fruit Incorporated Ice Cream

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In recent decades, there has been a significantly growing consumer demand for plant-based dairy alternatives due to milk allergies and an increasing interest in sustainable and cruelty-free food products. As a result, the trend of maximizing credentials in non-dairy ice cream has increased. But lower palatability is a major problem of non-dairy ice cream. This study was carried out to develop a non-dairy ice cream by incorporating coconut cream and fresh fruit pulp with higher sensory attributes. Ice cream mixes were prepared by adding fresh fruit pulp, including mango, banana, and pineapple, in equal weights. Three formulations were developed by adding fruit pulp and coconut cream in different percentages of final weight as 0%, 60%, and 75 % fruit pulp and 85%, 25%, and 10% of coconut cream, respectively while the rest were sugar, stabilizers and emulsifiers. The prepared products were subjected to physicochemical (melting point, pH, titratable acidity, fat, protein, fiber, and moisture content), microbial and sensory analyses. The results showed that the fat contents of ice cream samples were reduced according to the decreasing order of coconut cream but the fiber contents were increased with the increment of fruit pulp. Negative results were obtained for *E. coli* and Coliform, which meet SLS 223 specifications for ice cream. The seven-point hedonic test was conducted for the sensory evaluation of developed ice cream and the Friedman test revealed that ($P < 0.05$) all sensory attributes were significantly different. There were 6.2 pH value, 0.2% titratable acidity, and 66% overrun values for ice cream, which had higher sensory attributes. Ice cream with 25% coconut cream and 60% fruit pulp was selected as the most acceptable formulation (1.43% protein, 1.57% fiber, 5.67% fat content, 0.2%) and which can fulfill the market demand for non-dairy ice cream with desired sensory and functional properties.

Keywords: Non-dairy, Ice cream, Coconut cream, Fruit pulp

Development of Biodegradable Packaging with Antimicrobial Properties for Fresh Fruits, from Banana Pseudo-Stem Pulp and *Vateria copallifera* Bark Extract

(*Vateria copallifera*) Bark Extract

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In Sri Lanka, annually, 30–40% of fruits and vegetables are lost as post-harvest losses, causing a loss of approximately LKR 20 billion to the economy. Among potential causes of spoilage, microbial deterioration remains a primary reason. Therefore, this study aimed to develop biodegradable food packaging with antimicrobial properties against fruit spoilage microorganisms to extend the shelf-life of perishable fruits using banana pseudo-stem pulp and *Vateria copallifera* stem bark extract. The base packaging material was developed using the banana pseudo-stem pulp obtained via a soda-pulping process, and the *V. copallifera* stem bark extract was coated onto the base packaging material. *V. copallifera* bark extraction process was optimized using distilled water, 70% acetone, 99.9% acetone, 70% ethanol, and 96% ethanol. The antimicrobial activity of *V. copallifera* extract was screened using the agar-well diffusion method against *Staphylococcus aureus*, *Streptococcus pyogenes*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Penicillium* sp., and *Aspergillus* sp. The bacterial strains that showed significantly visible inhibition zones were used to determine the Minimum Inhibitory Concentration (MIC). The biodegradability and practical applicability of the wrapping material were also measured using physical parameters. Based on availability and extraction efficiency, 96% ethanol was selected as the solvent of extraction for the final extraction process. From tested microorganisms, only *Staphylococcus aureus*, *Streptococcus pyogenes*, and *Penicillium* sp. showed visible inhibition zone diameters of 18 ± 0.8 mm, 20 ± 0.5 mm, and 15 ± 0.6 mm, respectively. The MIC values for *S. aureus* and *S. pyogenes* were determined to be 0.25 mg/mL and 0.125 mg/mL, respectively. Only 5g of dry pulp demonstrated its required flexibility to effectively cover fruits and was biodegraded within 3–4 weeks under normal atmospheric conditions. The results indicate that the formulated packaging material has promising potential to be an effective antimicrobial and biodegradable packaging, primarily against Gram-positive bacteria and certain fungi.

Keywords: Antimicrobial, Biodegradable, Fruit wrapping, Packaging, Sustainable

Spiking Neuron Architecture for Inference

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The Artificial Neural Networks (ANN) require a large number of nodes to achieve a certain level of accuracy for many applications. As the number of nodes grows, the power demand will increase exponentially. Hence, researchers are increasingly focused on creating technologies that can harness the power-efficiency of the human brain for artificial intelligence applications. Spiking Neuron Networks (SNN) is one such promising approach that aims to replicate the event-driven information processing of biological neuron networks. In this study, we successfully replicated the decision-making accuracy of ANN inference by implementing an equivalent SNN using Izhikevich neurons. In our approach, we first choose an ANN that produces acceptable results and then construct the same network using Izekevich excitatory neurons. We import the weights calculated in ANN into the SNN. The power benefit of the SNN stems from the fact that only the signals corresponding to the spiking neurons need to be propagated, while in an ANN, all signals at all nodes have to be computed. To showcase our approach, we constructed a 3-layer ANN with 100 nodes. We then used a set of images to evaluate the accuracy of an SNN. The SNN network is able to produce 92% accuracy, whereas ANN accuracy is 94%. However, on average, 18% of neurons show spikes, which is a significant reduction in processing and then power consumption. For the implementation of the SNN, we utilized Xilinx's PYNQ FPGA (Field Programmable Gate Array) board, with the prime focus of extending the method to energy-critical remote applications. This method provides a way to harness the efficiency of the spiking neurons. We demonstrated that the event-driven nature of spiking neurons significantly reduced the number of calculations required while still achieving comparable results.

Keywords: Spiking Neuron Network (SNN), Artificial Neuron Network (ANN), FPGA, Power Efficiency, Event-Driven Computing

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Higher Filter Performance of Burned Coconut Shells Filter Media

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Filtration is one of the essential unit process of water and wastewater treatment in which energy and water are used for backwashing to ensure continuous operation. Silica sand has traditionally been used as the filter medium for rapid gravity filtration. It was the predominant filter media due to its wide availability, low cost, and the large amount of information and experience concerning its use. Many research are being conducted with the aim of energy-efficient filtration since it is crucial as a remedy for the overuse of energy and backwash water in rapid sand filtration. This study focused on introducing burned coconut shells (BCS) as the filter media for rapid gravity filtration in mono-media and dual-media configurations. The research was conducted on a pilot scale filter column facilitated with air and water backwash for testing the filter performance of the BCS filter media, sand, and anthracite and the result was compared. BCS filter media of 1.0 mm effective size and uniformity coefficient of 1.5 were tested. Clarified water with a turbidity of nearly 4.0 NTU was used as the filter inlet. The flow rate was set to 2.0 l/min to create an 8 m/h surface loading. The result showed that water filtered through the BCS media satisfied the drinking water quality standard, SLS 614(2013). The average filter run time in mono-media setup was almost similar (55 hours) for all media types. In dual-media setup, BCS showed a higher filter run value of 95 hours. Water saving of about 2.0% from the total production was observed in the sand and BCS dual-media setup compared to the sand in mono media configuration. This study revealed that the BCS filter media can be used in rapid gravity filtration with higher water production (98.8 %) by only consuming 1.2 % for backwashing.

Keywords: Burnt Coconut Shells filter media; Filter Performance; Filter Run Time; Rapid Gravity Filtration; Anthracite

Innovative Head Cap Inserting Machine for the Toothbrush industry's Efficient and Sustainable Production

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The plastic manufacturing industry is continuously seeking new technologies due to the potential increase in demand for new products that are to be produced on a single production line while reducing model changeover time and improving product quality. In mass volume production, improvement of the cap inserting machine systems becomes a favorable way to reduce the unit cost of production in an effective and sustainable manner. This may significantly reduce cost, manufacturing lead-time, increase flexibility, and usually be economically modified for use on another product. A cap inserting system consists of standard components that can be used to satisfy different fixing requirements. These fixtures are reusable, and this enhances their flexibility and reduces the time and cost of development. It also offers the benefit of eliminating the need for dedicated tooling facilities and their associated storage and floor space, rapid response to engineering and production changes, system expandability, and considerable reduction in setup time. This research presents a novel cap inserting system for toothbrush manufacturing in the plastic industry. The developed system has been successfully validated using several plastic manufacturing such as hot stamping. The developed system can be further expanded to the fully automated system. A programmable logic controller was used to control the cylinders and other components. The machine was modelled and simulated using SolidWorks software and found to be functionally accurate. As a continued study, a prototype machine is built and tested for functionality and kinematics.

Keywords: Semi-automated system, Toothbrush cap inserting, Mass-volume production, Lead time

Investigation of the Role of Oxygen in Close-Spaced Sublimated CdS Layer for Enhancing the Efficiency of CdS/CdTe Thin Film Solar Cells

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As an alternative to silicon solar cells, polycrystalline thin-film heterojunction solar cells stand out due to their promising efficiencies and low manufacturing cost. In CdS/CdTe thin film solar cells, cadmium telluride (CdTe) is employed as the absorber material and cadmium sulfide (CdS) is used as the window material. In this work, the close-spaced sublimation (CSS) method was used to deposit a CdS window layer. We have conducted a comprehensive study of oxygen incorporation into the CSS CdS window layer to enhance the efficiency of CSS CdS/CdTe thin film solar cells. UV-visible spectroscopy was used for the optical characterization of the CdS layer, and a solar simulator was employed to study the current-voltage characteristics of the CSS CdS/CdTe solar cell. The optimum bandgap of 2.44 eV was obtained for the CdS films incorporating 20% O₂ with Ar ambient and the films thicknesses were maintained around 220 nm. Bandgap values tend to increase with the increase in O₂ concentration. Also, according to the SEM and EDX analysis, 20% O₂ concentration revealed the highest oxygen incorporation with a denser microstructure. Oxygen diffusion into the CdS crystal structure is expected to substantially affect the films' crystallite size, lattice strain, and dislocation densities. The highest average efficiency of 13.8% with an open-circuit voltage (V_{OC}) of 717 mV, a short circuit current (J_{SC}) of 34 mA/cm², and a fill factor (FF) of 52% was obtained for the dot cells with an area of 0.12 cm², comprising CSS-deposited CdS layer incorporating 20% of oxygen under the AM 1.5 illumination.

Keywords: CdS window layer, CdS/CdTe solar cell, Close-spaced sublimation, O₂ incorporation.

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Synergistic Synthesis and Multifunctional Applications of Fe₃O₄/Graphene Oxide Nanohybrids

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The synthesis and characterization of Fe₃O₄/Graphene Oxide (GO) nanohybrids have attracted considerable attention due to their synergistic properties and versatile applications. This study focuses on their synergistic synthesis and characterization to unlock their potential in various technological realms. Combining Fe₃O₄/GO nanohybrids, merge Fe₃O₄'s magnetism with GO's unique attributes is highly promising for multifaceted applications. This work explores their synthesis, characterization, and implications in scientific and technological domains. Graphene oxide was synthesized using a modified Hummers method involving graphite flakes and reagents such as H₂SO₄, KMnO₄, H₂O₂, and HCl. This process exfoliated graphitic layers and introduced oxygen functional groups, enhancing hydrophilicity, and reactivity. Co-precipitation attached Fe₃O₄ nanoparticles to GO sheets, strategically combining Fe₃O₄'s magnetism and GO's properties for multifunctional applications. FTIR analysis unveiled distinct spectral peaks corresponding to functional groups in Fe₃O₄ and GO, providing insights into integration and chemical interactions. SEM highlighted the wrinkled sheet-like morphology of graphene oxide. The co-precipitation process successfully integrated Fe₃O₄ nanoparticles onto GO sheets, creating a structurally distinct Fe₃O₄/GO nanohybrid. FTIR analysis offered valuable information about the nanohybrid's composition and chemical bonding. Fe₃O₄'s magnetism synergized with GO's exceptional attributes, rendering the nanohybrid suitable for diverse applications. Potential applications include targeted drug delivery, catalysis, environmental remediation, and advanced sensing, benefiting from Fe₃O₄'s magnetic response and GO's diverse functionalities. The synthesis and characterization of Fe₃O₄/GO nanohybrids introduce a versatile platform with applications spanning multiple domains. This study highlights the importance of rational material design in developing multifunctional materials with the potential to revolutionize cutting-edge applications. As the demand grows for high-performance materials with diverse capabilities, Fe₃O₄/GO nanohybrids emerge as strong candidates poised to contribute across interdisciplinary fields significantly. Their synergistic attributes position these nanohybrids to tackle evolving challenges across industries and scientific pursuits.

Keywords: Nanohybrids, Fe₃O₄, Graphene-Oxide, Synergistic-Properties.

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Impact of Bath Temperature on Optical and Morphological Properties of Chemical Bath Deposited CuO thin films

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CuO thin films were deposited onto glass substrates using the chemical bath deposition technique (CBD) by varying the temperature of the solution. The chemical bath technique possesses outstanding advantages like relatively low-temperature growth conditions (<100 °C), low cost, and scalability in the deposition. Morphological and optical properties of the synthesized CuO films were studied as a function of the chemical bath solution temperature. Scanning electron microscopy (SEM) and UV-vis spectroscopy were used to study the morphological and optical properties of the films, respectively. SEM analysis revealed the formation of nano-sheet-like structures at all bath temperatures investigated. The film surface was found to be uniform, and the average nanosheet thickness was found to increase with solution temperature up to a temperature of 85 °C, before it decreased at 90 °C. The lowest bandgap value, 1.32 eV, was reported for the bath temperature at 90 °C.

Keywords: CuO thin films, Chemical bath deposition, Temperature variation

Effect of Incorporation of Graphene to the Electrolyte on the Performance of Quasi-Solid-State Dye-Sensitized Solar Cells

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This study investigated the use of graphene as a performance enhancer of the electrolyte for dye-sensitized solar cells (DSSC). The electrolyte is a major component that affects the performance of a DSSC, as it can govern both the efficiency and the stability of the solar cell. A gel polymer electrolyte, which shows higher long-term stability while maintaining comparable efficiency, is developed in this study. In this research, a small percentage of graphene is added to an electrolyte containing ethylene carbonate, propylene carbonate, polyethylene oxide, 4-tertbutylpyridine, lithium iodide, tetra-hexyl-ammonium iodide, 1-methyl-3-propyl imidazolium iodide and iodine. The conductivity of the electrolyte and the efficiency of the solar cell are studied. The electrolyte containing 1% graphene mass fraction with respect to polymer demonstrated a higher conductivity of 0.511 mS cm^{-1} at 30 °C. A quasi-solid state DSSCs constructed using 6-layered TiO₂ photoelectrodes and Pt counter electrodes exhibited a power conversion efficiency (PCE) of 5.83%, which is 4.3% higher than the control cell. This observation can be attributed to the higher conductivity of the graphene-added electrolyte since graphene may assist charge transportation through the electrolyte.

Keywords: Gel polymer electrolytes, Graphene, High-efficiency DSSCs, Ionic conductivity

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Review Paper: Chitin and Chitosan: Versatile Polymers for Sustainable Applications

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This review delves into the extensive potential of chitin and its derivative, chitosan, as sustainable materials with diverse applications across industries. Chitin, the second most abundant biodegradable polymer in nature, boasts exceptional chemical and biological properties that have garnered attention for industrial and biomedical use. The review underscores the sustainability of chitin extraction, particularly from discarded marine food production waste like crustacean shells, presenting a green and eco-friendly alternative. Enzymatic extraction methods emerge as environmentally conscious approaches for chitin recovery. These sustainable materials find applications in various sectors, ranging from food, agriculture, and biomedicine to cosmetics and environmental solutions. Biotechnological production methods, including enzymatic and fermentation processes, further contribute to greener alternatives and innovative applications. Chitosan, derived from chitin through deacetylation, possesses distinct properties that make it a valuable commodity across industries. Chemical and enzymatic deacetylation methods provide tailored chitosan products for specific applications, enhancing their versatility. The biological properties of chitin and chitosan encompass a wide spectrum, from anti-cancer and antimicrobial effects to wound healing, drug delivery, and environmental solutions. Their renewable nature positions them as eco-friendly solutions for various industries. The review also highlights the antioxidant potential of chitosan, particularly its role in combating oxidative stress-related diseases. Factors influencing its antioxidant capacity, such as degree of deacetylation and molecular weight, are explored alongside mechanisms for enhancement. In conclusion, the remarkable properties and versatile applications of chitin and chitosan hold immense promise for sustainability across diverse industries. The use of these biodegradable materials not only addresses environmental concerns but also offers innovative solutions for numerous challenges faced by modern society.

Keywords: Chitin, Chitosan, Sustainable materials, Biomedical applications, Enzymatic extraction, Antioxidant potential

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Synthesis and Gelation of β -Cyclodextrin Inclusion based Supramolecular Network for Controlled Drug Delivery

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β -Cyclodextrin (β -CD) inclusion based supramolecular networks exhibit interesting properties which make them potential candidates in novel drug delivery applications. This research focused on the synthesis and characterization of two building blocks, namely, BB1 and BB2 to construct a novel supramolecular network with the intention of developing an efficient multi-responsive novel hydrogel for controlled drug delivery. BB1, poly (β -cyclodextrin-co-citric acid), and BB2, citric acid ester of phenyl-monocapped PEG-4000 were synthesized using modified literature procedures and characterized using UV-visible, Fourier transform infrared spectroscopy and high performance liquid chromatography. After studying the supramolecular network formation between BB1 and BB2 in phosphate buffered saline pH 7.4 and aqueous media, using UV-visible spectroscopy, supramolecular hydrogel formation study was performed using a vial inversion test. UV-visible analysis of a mixture of BB1 and BB2 demonstrated an enhancement of absorbance with respect to the UV-visible absorbance of each individual building block. This observation indicates the supramolecular network formation between building blocks via inclusion between β -CD of BB1 and phenyl groups of BB2. Vial inversion test indicates the sol-gel transition of the BB1-BB2 supramolecular network to a hydrogel. In conclusion, the supramolecular network of BB1 and BB2 undergo gelation. These research findings could support further optimization and characterization of the hydrogel to obtain a biomaterial with optimal rheological properties for drug delivery applications.

Keywords: β -Cyclodextrin, citric acid, hydrogels, polyethylene glycol, supramolecular polymers

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Determination of the Solute Descriptors for Eugenol Acetate by Gas Chromatography and Liquid-Liquid Partition Systems

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Eugenol acetate is a naturally occurring phytochemical compound found in a wide variety of plants including Cinnamon. The pleasant aroma makes it useful in the cosmetic and food industries as a fragrance and as a food flavoring agent. Furthermore, it is useful as an antioxidant and anti-inflammatory agent in the traditional medicine. It is important to determine the toxicological and environmental properties considering its uses. The conventional methods to determine these properties are costly and time consuming. Instead the Abrahams solvation parameter model which is based on the quantitative structure-property relationships can be used. This theory can be summarized with the following equations. $\log SP = c + eE + sS + aA + bB + IL$ for transfers from gas phase to a condensed phase, and $\log SP = c + eE + sS + aA + bB + vV$ for transfers between two condensed phases. Here, SP is a solute property. The simple letters are system constants and the capital letters are solute descriptors. Here V is the Characteristic volume descriptor, and E is the Excess molar refraction descriptor. L is the Gas-Hexadecane Partition coefficient. S is the Dipolarity/polarizability descriptor and A and B are, the Hydrogen bonding descriptors. The retention factor values of solutes in chromatographic methods and equilibrium constants in partition systems can be used as solute properties to determine descriptor values. In this research, the descriptor values of Eugenol acetate were determined using gas chromatography. Seven stationary phases with different polarities were used to obtain standard retention factor values at different temperatures. Also partition coefficient values in eleven organic biphasic systems were determined. The obtained standard retention factor values and the partition coefficient values were used to determine descriptor values using the Solver algorithm in MS excel® with minimum standard deviation. The determined descriptor values for Eugenol acetate are, E= 0.9161, S = 1.3293, A = 0.000, L= 6.3943, B= 0.7928 and V= 1.6519 respectively with a 0.064 standard deviation.

Keywords: Eugenol acetate, Descriptors, Solvation parameter model, Gas chromatography

Acknowledgement: National Research Council Grant (20-086) is acknowledged.

Formulation of Slow-Releasing NPK Hybrid Nano-Fertilizer using Eppawala Apatite, Partially Burnt Rice Husk and Dried Banana Peels

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A major source of soil resources that promotes plant growth and production is fertilizer. There is currently a desire for environmentally friendly synthetic materials that minimize nutrient leaching and release plant nutrients under control. Major aim of this research was to propose slow-releasing hybrid nano fertilizer (HNF) by using natural resources chemically modified as a value- added product, that are Eppawala apatite, a rich source of phosphate, partially burnt rice husk (PBRH), and dried banana peels. Apatite were transformed into urea modified hydroxyapatite (HA) nanoparticles using hydrothermal method, and major nitrogen (N) source is urea. These nanoparticles were loaded into the pores of PBRH which is a highly porous material that was prepared by pyrolyzing rice husk, to increase the slow- releasing efficiency of the proposed fertilizer. To increase the amount of potassium (K), dried banana peels were used. Different characteristic techniques were used including powder X-ray diffraction (PXRD), Fourier transform infrared (FTIR), and scanning electron microscopy (SEM). SEM images confirmed the nanoparticles were loaded into the pores of PBRH and the hydrogen bonding interactions of HA nanoparticles clearly defined by the FTIR spectrums while PXRD patterns indicate the formation of crystalline HA. Release behaviors were studied of the fertilizer in soil with a pH value of 6.36 and in deionized water for 20 days and nutrient uptake by plants, pot plant experiments were conducted for 7 days with the control experiment by applying the same amount of dosage. The NPK levels were determined using Kjeldahl method, UV-Visible spectrometry by vanadomolybdate method, and Flame atomic absorption spectroscopy (FAAS). Final fertilizer complex contains NPK levels of 29.68%, 31.20%, and 31.46% respectively while PBRH contains 1.132% of K. A significant increment in NPK levels confirm that the synthesized HNF has the slow release potential for NPK levels compared to the control fertilizer.

Keywords: Eppawala apatite, Rice husk, Slow-release, Nano fertilizer

One-pot Multicomponent Synthesis of Indole-derived Fluorometric Chemosensor for Detection of Fe³⁺ Ions in Aqueous Media

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Ferric, one of the vital trace metal ions in biological systems, is essential to the metabolism of living organisms. Thus, there is much interest in biological and environmental concerns for an easy and rapid approach to detecting Fe³⁺. A one-pot multicomponent conventional synthesis with hydrated ferric chloride as the catalyst and benzaldehyde, indole, and 4-nitroaniline as the reactants, a simple indole-derived fluorometric "TURN-OFF" chemosensor was obtained in 62 % yield to detect the Fe³⁺ ion. The synthesized ligand was characterized by FT-IR spectroscopy and the major absorption bands of the FT-IR spectrum were positioned at 3360, 2962, 1585, 1455, 1311, 1259, 796, 742, and 696 cm⁻¹. Furthermore, the melting point of the product was in the temperature range of 155 - 157 °C. The indole-derived product exhibited fluorescence-quenched "Switch-OFF" chemosensor activity at 355 nm via paramagnetic fluorescence quenching because non-radiative quenching is a common method for paramagnetic metal ions like Fe³⁺ to deactivate the excited state. The indole-derived fluorometric chemosensor and Fe³⁺ ion were shown to have a linear relationship, with an acceptable limit of detection for Fe³⁺ of 5.28×10^{-6} M. Other interfering ions, including, Fe²⁺, Cd²⁺, Cu²⁺, Co²⁺, Zn²⁺, Ag⁺, Ni²⁺, Na⁺, and K⁺ show either no change in the fluorescence intensity of the indole-derived ligand or a very slight difference in intensity in the presence of Fe³⁺ ions. Furthermore, this study adds to the evidence supporting the importance of multicomponent reactions that have the potential to synthesis of fluorescence chemosensors for the sensitive and selective detection of biologically significant metal ions. Thus, the one-pot multicomponent synthesis with the prominent fluorescence performance of the indole-derived ligand would make it an efficient and convenient Fe³⁺ fluorometric probe.

Keywords: Fluorometric chemosensor, TURN-OFF, Indole derivatives, Multicomponent reactions, One-pot synthesis

Develop a Garment Compatible Hydrophobic and Oleophobic Coating Through the Activation Process of PECVD Using C-Zero Chemistry

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Garment compatible functional surfaces have a higher demand in the textile industry due to many applications. However, the development of a fluorocarbon-free functional surface with oleophobic properties is difficult to obtain compared to the hydrophobic properties. Generally, an economically viable, simple and efficient process is essential for large-scale production of garment compatible oleophobic coatings. In this study, first nylon fabric surfaces were activated using the PECVD (plasma enhanced chemical vapor deposition) method before the silicon coating process. A low viscous silicon polymer was used as the durable adhesive material and low surface energy substrate. The two kinds of particles such as SiO₂ and ZnO were used in two different size ranges to create nano roughness thin coating on the fabric surface. The surface and cross-sectional images of SEM showed the effect of activation on changing the fiber structure and deposition of particles on the silicon-coated fabric respectively. The concentration of 3% w/w SiO₂ and ZnO coated fabric sample was obtained the maximum oil droplet remaining time for the kaydol liquid. However, the prepared surface only exhibited hydrophobic properties with oleophilic properties resulting in average water contact angle larger than 120° with 68.325° of average kaydol contact angle. The aesthetic appearance of prepared surfaces was similar to the original nylon fabric. Moreover, the prepared surface had a negligible effect on changing the tensile strength value compared to the original fabric.

Keywords: Fluorocarbon-free, Oleophobic, Hydrophobic, PECVD, Silicon, Kaydol

A Stable Isotope and Chemometric Framework for Non-targeted Detection of Adulterations in Milk

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Dairy is the most important subsector in the livestock industry in Sri Lanka due to the growing demand for fresh milk and its potential influence on the rural economy. Adulteration of milk reduces its quality and may introduce hazardous substances into the dairy supply chain jeopardizing consumers' health. The present study used stable isotopes to identify adulterations in milk based on multivariate chemometric modelling techniques. Thirty-six authentic milk samples were collected throughout the year from the farm belonging to the Faculty of Veterinary Medicine and Animal Science, University of Peradeniya. A set of adulterated milk samples was prepared with possible adulterants including sodium bicarbonate, hydrogen peroxide, sodium chloride, sugar, urea, vegetable oil and water. The milk components such as fat, casein, and whey, were extracted from all the authentic samples and adulterated milk samples. Samples were analyzed using Isotope Ratio Mass Spectrometer (IRMS) for $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$. The results of isotope compositions of the samples were statistically evaluated using R-Studio version 4.2.0. A preliminary data analysis was carried out using descriptive statistics including box plots and scatter diagrams. Principle component analysis (PCA) was performed to check whether the combined isotopic parameters could be used to distinguish adulterated milk samples from authentic milk samples. A linear discriminant analysis (LDA) and orthogonal projection to latent structures discriminant analysis (OPLS-DA) test was performed to discriminate adulterated milk samples. The results revealed that adulterated milk can be distinguished from authentic milk using stable isotope data combined with chemometrics with classification accuracies of more than 96%. The present study provides empirical evidence on the ability of IRMS in the detection of adulterated cow milk. Further, this study provides insight into non-targeted milk screening for adulterants using stable isotope information and a chemometric framework. Further investigations are required to confirm the promising results of this study.

Keywords: Milk, Authenticity, Isotopes, Chemometrics

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Extent of Human-Monkey Conflict (*Macaca sinica*) at the Hilda Obeysekera Hall, University of Peradeniya

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Toque monkeys (*Macaca sinica*) are non-human primates which are endemic to Sri Lanka and cause conflicts with humans. Human-monkey conflict is one of the most concerned environmental problems in all communities. This study was done on the impact of monkeys on the lives of students who reside at Hilda Obeysekera Hall, University of Peradeniya. The human monkey conflict (HMC) was studied at Hilda Obeysekera Hall, a hall of residence for female students at the University of Peradeniya, using 150 questionnaires distributed to residential students (n=130) and workers (n=20). Out of the 112 responses, 106(94.6%) were students while 6(5.4%) were academic and non-academic workers. According to results, toque monkeys were not seen after late evening. Ninety six percent (96% : 106/110) trust that monkeys come in search of food, are not scared of humans (85% : 96/110). About 80% (89/110) claimed that monkeys cause damage to clothes and university property. About 68% (75/110) could not study and (47% : 52/110) experienced mental agony. Most (83% : 93/111) indicated that such monkeys are aggressive and even come into rooms (36% : 40/111). Some (35% : 39/111), believe that they attack only in response to provocation while most (42% : 47/111) indicated that the attacks were unprovoked. Most (64% : 84/131) indicated that monkeys come in troupes of 6-10 or 10-15 in each. Rarely, troupes can be 16-20 (17.5% : 23/131) or even more (13% : 17/131). The line of trees along Mahaweli river (51% : 56/109) is the commonest route of entry into hostel while the open-air theatre (28% : 31/109) and *Sangamitta Hall* (22% : 24/109) were also being used. Monkeys were mostly observed near garbage collecting rooms (84% : 92/109). Occasionally, they were seen (89% : 97/109) on the balconies between wings and near the canteen (11% : 12/109). Respondents (73%) did not know where monkeys spent their nights. However, 20% of them believe that they stay away from hostel at night. Only 13% indicated that proper garbage collection and disposal could reduce the problem. A majority (44%) suggested to catch and relocate monkeys and 10% indicated that they must be captured and sterilized before releasing. Cutting down trees and construction of iron grills also were indicated by less than 10%.

Keywords: Catch and relocate, Human monkey conflict, Surgically sterilize, Toque monkeys

Evaluation of Characteristic Properties and Analysis of Sun Protection Factor Value of Stable Emulsions Containing *Callophyllum inophyllum* Seed Oil

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Sunscreens are photoprotective topical products that protect skin against sunburn and prevent skin cancers. Over many synthetic products, natural products are highly demanded due to several benefits. The aim of this study was to evaluate the physical and chemical properties and analysis of the sun protection factor (SPF) value of stable emulsions containing *Callophyllum inophyllum* (Domba) seed oil. Series of primary and secondary emulsions were prepared according to randomly selected five ratios using commercially available *Callophyllum inophyllum* seed oil, distilled water and, Tween 20[®] or Tween 80[®]. Only the physically stable primary and secondary emulsions throughout 60 days at room temperature ($28\pm5^{\circ}\text{C}$) were considered for further analysis. Creaming indices, spreadability, viscosity, microscopic analysis, colour, odour and texture were evaluated as physical characteristics, and pH was considered to chemically characterize the stable emulsions according to pharmacopeia guidelines. The SPF value determination was carried out for all stable emulsions between 290 nm to 320 nm wavelength at 5 nm intervals and absorbance was measured in triplicates every 5 minutes. It was found that four emulsions were stable throughout the physical stability evaluation period without providing any creaming indices within 24 hours. These were oil in water type, pale yellow colour, smooth texture with natural Domba oil fragrance. The spreadability, pH and viscosity parameters were within 8.0-11.5 g/cm², 6.6-7.0 and 120-30250 cps respectively. Out of four stable emulsions, Tween 20[®] consisting primary emulsion showed the highest SPF value with 22.6. The other three emulsions showed less SPF value (> 5). In conclusion, the ratio compromised with 23.80% *Callophyllum inophyllum* seed oil: 42.85% distilled water: 33.33% Tween 20[®] showed the highest SPF value which can be considered for further development to produce commercially viable natural sunscreen.

Keywords: Sun protection factor value, *Callophyllum inophyllum* seed oil, Tween 20[®], Tween 80[®]

Successful Plastron Osteotomy Surgery in a Parker's Black Turtle (*Melanochelys trijuga parkeri*)

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This context describes the surgical procedure of removing a fishing hook lodged in the gastrointestinal tract of a Parker's Black Turtle (PBT) (*Melanochelys trijuga parkeri*). A PBT weighing 1 Kg was presented to the Veterinary Teaching Hospital of the Faculty of Veterinary Medicine and Animal Science, after being caught on a fishing line. Plain radiographs revealed a radiopaque foreign body (fishing hook) lodged halfway in the gastro-intestinal tract. Thus, plastron osteotomy technique was suggested to remove the object. Pre-surgically normal saline (0.9%) was given subcutaneously (SC), for two days. Sedation and anesthesia was achieved using Midazolam (2 mg/Kg) and Ketamin Hydrochloride (30 mg/Kg) given intramuscularly (IM). After disinfection with 70% Isopropyl alcohol, a square-shaped transection was made on the plastron using a surgical bone cutter. A wedge-shaped bone flap was cut and reflected to a side. The coelomic membrane was incised along the midline. Intestines were exteriorized and the obstruction was localized. A longitudinal incision placed in the intestines enabled the removal of the fishing hook together with the line. Intestinal wall and coelomic membrane were sutured with absorbable suture material. The cut bone flap was replaced to close the plastron. A water sealant gum was applied along the cut edges to create a tight seal. Then a thin layer of plaster of paris was applied and covered with adhesive plaster. Postoperatively, the antibiotic Enrofloxacin was given (5 mg/Kg), once every three days for two weeks, and the analgesic Ketoprofen (2 mg/Kg) at a similar time interval. After recovery, dry and dirt-free bedding was provided. Food or water was substituted with normal saline given SC twice daily for three days post-surgery. The turtle recovered successfully and was able to drink and feed without complications on the fifth-day post-surgery. Thus the surgery was a success.

Keywords: Parker's Black Turtle, Foreign body, Fishing hook, Plastron osteotomy, Coelomic membrane

Optimization and Validation of Single Chain Recombinant Antibody Based ELISA to Detect Microcystins from Fresh Water Bodies in Sri Lanka

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Microcystins (MCs) and nodularins (NODs) are produced by different species of cyanobacteria. MCs are heptapeptides composed of varying combinations of seven amino acids. Nodularin also has a structure similar to those of MCs. Over 90 different variants of identified MCs, MC-LR is the most abundantly found MC. MCs are known to cause liver damage, and reproductive toxicity. Detection of these toxins need to follow extraction, purification and detection using sophisticated instruments such as HPLC-UV and LC-MS/MS. Though these techniques offer a good sensitivity and accuracy, they are highly expensive and not readily available in Sri Lanka. Therefore, we optimized and validated single chain recombinant antibody (Nat.1.scAbs) based indirect competitive enzyme linked immunosorbent assay (ic-ELISA) to detect MCs from freshwater bodies, well below the WHO recommended value of 1 µg/L. The standard curve was constructed by plotting the binding percentage against the concentration of the ten calibrators on a logarithmic scale. To determine the accuracy (recovery percentage), precision (Coefficient of variation (CV)) and matrix effect, three blank samples were spiked at four concentration levels (2.5 µg/L, 1.25 µg/L, 0.8 µg/L, and 0.35 µg/L). The working range of an ic- ELISA is between IC80- IC20 and the range was determined by the calibrators. Cross reactivity was determined by testing the binding ability of the scAb's against seven microcystin analogues and nodularin. The optimum sub-saturation concentration of MC-LR specific Nat.1.scAbs was 0.0781 µg/L. The Limit of detection (LOD) was 0.255 µg/L with the range of 11.133– 0.353 µg/L. The ic-ELISA showed recoveries in the range of 88.80% to 139.20% for all three tested matrixes namely de-ionized water, tap water and water obtained from freshwater bodies. The precision of the ic-ELISA was also high where the coefficient of variation (CV) was less than 10% for all the matrixes. There was no significant matrix effect noted. The cross reactivity was within the range of 44.88% to 96.62% for MC-RR, MC-YR, MC-WR, MC-LW and NOD. ELISA with Nat.1.scAb proved to be a sensitive and a reliable method to detect MCs from fresh water.

Keywords: Microcystins, Nodularin, ic-ELISA, Fresh water

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Evaluation of anti-inflammatory activity of modified topical dosage form based on Ayurveda formulation (Murungadi Lepaya) using *in vitro* methods

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Murungadi lepaya is an Ayurvedic formulation which is used to treat rheumatoid arthritis prepared according to the Ayurvedic pharmacopeia of Sri Lanka using rhizome of *Curcuma zedoaria*, fresh bark of *Crateva adansoni* and *Moringa oleifera*. In our previous study, anti-inflammatory activity of three plant parts mentioned above was evaluated individually and in combination. Objective of this study was to prepare a new gel formulation using combined extract of above plant materials which have higher compliance than a traditional lepaya when apply on skin and evaluate anti-inflammatory activity using egg albumin denaturation assay. Combined freeze-dried extract was prepared according to the ratio of the ingredients used in traditional formulation, Murungadi lepaya 1:1:4(*C. zedoaria*, *C. adansoni* and *M. oleifera*). Using the combined freeze-dried extract, a gel (10 %) was prepared. Using the gel formulation, a Concentration series was prepared (39.0625 µg/ml - 5000 µg/ml) and anti-inflammatory activity was evaluated. Diclofenac sodium gel was used as the standard drug. Then all samples were triplicated for each concentration. UV absorbance of the above samples were measured using 660 nm wavelength. IC₅₀ value was calculated. Prepared gel was tested for organoleptic properties, pH, spreadability, homogeneity and centrifugation tests. According to the results of the egg albumin assay prepared gel formulation demonstrated a IC₅₀ value of 395.4 µg/ml whereas the standard drug, diclofenac sodium gel demonstrated a IC₅₀ value of 411.3 µg/ml. Anti-inflammatory activity of the prepared gel formulation was statistically significant when compared with the standard gel ($p<0.05$) based on ANOVA test results. Prepared gel formulation was transparent, smooth and not sticky, pleasant odour, soft texture and homogeneous. The pH value of the formulation was 6.24 which is in between the range of skin pH. The spread diameter was 4.7 cm. In conclusion, prepared gel formulation shows promising anti-inflammatory activity *in vitro*. Clinical studies are recommended in future.

Keywords: Anti-inflammatory, *Crateva adansoni*, *Curcuma zedoaria*, egg albumin denaturation assay, *Moringa oleifera*

Enumeration of heterotrophic bacteria in raw and treated water of the river Mahaweli - A culture-based approach

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Heterotrophic bacteria are naturally present in water bodies. While most are harmless, some species can have implications on human health and water quality. Thus, it is essential to monitor heterotrophic bacterial counts (HPCs) and implement appropriate treatment processes to maintain the safety of drinking water. Mahaweli river is the main drinking water source in the central province. This study investigated the HPCs in raw and treated drinking water and the efficiency of the water treatment process in removing heterotrophic bacteria at 14 water treatment plants (WTPs) situated along the Mahaweli River between Kotmale and Victoria reservoirs. Water samples were collected in September 2022 (rainy season) and February 2023 (dry season), and the HPCs were determined by spread plate technique according to APHA guidelines. Gram staining was used for preliminary identification of morphologically different colonies (>85 colonies per season). Raw water HPCs ranged from 1.40×10^2 to 3.48×10^5 CFU/mL, while treated water HPCs ranged from 0.00 to 2.36×10^4 CFU/mL. The lowest and highest HPCs of raw water were reported from Kotagala and Greater Kandy WTPs respectively. The HPCs varied significantly between seasons and locations, probably due to anthropogenic activities (urbanization etc.) and rainfall. Treated water had only Gram positives, whereas raw water gave an average of 70% and 66% Gram negatives in the wet and dry seasons, respectively. The heterotrophic bacteria removal efficiency was >78% in WTPs, except for two; Nawalapitiya and Nillambe in the dry season. However, treated water samples from Thalawakelle, Nawalapitiya, Pundaluoya, Ulapane, Nillambe, and Polgolla exceeded the maximum HPC recommended by WHO for treated drinking water (<500 CFU/mL at 35°C) in the rainy season whereas only Elpitiya exceeded it in the dry season. Overall, this study highlights the importance of monitoring heterotrophic bacterial contamination in water sources, especially during the rainy season. The findings demonstrate that the majority of selected WTPs effectively remove heterotrophic bacteria.

Keywords: Heterotrophic bacteria, Mahaweli River, Treatment plants, Water quality

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Comparative Analysis of Deep Learning Model for Solar Irradiance Forecasting

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Solar irradiance forecasting is crucial for optimizing the utilization of photovoltaic plants and facilitating various tasks like unit commitment, transmission management, and maintenance scheduling. When implementing a new solar plant at a specific location past solar irradiance data is a critical factor for deciding which location is best or not. However, past irradiance data is not normally available and plant developers depend on data collected for 1 or 2 years. To overcome this limitation, this study presents a Long-Short-term memory (LSTM) model architecture for solar irradiance prediction using early weather data. For comparison purposes, a LSTM model using past irradiance data as an input was also developed. The research uses data from a solar station in Sri Lanka from 2013 to 2015. As well as two LSTM architectures combined with Attention mechanism are constructed to analyze time series data to improve prediction performance by enabling the models to focus on relevant features and capture complex temporal dependencies. The number of weather data like temperature, humidity, precipitation, sun height, surface pressure, and wind speed were included to improve the accuracy of model. Performance evaluation of the model is based on R square and mean squared error (MSE) metrics. The results show that a solar irradiance forecasting model that uses weather data as input provides comparable results as the past irradiance data model. The research emphasizes the importance of past weather data for accurate solar irradiance forecasting when past irradiance data is not available at specific locations. The research emphasizes and provides valuable insights into accurate solar irradiance forecasting when implementing new solar plant and optimizing solar power generation.

Keywords: Deep Learning, Long-solar-term memory, Attention mechanism, Solar irradiance, Mean squared error

Detection of Frying Oil Rancidity Levels Using a Mobile Application

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One of the most popular ways to prepare meals is deep-fat frying. In the catering industry, oil is heated repeatedly up to a specified point while maintaining customer safety and profit margins. If the threshold is crossed, rancidity may form. Test kits are used to make sure the safe margin of frying oil. These test kits are quite costly. In this research, a test kit and a mobile app that can be used to evaluate the rancidity levels of frying oil have been developed. The study was done by two methods (direct, chemical). In the direct method, A digital colorimeter was used to analyse the samples' colors, and a *Vito* oil tester was used to measure the samples' total polar materials (TPM%). The TPM (%), L*, a*, b* values, and acid values all had substantial positive relationships that were greater than 0.90 in linear regression (R^2). The chemical method was developed as an advanced version of the direct method and used a chemical solution which is sensitive to the free fatty acid percentage in frying oil. The Mobile application was developed using the *React Native* software. It was compatible with the android operating system. The mobile application was validated using randomly selected oil samples and determined TPM (%) values by both mobile application and *Vito* oil tester. Results were analyzed using *R* statistical software. Based on the results, there was not a significant difference ($p>0.05$) between the TPM (%) values which were obtained by the mobile application and *Vito* oil tester. The outcomes also showed that the suggested technique can be used as an alternate method to accurately determine the rancidity levels of frying oil.

Keywords: deep frying, reheating, rancidity, test kit, mobile application

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Computer-aided Measurement of Lumbar Canal Body Ratio for the Sri Lankan Population

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This study aimed to propose a computer-aided method to measure the average lumbar canal body ratio for the Sri Lankan population. Lumbar canal body ratio (CBR), the relationship between the antero-posterior diameters of bony spinal canal and lumbar vertebral body, has been considered a key method to assess the spinal stenosis which is the narrowing of the spinal canal. 110 DICOM images of 39 female and 71 male patients who underwent abdomen computed tomography (CT) scans were collected using an interviewer administered questionnaire based on a specific selection criterion where patients with sciatica, focal bony lesion and numbness in lower limb, trauma or surgery or congenital anomalies of lumbar spine and CT images with artifacts were rejected. A computer algorithm was developed using Java computer language to measure the CBR for all five lumbar vertebrae by measuring antero-posterior diameter of the lumbar vertebra bodies and bony spinal canal. To assess the reliability of the computer aided measurements, the CBR of each sample was calculated manually with the use of RadiAnt DICOM Viewer. The average CBR of lumbar vertebrae for the Sri Lankan population was obtained using the computer-aided method as 0.56725 ± 0.08544 and using the manual method 0.53723 ± 0.09561 with a 95% confidence level. Different values of CBR were obtained for male and female Sri Lankan population and CBR value was observed to be higher for female. Finally to analyze the reliability of all the measurements, the concordance correlation coefficient (CCC) was obtained using R software as 0.554 which indicated that there was a mild agreement between manual and computer-aided measurements. As a conclusion, the proposed computer algorithm could be useful in assessing the CBR in lumbar vertebrae easily with minimum human intervention to assess the lumbar spinal stenosis condition even when the patients show no symptoms.

Keywords: Canal body ratio, CBR, Lumbar vertebra, Spinal canal, Vertebral body

Application of Refuse Tea Water Extracts to Enhance Colour Stability of Chicken Burger Patties

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The colour of fresh meat is a key attribute that significantly influences consumer acceptability. Incorporation of antioxidants into fresh meat and meat products is a widely employed technique aimed at mitigating discolouration, lipid oxidation, and the development of off flavors. Therefore, the objective of this study was to investigate the potential of black tea waste (refuse tea) extract to extend the colour stability of uncooked chicken meat during their refrigerated and frozen storage. Samples of patty were prepared after mixing ground chicken meat with two concentrations of refuse tea extracts (0.05% and 0.1% w/w). Patties were then stored at 4°C (refrigerated storage) and -18°C (frozen storage) along with control samples (no antioxidants added negative control and FeSO₄ added as a positive control). Colour measurements (CIE L*, a*, and b* values) were taken at 1-day and 1-week intervals. Total plate count (TPC) was measured for refrigerated and frozen samples at the respective storage intervals. The a* values, which represent how red the meat is, were higher at the beginning and subsequently decreased across all treatments during storage. During the refrigerated storage, patty samples showed higher a* values than the standard value (20) up to day 5, except for control samples. For the frozen storage, a* values were maintained above 20 for a 6-week period, showing the potential colour-stabilizing properties of the tea extracts. Refused tea-treated samples had lower TPC ($p < 0.05$) and exhibited superior acceptability compared to the control samples in terms of colour preference and overall acceptability ($p < 0.05$). Overall, the chicken patty treated with 0.1% tea extract showed the highest colour stability, along with lower microbial counts and higher overall acceptability. Therefore, tea extracts, as a natural source of antioxidants, offer a promising way to enhance colour retention in uncooked meat products.

Keywords: Antioxidant, Attribute, Discolouration, Acceptability, Colour stability

Creating Digital Twins of Ancient Stupa Structures in Sri Lanka: Photogrammetric Model Creation and Finite Element Analysis of Rankoth Wehera Stupa

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Sri Lanka, a land rich in cultural heritage, is adorned with numerous awe-inspiring ancient stupas, some nearly 2 millennia old. Numerous natural and human factors have caused damage to these stupas compromising their structural integrity. In this premiering work, the authors intend to introduce modern scientific techniques of Photogrammetric Digitization, Digital Twins (DT) and Finite Element Modelling (FEM) to aid with conservation efforts. By adopting said technologies, experts can gain a comprehensive and accurate understanding of these structures, allowing for detailed analysis of their geometry, structural integrity, and deterioration patterns. This information serves as a valuable resource for conservation planning and implementing targeted maintenance and restoration strategies. DJI Mini3 PRO drone was used for the survey, and a sequence of computer programs was used to import the model to FEA software. Meshroom, an open-source photogrammetry software, created the initial model, which was then repaired using Meshmixer. This model was converted into a single surface and used to create a meshed model for Finite Element Modeling (FEM). The 3D solid model was discretized using Meshroom and analyzed in ABAQUS/CEA software for structural analysis. Based on the stress analysis results, it can be observed that the stupa experiences compressive stresses under self-weight and hoop stress contours predominantly exhibit compressive stresses, both gradually increasing from top to bottom. All stress values are well below the allowable material strength properties of the stupa. The photogrammetry process employed to obtain geometric proportions of the stupa structure was successful. The methodology of obtaining the FEM numerical analysis of the Rankoth Wehera solid superstructure using ABAQUS/CEA revealed that the methodology developed in this study can be used for renovation and restoration work of the stupa.

Keywords: Photogrammetric digitization, Digital twins, FEM, Stupas, Conservation

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Cement Sand Blocks Cast with Rice Husk Ash and Limestone Crusher Plant Dust

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Sri Lanka faces environmental problems due to the over-exploitation of natural resources, like clay and river sand, for construction, leading to a shortage of resources and, thus increased prices. Developing alternative masonry materials using wastes as sand substitutes is a potential solution. This study examines the feasibility of using rice husk ash and limestone crusher plant dust as partial replacements for sand in making cement blocks. Rice husk ash is produced by burning rice husk at high temperatures, while limestone dust is obtained from limestone crusher plants. Cement blocks of 300 mm x 100 mm x 150 mm are made with a predetermined amount of cement and different proportions of sand, rice husk ash, and limestone dust. The control block was prepared with cement and sand with a volume ratio 1:6. Density, compressive strength, and water absorption characteristics of cement blocks were assessed after 28 days for 25 different mix combinations, including the control block. The compressive strength of blocks increased with increased rice husk ash and limestone dust content, but further addition led to weaker blocks. The block's maximum average strength at 28 days was 4.85 N/mm², higher than the ASTM standards (4.14N/mm²). The study found that adding of rice husk ash and limestone dust increases water absorption as mix proportions 01-14 were within the allowable limit, while from 15 - 25 exceeded the ASTM C55-11 limit of 240 kg/m³. The density decreases from normal to medium weight blocks with increasing rice husk ash and limestone dust. Treatments 01 - 16 fall within the normal density category ($>2000\text{kg}/\text{m}^3$), while 17 - 25 fall within the medium weight category ($1680 \text{ kg}/\text{m}^3 - 2000 \text{ kg}/\text{m}^3$) according to ASTM standards. The cost analysis showed that increased use of rice husk ash and limestone dust reduced the unit cost by 20%.

Keywords: Rice husk ash, Limestone crusher plant dust, Density, Compressive strength, Water absorption

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A Genetic Algorithm to Solve the Integrated Vehicle Routing and Vehicle Sequencing Problem with a Single-Door Depot

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Vehicle Routing Problem (VRP) is a well-known combinatorial optimization problem. In the case of single-door at the depot to enter, vehicles have to wait in the parking yard until they get their turn to unload their accumulated products. This waiting creates additional transportation cost and therefore, this idle time of each vehicle in the parking needs to be reduced. A proper mechanism to sequence the routed vehicles to the door is essential. Therefore the objective of this study is to test the compatibility of the developed model to the integrated VRP and Sequencing Vehicles (VRP&SV) to a single-door depot problem and propose a Genetic Algorithm (GA) to solve it. In the proposed GA, tournament selection, order crossover and swap mutation are chosen as the best combination of the operators for the robustness of the algorithm by employing the Taguchi method. The accuracy of GA is tested using the Branch and Bound (BB) algorithm. When the vehicles return to the depot, after serving the suppliers, the sequencing those vehicles to the door at depot is purely based on the principle of first come first serve basis. The factors of the total cost of VRP&SV are due to travelling between suppliers, preparation to load the quantities and loading them at suppliers, vehicle waiting at the parking yard, vehicle changeover to the door and unloading the accumulated quantities by vehicles. The results of small-scale instances not only confirm the feasibility of the proposed GA to solve the integrated VRP&SV but also reveals that the exact optimal solution can be reached by GA in less than 5 seconds even to the instance with 100 suppliers. Therefore, it can be concluded that the applicability of the integrated problem is confirmed. Further, it is recommended that the proposed GA can be employed at last time planning of VRP&SV models.

Keywords: Genetic Algorithm, Scheduling Vehicles, Single-door depot, Taguchi method, Vehicle routing

Investigating the Development of Mathematics Teachers' Pedagogical Content Knowledge for Teaching Algebra: A Professional Development Program

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This study aims to examine the success of Professional Development (PD) program for developing the secondary level mathematics teachers' pedagogical content knowledge (PCK) in teaching algebra. The approach used is a mixed methods case study. The PD program was introduced to twenty (N=20) in-service mathematics teachers. The program included three stages based on its content. The nature of algebra, psychological foundation of teaching algebra and algebraic thinking were the components of the program. This PD program was conducted for two months continuously. The workshops included discussions and group activities. The participants' existing experiences were used to fine-tune the workshop objectives. A pre-test, post-test and interviews were conducted to collect data. A paired sample t-test was used to analyze the pre and post-test marks while thematic approach was used to analyze qualitative data collected from interviews. The results revealed that the mean values of the pre-test and the post-test were 31.10 and 65.60 for valid 20 of data for both tests respectively. It indicates an appreciable success of the PD program. A considerable variability was found with a standard deviation between 10.252 and 4.012. The result of the paired sample t-test was 0.345, which indicates a positive correlation between the pre-test marks and the post-test marks at the 5% significant level and the p-value was less than 0.05. Therefore, it is observed that the PD program had considerably supported the development of the teachers' PCK in teaching algebra. Interview results showed that teachers had acknowledged the abstract nature of algebra, selecting appropriate teaching strategies and designing creative activities with the help of improved algebraic thinking in them. The participants accepted that they have already applied less productive activities for teaching algebra. They asserted the lack of awareness of algebraic thinking as the cause. Hence, this study recommends similar PD programs for mathematics teachers.

Keywords: Algebra, Algebraic thinking, Nature of algebra, Pedagogical content knowledge, Professional development program

Graph Labeling and Harmonies: Odd and Even Labeling of Star Graphs

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This research paper delves into the realm of graph theory, focusing on the concept of odd and even harmonies labeling within the framework of star graphs. The star graph family, characterized by a central vertex connected to peripheral vertices resembling a star's shape, serves as the primary subject of exploration. Harmonies labeling, an intriguing concept, involves assigning labels to graph vertices and edges following specific rules. A graph is considered harmonies if an injective function can be established between its vertex set and the integers modulo q (where q represents the number of edges), while ensuring distinct edge labels. This paper introduces the notions of odd and even harmonies labeling. In the odd harmonies scenario, each vertex is assigned a distinct even number from 0 to $2q-1$. Notably, the sum of labels on adjacent vertices results in a unique odd number between 1 and $2q-1$. Conversely, the even harmonies scenario assigns even labels to vertices within the same range, yielding a unique even sum for adjacent vertices. Extending Rosenfeld's 1979 work on odd harmonies labeling, this study explores both odd and even cases. The inherent properties of star graphs make them an ideal focus. As bipartite graphs, they naturally divide vertices into two sets, with connections exclusively between sets. Additionally, star graphs exhibit planar attributes, allowing representation on a flat surface without edge crossings. In summary, this research enriches graph theory by investigating odd and even harmonies labeling in the context of star graphs. By capitalizing on the unique properties of star graphs, this study advances our understanding of the intricate relationship between graph structures and harmonies labeling, encompassing both odd and even scenarios.

Keywords: Even harmonies labelling, Graph theory, Odd harmonies labelling, Star graph

Choice of the Inverse Linear Mapping in the Method of Directly Defining the Inverse Mapping for Inhomogeneous Heat and Advection Problems

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Semi-analytical methods for solving nonlinear partial differential equations (PDEs) combine aspects of both analytical and numerical techniques. Unlike linear PDEs, which can be more straightforwardly solved using the separation of variables and superposition principles, nonlinear PDEs involve terms with nonlinear dependencies, making them significantly more complex to handle. The key to the analytical method lies in employing techniques like perturbation methods, similarity transformations, and integral transformations such as Fourier and Laplace transform to simplify the equations. These techniques often lead to obtaining exact solutions or approximations that provide valuable insights into the behavior of the system. However, due to the intricate nature of nonlinear PDEs, the analytical method may not always be applicable, and in these cases, numerical methods or approximate techniques become necessary. The Method of Directly Defining the inverse Mapping (MDDiM) is a semi-analytical method for obtaining approximate solutions for complicated nonlinear PDEs without using any kind of transformation. In this study, we explore different inverse linear mappings in order to determine the optimal inverse linear mapping that allows accuracy just after a few terms are evaluated by applying MDDiM to the inhomogeneous heat and advection problems. Additionally, we optimize the convergence control parameter by constructing an optimum control problem for minimizing the accumulated L²-norm of the squared residual errors using directed sum. This approach is far easier to compute than the square integrals of an infinite domain. By computing three-term optimal approximate solutions and comparing them with the exact solutions, we were able to choose the better inverse linear mapping for these two inhomogeneous PDEs. We can conclude that choosing a better inverse linear mapping leads to a more accurate solution in MDDiM.

Keywords: Advection Problems, Convergence control parameter, Heat Problem, Inverse linear mapping, Method of Directly Defining the inverse Mapping

A SEIR Model for Spread of Hand, Foot, and Mouth Disease

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Hand, foot, and mouth disease (HFMD) is an infection disease affecting tropical and subtropical regions worldwide. There are no vaccinations or antiviral medications available that target HFMD. In this study, an existing mathematical model is modified. The parameters which are used in this modified SEIR model are taken from previous studies in similar environments. The new mathematical model is proposed to calculate the transmission probability of two genders, and investigate the effect of indirect transmission from contaminated environments. Moreover, modified SEIR model is fitted to the real data on the number of infected children (under 14 years old) in 2020. Then some of the parameters that produce the best fit to the real data are estimated. In our results we can see that $\beta_g < \beta_b$, which means the disease infected boys more than girls. The parameters η_g and η_b are much less than the rate μ , which means that the loss of viruses due to individuals taking out is much less than the loss due to clearance. Throughout this results we can see that effect of indirect transmission has two sides, threshold amount of hand, foot, and mouth disease is very small, or indirect transmission is not effected of transmission of the disease as we thought.

Keywords: Hand, foot and mouth disease, the SEIR model, Reproduction number, Transmission rate, Indirect transmission

A Method of Optimal Homotopy Analysis for Solutions of Boundary Layer Convection Heat Transfer of High-Speed Flow Over a Flat Plate

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The present study addresses the intricate problem of boundary layer convection heat transfer in high-speed flow over a flat plate. The governing continuity and Navier-Stokes equations are considered under boundary layer assumptions and constant property assumptions. By introducing dimensionless variables, the equations are transformed into a coupled system, facilitating analysis. The goal of the research is to employ the Basic Optimal Homotopy Analysis Method (OHAM) to solve these equations and analyze heat transfer characteristics. OHAM, rooted in topology and geometry concepts, constructs linear operators, initial approximations, and deformation equations. The introduced parameter h is optimized using step-by-step optimization to minimize residual error, yielding accurate solutions satisfying initial and boundary conditions. Results demonstrate the accuracy of the approach, yielding higher-order approximations with minimal errors. Employing this approach, a 10th-order approximate solution is obtained, where errors are confined to third-order approximations. The presented results are consistent with the Mathematica package BVPH 2.0 developed by Liao. The presented figures illustrate velocity and temperature profiles, while a comparative table showcases the effectiveness of the method under different parameter sets. This study contributes to understanding complex convection heat transfer phenomena in high-speed flow scenarios. The proposed OHAM offers exceptional accuracy, making it a powerful tool for solving nonlinear systems in various fluid dynamics problems. The approach can be effectively employed for solving boundary layer convection heat transfer problems in high-speed flow.

Keywords: Optimal homotopy analysis method (OHAM), Boundary layer, Convection heat transfer, High-speed flow, Flat plate

New Approach to Problems with One-dimensional Bin Packing

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The Bin Packing Problem is a well-known optimization problem that is renowned for its applicability and complexity. It belongs to a special class of problems called NP-hard and entails trying to fit a set of items of varying sizes inside fixed-size containers while attempting to minimize the number of containers needed to fit the maximum number of items. The dimensions in bin packing problems refer to the number of characteristics or attributes used to describe the items and bins. Bin packing problems can be classified as One-Dimensional, Two-Dimensional, or Three-Dimensional depending on the dimensions. Among these, the One-Dimensional Bin-Packing Problem is one of the best-known optimization problems, and it has a significant number of applications. In order to pack all the products while keeping the bin capacity in mind, the challenge calls for determining the bare minimum number of bins. In this study presents a new algorithm for the ODBPP and provides comparative examples with Heuristic algorithms such as Next-Fit, First-Fit, Best-Fit, Worst-Fit, First Fit Decreasing and Best Fit Decreasing. These Heuristic algorithm techniques aim to strike a balance between computational complexity and solution quality. Through extensive computational experiments, it demonstrates superior performance in terms of the number of bins used and packing efficiency compared to other algorithms and the optimal solution. The objective is to minimize the number of bins used, thus maximizing space utilization and reducing resource waste. This algorithm contributes to the field of bin packing and provides a valuable tool for optimizing resource allocation and minimizing waste in practical applications.

Keywords: Bin-packing problem, Heuristic algorithms, New algorithm, One-dimensional, Optimal solution

Implementing an Intrusion Detection System for Software Defined Networks using Artificial Intelligence

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This study presents an artificial intelligence (AI) based innovative approach for an Intrusion Detection System (IDS) within a Software-Defined Networking (SDN) environment. The research involves testing and identifying the most effective algorithm of machine learning and deep learning, specifically XGBoost, Logistic Regression, LightGBM, and Artificial Neural Network (ANN), for intrusion detection. The methodology consists of creating a virtual SDN using Mininet, a virtual network emulator package, with five hosts and three switches to emulate real-world network scenarios. The OpenDaylight SDN controller is integrated into this network, facilitating seamless communication and control. Rest API and Wireshark tool are used to control the SDN controller and monitor the traffic of the network. Learning models are integrated into the SDN controller to monitor and analyze network traffic effectively and detect the attack types of DoS, DDoS, BOTNET, BFA, Probe, U2R, and Web-attack with a minimum false positive rate. We have used a publicly available SDN intrusion detection dataset to train these learning models. Hyperparameter tuning is carried out to determine the optimal conditions of each learning model and comprehensive performance comparison is carried out using accuracy, precision, recall, and F1-score. At model training, the highest accuracy of 99.9% was achieved through XGBoost algorithm while ANN with ten layers followed closely with an accuracy of 99.26%. These findings were further validated through the emulated SDN network. Our finding showed that the proposed models can successfully prevent a DDoS attack through the integration of the SDN controller and the machine learning model. These observations demonstrate the significant potential of machine learning and deep learning techniques for effectively coping with cyberattacks and improving cybersecurity strategies. In conclusion, this study presents a promising approach to enhance cybersecurity in SDN networks through AI approaches.

Keywords: machine learning, deep learning, cybersecurity, intrusion detection systems, software defined network



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TOWARDS SUSTAINABLE AGRICULTURAL SYSTEMS: TRANSFORMING CHALLENGES INTO OPPORTUNITIES

Commercialization and Collaboration as Smart-KPIs of a Performance Measurement Framework to Assess Research on the Commercial Agriculture Sector in Sri Lanka

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Unending pressures on the research institutions by regulators to alter their research agenda to guarantee “more quality food from fewer resources” is ‘justified’ on the grounds of an ever-increasing population, emerging environmental challenges, and numerous other socio-economic situations faced by the nation. In the context of the commercial agriculture (CA) sector, these warrants ‘commercialization of research’ to induce more ‘collaborations’ between the institutes and industry to produce more society-friendly agriculture technologies. Thus, this research was directed, first, to determine how terms such as commercialization and collaboration were characterized by these CA-based research institutes, and then, to establish a performance measurement framework (PMF) that defines a set of key performance indicators (KPIs) to work in these regards. A systematic literature review facilitated the identification and collation of the information on PMF and KPIs (Phase I) followed by contact of the leaders in upper echelons (n=32) affiliated with leading research institutes work on CA by way of in-person interviews facilitated by a pre-piloted interview guide comprised of 15 probing questions (Phase II). Thematic Models produced through the MAXQDA Software were employed to converge leaders' perspectives into five major themes, namely 1. Research commercialization (R-Com), 2. Research collaboration (R-Col), 3. Research for society, 4. Institutional management and 5. Technology-integrated systems. The organizational benefits gained from a well-thought-out PMF comprised of smart KPIs (e.g., R-Com and R-Col) and their interactive effects were well accentuated. The analytical tools provided by the software (e.g., Code-Maps) were methodically used to build up these frameworks. The research outputs generated using real-time data-driven performance management based on KPIs will inevitably help to work out those modifications made to the research agenda in CA effectively.

Keywords: Collaboration, Commercial agriculture, Commercialization, KPI, Research management

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Climate Resilient Crop Varieties in Sri Lanka for Enhancing Food Security: Compilation of Literature

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Climate change is affecting the consistency of crop production and one of the main challenges to achieve food security. Cultivation of climate resilient crop varieties has been identified as an effective solution in combating this challenge globally as well as locally. In Sri Lanka, there are many researchers and institutions involved in developing climate resilient crop varieties, yet there are inefficiencies in applying these findings to the practical context. In order to enable the efficient utilization of these crop varieties towards establishment of climate resilient food systems, it is important to collect and compile the relevant research findings that have been made so far. Related to this objective, research studies regarding climate resilient crop varieties were referred and the findings were compiled into an excel data base. Data collection was done through the internet, published journal articles, conference proceedings, etc. and contacting and referring to reports of research institutions that conduct relevant research. Information related to approximately 70 crop varieties those were grouped under 6 main crop categories namely paddy, fruits, vegetables, other field crops, tea, and other crops, based on the tolerance under drought, salinity, and submergence. Compilation of these findings will facilitate knowledge dissemination programs and easy access of this information by the farmers. It was noted that identification of salinity tolerant varieties has not been paid much attention to hence can be considered as a new research direction. Identification of climate resilient varieties of many commercially valuable crops have not been done yet, which should be given more consideration in the process of enhancing food security through climate resilient crop systems.

Keywords: Climate resilient crop varieties, Food insecurity, Compilation

Effect of *Photobacterium Damselae* subsp. *Damselae* on Behaviour and Standard Metabolic Rate of Western Pygmy Perch (*Nannoperca Vittata*)

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Infection is often been associated with changes in host metabolic rate and behavior. Behavioral changes, particularly those relating to increased activity and boldness, have frequently been attributed to adaptive host manipulation by the parasite, but could also result from the host's response to pathology or as a non-adaptive side effect of infection. In this study, I exposed a freshwater fish (64 fish), western pygmy perch (*Nannoperca vittata*), to a sub-lethal concentration (1×10^6 cfu/ml) of a bacterial parasite (*Photobacterium damsela*e subsp. *damsela*e) for 6 hours, and measured the standard metabolic rate (SMR), the activity trait track length (TL), and the boldness traits time to emergence (ET) and time spent in a risky zone (RZ) (with 1-week intervals in between each time point). Infected fish (13 of 64 fish) that were exposed to *P. damsela*e subsp. *damsela*e died or were euthanised because of signs of infection such as ulcerated lesions or haemorrhages. The effect of *P. damsela*e subsp. *damsela*e challenge on the metabolic rate and behaviour of *N. vittata* was studied using generalised linear mixed models. For all attributes, the interaction between time-point and treatment was significant, with bacterial challenge boosting fish SMR, activity, and boldness. The standard metabolic rate of challenge-exposed fish remained high throughout the post-challenge period (3 weeks), although behavioural abnormalities were temporary, returning to pre-challenge values after two weeks. I hypothesize that changes in SMR and behaviour in infected fish result from a greater need for energy, either (or both) as a result of immune activation or compensatory growth.

Keywords: Adaptive manipulation, Bacterial challenge, Behaviour, Immune activation, Standard metabolic rate

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Variation of Diversity and Abundance of Insects Associated with Ground Canopy in Home gardens in Matale District, Sri Lanka

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Insects play a crucial role for the sustainability of the homegarden ecosystem particularly pollination, predation and parasitization. The objective of this study was to assess diversity of insects in relation to the ecological zone, and homegarden diversity. Homegardens (25) were selected in Matale districts covering five ecological zones. Homegardens represent three levels of diversity index, based on five socioeconomic, and biological parameters. Insects associated with ground level plant canopy were sampled using a sweep net (20 sweeps/sample) and sorted them and classified into orders and families. Of the 25 samples, 1793 insects and 193 spiders were found. Insects were in Orders: Hemiptera, Hymenoptera, Diptera, Coleoptera, Orthoptera and Lepidoptera in descending order of abundance. Hemipterans belonged to 18 families: Cicadellidae (49%), Rhyparochromidae (27%), Aphididae (9%), and Pentatomidae (6%). Dipterans belonged to 19 families: Drosophilidae (35%), Agromyzidae (23%) and Lauxaniidae (12%). Hymenopterans belonged to 13 families: Formicidae (59%), Eulophidae (15%), Braconidae (9%) and Platygasteridae (5%). Hemipteran number varied significantly ($p<0.05$) among homegardens, ecological zones, and homegarden diversity index (HGDI). Hymenopteran number per homegarden did not vary significantly; it significantly ($p<0.05$) varied with ecological, and homegarden diversity index. Number of dipterans significantly varied ($p<0.05$) among homegardens, ecological zones, and HGDI. The highest mean insect count per ecological zone was in DL1b (91.5 ± 23) followed by WM3b (81.5 ± 24), IM3b (72.7 ± 16.8) and IM3a (69.5 ± 37). The data revealed that a diverse group of insects was associated with the vegetation of home gardens. The diversity and abundance varied with the ecological zones and HGDI. The diverse nature of the home garden also affects associated insect diversity; therefore, home gardening practices should be planned with due consideration of insect conservation.

Keywords: Order, Family, Hymenoptera, Hemiptera

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Evaluating a Consortium of Rhizospheric Actinomycetes for Plant Growth Promotion Ability in Rice

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Actinomycetes possess mechanisms to promote growth and mitigate biotic and abiotic stresses of plants. The present study evaluated a consortium of actinomycetes for its growth promotion ability in rice aiming to minimize the inorganic fertilizer usage in paddy cultivation. Ten rhizospheric actinomycete isolates, confirmed for their nitrogen fixing and phosphate solubilizing ability *in vitro* were tested on rice (var. Bg 360). The treatments were: no Nitrogen (N) and Phosphorus (P) fertilizer in inorganic or alternative form (T1), N and P inorganic fertilizer as recommended by the Department of Agriculture (DoA) (T2), 50% reduction of DoA recommended N and P fertilizer with the actinomycete consortium (T3) and only the actinomycete consortium (T4). Every treatment received the DoA recommended potassium dosage. A pot experiment was conducted using 5 L capacity pots having ten replicates/treatment according to a complete randomized design. Number of tillers/hill, % chlorotic leaves/hill, % heading-initiated tillers were recorded and root length, volume, and dry weight were measured. Incidence of sheath rot, the only disease observed was quantified. The % heading-initiated tillers, % chlorotic leaves, root volume and root dry weight were significantly differed among the treatments ($p<0.05$). T1 plants showed the highest % of chlorotic leaves but that percentage was significantly lower in the rest of the treatments. Root volume and root dry weight reported by the T3 plants were on par with those received the N and P inorganic fertilizer at DoA recommendation (T2). T3-treated plants reported a significantly higher % of heading-initiated tillers and a significantly lower sheath rot incidence, compared to the other treatments. The consortium introduced in the present study has the potential to reduce the recommended rates of inorganic N and P fertilizer by 50% without significantly affecting the tested parameters and reducing sheath rot incidence.

Keywords: N fixers, P solubilizers, Sheath rot, Leaf chlorosis

Evaluating Desirable Traits of Plant-Inhabited *Burkholderia*, *Pseudomonas* and *Bacillus* Isolates for Bioremediation of Crude-Oil

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Microorganisms are capable of cleaning petroleum hydrocarbon-contaminated environments. In addition to the degrading ability of petroleum hydrocarbons, some microbes have emulsification ability. The present study screened local isolates of bacteria for bioremediation ability and evaluated the emulsification potential. *Burkholderia* isolates (i.e. A, B, D, E, and F), a *Pseudomonas* isolate (G), *Bacillus megaterium*, and *Bacillus subtilis* which were inhabitants of plant surfaces were used for the study. Crude oil degrading ability of the bacterial isolates was tested in Bushnell Hass medium (BHM) using crude oil (0.1% v/v) as the sole energy source and optical density (OD) at 600 nm was measured. The emulsifying potential of the isolates was evaluated by calculating an emulsification index (E-24). The test was performed twice using the culture supernatants of the bacterial isolates and percentage E-24 was calculated. All the isolates demonstrated a typical growth curve over a two-week period in BHM supplemented with 0.1% crude oil indicating their ability to use/metabolize crude oil as the sole energy source as they did not grow in BHM without crude oil. Among the isolates, the highest and lowest growth rates were reported by *B. megaterium* and *Burkholderia* isolate A, respectively in BHM with 0.1% crude oil. *Burkholderia* isolate F and *Pseudomonas* isolate (G) showed no emulsification ability in comparison to the negative control but the emulsification indices of the rest ranged from 20- 40%. The study identified five *Burkholderia*, one *Pseudomonas*, one *Bacillus megaterium*, and one *Bacillus subtilis* isolates which are inhabitants of plant surfaces as potential microbes that can be grown on crude oil as the sole carbon source. Except for two tested isolates (F and G), the rest demonstrated emulsification ability. Results revealed the potential of using all the tested bacterial isolates, with or without the emulsification ability for the bioremediation of crude oil.

Keywords: Bioremediation, Emulsification, Petroleum hydrocarbons

Adsorption Characteristics of Ammonium onto Rice Husk Biochar Pyrolysed at Different Temperatures

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Low nitrogen use efficiency of added fertilizers is a great concern as it is less than 50% in most agro-ecosystems. Biochar (BC) has a massive micro pore structure, high surface area and surface charge which improve the soil nutrient adsorption. Nonetheless the pyrolysis conditions and type of feedstock determine the physicochemical properties of BC. The present study was conducted to study the ammonium (NH_4^+) adsorption of rice husk BC (RHB) produced at different pyrolysis temperatures (i.e., 300 °C, 500 °C and 600 °C) using a Down Draft Double Chamber (DDDC) pyrolyser (i.e., 500 °C) and a laboratory scale muffle furnace (i.e., 300 °C and 600 °C). Biochar were named as RHB_300, RHB_500, and RHB_600 and characterized. A batch sorption experiment was conducted to evaluate the NH_4^+ sorption on BC and sorption isotherms were fitted (i.e., Langmuir and Freundlich). The fixed carbon percentage was increased with increasing pyrolysis temperature and highest was observed in RBH_600. Therefore, it can exist in soil over a long period of time as an NH_4^+ adsorbent. The RHB_300 showed the highest NH_4^+ sorption capacity at pH7. Langmuir isotherm model was best fitted with the NH_4^+ sorption ($R^2=0.99$) on RHB_300 and RHB_600, and RHB_500 was best fitted with Freundlich isotherm model ($R^2=0.97$). The significantly higher ash content (i.e., 45%) in RHB_500 can be attributed to this deviation by increasing the BC surface heterogeneity. Among the tested BCs for soil application aimed at enhancing nitrogen use efficiency, the RBH_300 stands out as the best performer as it exhibited significant NH_4^+ sorption capacity and high fixed carbon content.

Keywords: Rice husk, Black carbon, Nitrogen, Fertilizer use efficiency

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Prevalence of Occupational Hazards among Paddy Farmers and Role of Agricultural Extension: A Study in Horowpathana DS Division, Anuradhapura District, Sri Lanka

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Occupational safety and health is a prime area of concern for international labour regulations. Different occupational safety and health issues could be evident among farmers. There are limited studies conducted in Sri Lanka from the perspective of occupational safety and health among farmers. A descriptive cross-sectional study was conducted to identify the prevalence and awareness of occupational hazards among paddy farmers in Horowpathana DS division, Anuradhapura district. Data were collected from five key informant interviews, two focus discussions with officers, a questionnaire survey on 300 paddy farmers, and an informal discussion with 20 paddy farmers and analyzed using qualitative and quantitative methods. More than half (62.1%) of the respondents were male, paddy farmers. The majority (32.6%) was in their middle age (42-52 years) with the mean age of 48 years. The majority (28.7%) had farming experience for 11-22 years and about 24.3% of respondents had more than 34 years of paddy farming experience. The average land area under paddy cultivation was 3.1 ha. and 91.3% of respondents were members of different farmer organizations. Different types of agricultural diseases such as leptospirosis (5.1%), kidney diseases (6.7%), muscular disorders (30.9%), and accidents such as agrochemical poisoning (5.1%), injuries (22.4%), wild elephant attacks (1.0%) and snake bites (8.4%) were prevalent in the area. Awareness of some occupational hazards was poor among respondents and extension officers. Therefore, improving awareness of occupational safety and health is needed, adopting a multi-institutional approach. Kanna meeting was identified as the most appropriate platform to conduct awareness programmes. Incorporating occupational safety and health into agricultural extension policies would be helpful to ensure farmers' well-being.

Keywords: Occupational Hazards, Paddy farmers, Agricultural extension, Anuradhapura, Sri Lanka

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Farmer's Intention to Engage in Groundwater Recharging and Management Practices: A Case Study from the *Mottapeththewa* Cascade System

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The *Mottapeththewa* cascade system is located in the *Galgamuwa* area of the *Kurunegala* District. The objectives of this study are, to estimate the factors affecting the intention of farmers to engage in groundwater recharging and management practices and to estimate the factors affecting farmers' engagement in groundwater recharging and management practices. A field survey was conducted using a questionnaire. The descriptive statistics indicate that more than half of the sample had training on groundwater recharging. The conceptual framework based on the Technology Acceptance Model consists of 7 constructs such as (i) result demonstrability, (ii) self-efficacy, (iii) perceived usefulness, (iv) perceived ease of use, (v) attitude, (vi) intention, and (vii) demographic factors. According to the results of the Structural Equation Model, result demonstrability and perceived usefulness have an indirect effect on intention ($P<0.05$) while attitude and perceived usefulness have a direct effect on intention ($P<0.05$). A probit model was conducted to find the factors affecting farmers' engagement in groundwater recharging practices. The results revealed that percolation pits are affected by education, farming experience, land area, training on groundwater recharging, annual and perennial crop types, and home gardening ($P<0.05$). Constructing percolation wells is affected by the farming experience, land area, training, vegetables, and field crops ($P<0.1$). The practice of lock and spill drain is affected by home gardening, perennials, and manual irrigation ($P<0.1$). Home gardening, field crops, and manual irrigation affect practicing runoff water harvesting trenches ($P<0.1$). The practice of organic mulching is affected by education, annuals, and vegetable crop type ($P<0.1$). The findings of the study imply that farmers' engagement in groundwater recharging practices is affected by different farm and demographic factors. Relevant authorities can use these findings for their further projects on groundwater recharging and awareness programs.

Keywords: Groundwater recharging, Percolation pits, Rainwater harvesting, Structural equation model, Technology acceptance model

Addressing Information-related Issues in Sri Lanka's Smallholder Plantation Sector: A Web-based Approach (AGISSP)

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The advent of the digital revolution has sparked a remarkable transformation in information utilisation. With the widespread accessibility of the internet and mobile technologies, it allows people to access vast knowledge and connect effortlessly, leading to an era of efficient information utilisation. However, many developing countries, including Sri Lanka, have not fully harnessed these opportunities. Despite being vital for optimal agricultural production, timely and relevant information remains overlooked. The plantation sector, crucial to Sri Lanka's economy, is currently declining, necessitating innovative solutions for its revival. Therefore, this study aimed to identify information-related issues within the smallholder plantation sector in the Western Province, Sri Lanka. Additionally, it sought to design and develop a web-based system for plantation crops, addressing the identified issues effectively. A survey involving 134 smallholder plantation growers was conducted, gathering data through structured questionnaires via online and face-to-face methods. The analysis of the data led to the creation of a web-based agricultural information system, with its frontend designed using HTML and CSS, and the backend implemented with MySQL and PHP. Survey results emphasised the importance of information like suitable varieties, fertilisers, pests and diseases in their cultivation. A significant proportion of respondents agreed that an internet-based solution could efficiently and effectively provide agriculture-related information to farmers. The development of AGISSP (Agricultural Information Systems for Smallholder Planters), a web-based agricultural information system, aimed to address their information needs. AGISSP is a user-friendly platform that offers comprehensive information related to plantation crops, their best management practises, fertiliser recommendations, and pest and disease management. Over time, agricultural systems have proven successful, addressing challenges like climate change, food security, and sustainable farming. Their effectiveness highlights the need for ongoing research and development to further improve the agricultural sector.

Keywords: Agricultural information, Agricultural system, Smallholder plantation sector, Web-based solution

Estimating the Technical Efficiency of Small-Scale Inland Fisheries: A Case from Vavunikulam Tank

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The fisheries sector comprises coastal, offshore, and inland fisheries. Inland fisheries specifically involve the exploitation of fishery resources from inland water environments. Vavunikulam is one of the largest tanks in the Mullaitivu District, Northern Province, Sri Lanka, and holds immense potential for inland fishing. This study aims to determine the level of technical efficiency and identify factors affecting the technical efficiency of small-scale fishing households. This study also focuses on the role of the National Aquaculture Development Authority of Sri Lanka (NAQDA) and the fishing society in this context. Out of the 60 fishing households using the Vavunikulam tank, 50 fishermen were selected using a convenient sampling method. Data were collected with thoughtfully designed questionnaires. A Cobb-Douglas stochastic frontier approach with an inefficiency model was used to estimate the technical efficiency and identify the determinants of the efficiency of fishermen. The maximum likelihood parameter estimates showed that fishing output was significantly and positively correlated with the number of fishing gear used and the duration of fishing. This indicates that optimizing input usage can lead to increased fish output levels. The study found that 69.80% of the deviation of observed fishing output from frontier output was due to technical inefficiency. The estimated mean of technical efficiency of the sample fishermen was about 86%, suggesting that by efficiently utilizing existing resources, the technical efficiency could be enhanced by 14%. Further results showed that education level, experience, and income from other sources were found to have a negative and significant effect on technical inefficiency, and age was found to have a positive and significant effect on technical inefficiency of fishing output. Therefore, government and policymakers should take necessary actions and foster policies to improve the technical efficiency of fishermen through providing formal as well as informal education, training programs, and credit facilities.

Keywords: Technical efficiency, Inland fisheries, Catch-rate, Stochastic frontier analysis, Inefficiency model

Demand Estimation of Household Food Waste: A case from Kurunegala District

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Household food waste is driven by consumer habits and behavior. It differs with demographic, social, and economic factors. This study aims to determine whether household food waste is a luxury good and identify how demographic and socioeconomic factors affect household food waste. For this, a Quadratic Almost Ideal Demand System (QUAIDS) model was used, which is augmented with demographic, socioeconomic, and expenditure controls. Data were obtained in October 2022 through an online survey from 195 respondents living in the Kurunegala District of Sri Lanka. Data on food habits and quantity of food waste in food categories based on the consumption of most households in Sri Lanka, namely, rice, other cereals, pulses, fruits, vegetables, meat, fish, dairy products, eggs, and miscellaneous foods. Values (expenditure) on the waste of each food category were calculated by multiplying expenditure on each food category with the percentage of waste, and then expenditure share on each category of household food waste was obtained. The demand system estimation showed that all expenditure elasticities for all food waste categories as positive, indicating that they are normal goods. Food waste categories were identified as luxury goods or necessary goods. Waste of rice, other cereals, pulses, fruits, vegetables, and miscellaneous food in the household were necessary goods, while the waste of meat products, fish, dairy products, and eggs food categories were luxury goods. Expenditure share on household food waste differs with residence area. High-income group of households shows higher expenditure shares on food waste, lowest in the low-income group, and in between among middle-income households. Expenditure shares and expenditure elasticities vary with demographic, social, and economic factors. According to the study, most households practiced different management practices and they had positive attitudes toward minimizing household food waste.

Keywords: Demand estimation, Expenditure elasticity, Household food waste, QUAIDS

Evaluating the Effect of Soil Amendments to Reduce *Ralstonia solanacearum* Population Density in a Potato-Cultivated Soil in the Up Country Intermediate Zone (IU3) of Sri Lanka

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Reducing the initial inoculum density of the pathogen, *Ralstonia solanacearum* in soil is an effective strategy to control the bacterial wilt of potato. The present study evaluated the potential of locally available soil amendments for reducing the density of *R. solanacearum* in potato-grown soils reported to have wilt infection. Four soil amendments were used namely half-burn paddy husk, rice husk biochar, and radish and mustard plant residues at a rate of 2 kg/m² on fresh weight basis. Fresh wild sunflower (*Tithonia diversifolia*) leaves (2 kg/m²) with Urea (20 g/m²) and CaO (200 g/m²) was used as an already identified soil amendment effective for wilt pathogen. A treatment with no soil amendment served as the control. Potato var. Granola was planted two weeks after the incorporation of the soil amendments. The field experiment was arranged as a randomized block design with three replicates. Soil samples were collected five times (i.e. before the addition of soil amendments, at the time of planting, and one, two, and three months after planting (i.e. harvesting)) and plated on TZC medium by dilution plate technique. The virulent pathogen density in soil was calculated based on the colony morphology of *R. solanacearum* on the TZC medium. The density of the virulent *R. solanacearum* in soil varied significantly ($p<0.05$) due to the interaction effect of sampling times and treatments. Half-burn paddy husk, *Tithonia*+Urea+CaO (TUC) and radish residues reduced the virulent pathogen density significantly from the time of planting until the harvesting stage. At harvesting, the lowest pathogen density was reported by the TUC amendment. Mustard residues reduced the pathogen density from one month after planting. Rice husk biochar significantly reduced the pathogen density, except for two months after planting. The study confirmed the tested soil amendments' effectiveness in reducing bacterial wilt.

Keywords: Bacterial wilt, Brassicaceae crop residues, Wild sunflower

Acceptability of Liquid Fertilizer Produced from Sewage Sludge in Wastewater Treatment Plants by Sri Lankan Community

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Wastewater recycling is an important resource efficiency pillar in a sustainable city. Several countries are resolving the safe senatorial issue with the expansion of wastewater treatment while introducing a new issue on the handling and disposal of sewage sludge (SS). Hydrothermal carbonization (HTC) is a thermochemical technique for processing high moisture biomass at a specified temperature and autogenous pressure. This study investigates the social acceptability of liquid fertilizer from hydrothermal carbonization of SS (LFHTC) by Sri Lankan community. A questionnaire survey was used to collect relevant data from selected organic fertilizer distributors/sellers, users of organic and chemical fertilizers, and organic food consumers who represent the community after conducting a stakeholder analysis. The purposive sampling method was used. A total of 105 responses were received from 3 categories of respondents. Furthermore, the reasons for accepting or rejecting the LFHTC in the market, as well as the properties that need to be included in LFHTC for commercialization, were explored. The responses were as: 75% of organic fertilizer distributors accept future sales of the LFHTC, 84% of fertilizer users show the acceptance of using LFHTC for their cultivations, and 74% of organic food consumers show willingness to consume foods made with LFHTC. The highest percentage of fertilizer distributors/sellers have accepted considering that LFHTC would be an environmentally friendly product. Based on the responses of fertilizer users, the highest percentage of them accepted that the LFHTC would be environmentally friendly and its practices in other countries has produced successful outcomes. The distributors/sellers and users who have rejected the LFHTC, believed the lack of trust in the quality of the SS product. Also, the survey results emphasized that fertilizer users pay too much attention on fertilizer properties such as the nutrient level (N, P, K) when purchasing, the easiness of use and the price.

Keywords: Hydrothermal carbonization, Nutrient level, Organic fertilizer users, Purposive sampling method, Questionnaire survey, Social acceptability.

Impact of Threshing Method on Black Pepper Pericarp and Processing Procedures on Fungal Infection of Black Pepper (*Piper nigrum* L.)

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Black pepper (*Piper nigrum* L.) can be used in human foods for flavoring, and to incorporate aroma. Good Agricultural Practices can reduce the toxigenic fungi growth and dissemination in the post-harvest process of black pepper. Mechanical damage to the plant material during post-harvest manipulation may increase the possibility of subsequent fungal contamination. Therefore, the study aimed to find the damage percentage of the black pepper fruit's pericarp due to the facilitation of different threshing methods and the potential of fungal infections on black pepper due to the facilitation of different processing procedures in the processing chain. Three types of threshing methods, two types of blanching, and two types of drying methods were used as treatments. To determine the damage percentage of the black pepper, physical counting was used and to determine the fungal infection rate, the Serial dilution method and agar plate method were used. Minimum pericarp damage (17.62%) resulted in the hand-picked sample and maximum pericarp damage (93.89%) resulted in machine threshed sample. The fungal infection rate was significantly lower (1.4×10^4 Colony forming units/ml) in hand-picked samples compared to other treatments (Foot Threshed: 1.5×10^4 Colony forming units/ml, Machine Threshed: 4.6×10^4 Colony forming units/ml), because the damage to the spikes and the pericarp of the pepper fruits were minimal. The fungal infection rate was significantly higher in sun-dried and without-blanching samples as it took much time to dry the pods (Sun-dried- without blanching: 4.7×10^4 colony forming units/ml and machine-dried and blanched: 0.22×10^4 colony forming units/ml). Therefore, hand threshing, blanching, and machine drying were the best practices in the black pepper processing chain. If practiced machine threshing and foot threshing, it is essential to follow blanching and machine drying to minimize fungal infection.

Keywords: Black pepper, Damage percentage, Fungal contamination, Processing procedures

Evaluation of Impact of Climatic Factors on Tea Yield -A Case Study in Badulla Region

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Tea, *Camellia sinensis* is a perennial plant grown for decades sustaining various climatic conditions. The physiological activities of tea plants, including their growth and development, are significantly influenced by climatic parameters such as rainfall, temperature, sunshine hours, and relative humidity. Responses of tea plants for climatic parameters vary region wise. Therefore, this study was carried out to determine the impact of climatic parameters on tea yield in the Badulla region. Thirty years of climate and tea yield data were collected from Ury Estate, Badulla, and TRI Advisory and Extension Center, Uva and trend analysis was performed to determine changes in tea yield in response to climatic parameters. Lag periods were taken into consideration to analyze the effect of climatic conditions from previous months on tea yield. Three models were developed for green leaf yield, using Multiple Linear Regression, Generalized Linear Model, and Deep Learning. The linear relationship between tea yield and climatic parameters was identified through correlation analysis. The trend analysis showed significant trends with respect to different climatic parameters. Both green leaf and made tea yields have decreased over the years, due to climate change. Sunshine hours gave the highest positive correlation at a 5% significance level ($P \leq 0.05$) with both green leaf and made tea yield ($r = 0.40$ and $r = 0.45$). Average temperature also showed correlations ($r= 0.336$ and $r=0.383$) with green leaf and made tea yield respectively. Of the three models developed, the Deep Learning model demonstrated the best performance, exhibiting the least error value and the highest correlation ($r=0.73$) between actual and fitted values. Hence this model can be effectively utilized to predict tea yields based on changes in climate parameters of the studied locations of this study.

Keywords: Climate change, Machine learning, Regression analysis, Tea cultivation, Tea yield

Phylogenetic Analysis of Indigenous Dwarf Cattle Population in Sri Lanka

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The Sri Lankan indigenous cattle population is under a threat of genetic admixing in the context of production-oriented breeding policies. Genetic differentiation of existing populations and identifying the uniqueness are important for the sustainable utilization of the indigenous genetic resources in attempts taken to curb losing adaptive genetic characteristics of house populations. Hence, this research was conducted to construct phylogenetic structure to identify the placement of the phenotypically short, local non descriptive cattle population in Northern Province of Sri Lanka (Northern Local Cattle; NLC) compared to selected Sri Lankan local cattle populations and different populations of genus Bos. A total of 11 DNA sequences with 708 bases long segments of mtDNA D-loop region were generated from genetically unrelated Sri Lankan local cattle populations which includes five samples of NLC population, three samples of Lankan cattle and three samples of Thawalam cattle. Molecular variance analysis recorded 14 variable sites among local cattle populations producing eight singleton variable sites and six parsimony informative sites. Six of the eight singleton variable sites were unique to NLC population which is relatively a high polymorphism. The 11 DNA sequences of local cattle were aligned with 23 cattle D-loop sequences from countries in the region available in the National Center for Biotechnology Information database to analyze evolutionary development and diversification. The phylogenetic tree assigned the NLC population under the distinct clade of *Bos indicus* with close evolutionary divergence of two South Indian dwarf cattle populations (Kasaragod and Trinket) which are in geographical proximity with each other. This observation suggests a genomic inheritance of NLC population could be traced back to South Indian cattle. Thus, the clearly distinguishable short body morphology in NLC population might be a result of their genomic inheritance from the South Indian dwarf cattle populations as well as the generations of isolated breeding.

Keywords: Northern Province local cattle, Polymorphism, Phylogenetic analysis, Genomic inheritance

Effect of Nutmeg Peel Extracts on Survival of Aphids (Hemiptera: Aphididae) on Chilli

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Nutmeg (*Myristica fragrans* Houtt.) peel is the outermost fleshy part of the fruit and accounts for almost 80% of the total fruit weight; however, it carries less economic importance compared to the mace and kernel. During the harvesting season, the nutmeg peel is discarded in large quantities as a waste. The current study is aimed to evaluate the potential of using an aqueous extract of nutmeg peel as an insecticide for controlling aphids in chilli. An aqueous extract of the peel was prepared using cleaned, mature, and fresh fruits. The peel extract was diluted to prepare a concentration series of 100%, 75%, 50%, 25% and 12.5%. A plant house experiment was set following a completely randomized design layout with ten replicates for each of the five treatments along with a control. Ten adult aphids (*Aphis fabae*) were introduced to each chilli plant and the peel extract was applied using a hand sprayer ensuring even coverage of the entire plant. The number of aphids that survived after 24-hrs and 48-hrs after the treatment were counted. An analysis of variance was conducted for the survivability of aphids and a mean comparison was conducted using the Fisher LSD test at 0.05 significance level. Results of the experiment revealed significantly ($p=0.000$) lower aphid survival when they were treated with 100%, 75%, and 50% peel extracts compared to the control at both observational points, and there was no significant ($p>0.05$) difference among those three treatments. Hence, an aqueous extract of nutmeg peel (up to a 50% dilution), has a potential to be developed as a botanical pesticide to control aphids. Processing the peel extract into a botanical pesticide will add economic value to the nutmeg peel and can be further investigated to uncover its potential as a pesticide.

Keywords: Agricultural waste, Botanical pesticide, Nutmeg peel, Pest control

Acknowledgement: The authors wish to acknowledge the funding from Multidisciplinary Research Grant – 263 provided by the University of Peradeniya.

Extraction and Characterization of Starch Derived from Buthsarana (*Canna indica*), Hulankiriya (*Maranta arundinacea*) and Kiri Ala (*Xanthosoma sagittifolium*) Grown in Sri Lanka

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Starch provides 50–70% of the energy requirement in the human diet. In addition, starch has a great potential to serve as an important ingredient in the food industry due to its unique properties. Different types of roots and tuber crops grown in Sri Lanka can be used as a source of starch to be utilized in various food applications. However, most of them are considered underutilized crops. The extraction and characterization of starches from these underutilized crops hold significant value, as they can be effectively used in various applications. Therefore, the objective of this study was to extract and characterize the starches derived from Buthsarana (*Canna indica*), Hulankiriya (*Maranta arundinacea*) and Kiri Ala (*Xanthosoma sagittifolium*). Starch was extracted using the wet processing method, followed by vacuum drying and sieving. Starch granules were observed under the light microscope. Moisture content, bulk density, and yield were determined using standard methods. Amylose content was determined using the colourimetric method. Centrifugation methods were used in the determination of water holding capacity, oil holding capacity, solubility and swelling power. Round or oval shaped starch granules were observed in *C.indica* and *M.arundinacea* starches, and round or hemispherical shaped granules were observed in *X.sagittifolium*. Moisture content and bulk density of starches varied in the range of 10.17-11.31% and 0.48-0.71 g/cm³, respectively. The highest amylose content (24.73%) was observed in *C.indica* starch. There were no significant differences ($p>0.05$) in oil holding capacity and solubility among starches. Water holding capacity of starches varied in the range of 0.43-0.58 g/g. The swelling power of *C.indica* (13.93 g/g) starch was significantly higher ($p<0.05$) compared to that of *X.sagittifolium* (5.62 g/g) and *M.arundinacea* (7.63 g/g) starches. The study revealed that the selected underutilized root and tuber starches possess promising physico-chemical properties, making them potential ingredients in the food industry.

Keywords: Starch, physico-chemical properties, Underutilized root and tubers

Acknowledgement: This research was supported by the University of Peradeniya through University Research Grant (grant no: URG/2022/02/Ag)

Assessing Evapotranspiration and Environmental Factors in the Upper Montane Forest at Horton Plains and The Eucalyptus Plantation Forest on its Eastern Slope

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The Horton Plains National Park (HNP) and its upper montane forest (UMF) play critical roles in Sri Lankan agriculture as the origin of three major rivers. Evapotranspiration is a major component of the water balance of this ecosystem. Our objectives were to, (a) compute the reference evapotranspiration (ET_o) of UMF-HNP, defined as the evapotranspiration of a vegetation surface not experiencing water deficits, (b) determine its controlling factors and (c) compare it with ET_o of the Eucalyptus plantation forest (EuF) on the eastern slope of HNP. Automated weather stations were established at HNP and in EuF at Ohiya to record climatic data at one-minute intervals. The FAO Penman-Monteith equation was used to compute per-minute ET_o . Leaf area index (LAI) of UMF-HNP (2.089 ± 0.054) was measured using hemispherical photography. LAI of EuF was computed as the median (2.61) of 46 published values. Canopy surface resistance was computed as the ratio between leaf stomatal resistance (r_l) and $0.5 \times LAI$. Median of 41 published values of r_l (138.89 s m^{-1}) was used for EuF whereas a standard value of 100 s m^{-1} was used for UMF-HNP. Aerodynamic resistance was computed as a function of canopy height, surface roughness and wind speed. Per-minute calculations of day-time ET_o were summed to daily ET_o . Over the 69-day period of calculation, UMF-HNP had greater cumulative ET_o (123.39 mm) and daily mean ET_o ($1.788 \pm 0.081 \text{ mm d}^{-1}$) than EuF (55.39 mm and $0.803 \pm 0.056 \text{ mm d}^{-1}$). In both ecosystems, daily ET_o showed highly-significant ($p < 0.0001$) positive linear relationships with daily total solar irradiance (S_R), air temperature (T_a) and vapour pressure deficit (VPD) while showing significant ($p < 0.01$) second-order polynomial relationships with daily mean wind speed (W_s). Paired t-tests showed significantly ($p < 0.0001$) greater daily ET_o , S_R and W_s and lower T_a in UMF-HNP than in EuF. The higher ET_o was primarily caused by the higher S_R .

Keywords: FAO Penman-Monteith equation, Evapotranspiration, Climatic variables, Solar irradiance, Canopy surface resistance, Aerodynamic resistance

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Effectiveness of Poultry Litter Biochar on Improving Soil Quality of Vegetable Cultivating Degraded Lands in the Central Highlands of Sri Lanka

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Frequent use of poultry litter (PL) by commercial vegetable cultivating farmers in Sri Lanka has not contributed to an increase the soil organic matter content but contributed to the build-up of excessive levels of phosphorus (P). This study aimed to assess the effectiveness of the application of PL biochar (PLB) as an alternative technology to improve soil quality in these cropping systems. A field experiment was conducted with four consecutively cultivated crops within a year in a highly degraded field at Marassana with 6 treatments, containing the same quantity of organic carbon (OC) in PL and PLB as a soil amendment and with or without recommended rates of chemical fertilizers (CF). Soil properties were analyzed at the beginning and end of the experiment. The yield and nutrient uptake were measured at the end of each crop. Changes in soil quality after the four seasons were assessed using a soil quality index (SQI) developed for these cropping systems. The PLB amended treatments increased ($p<0.05$) pH probably by reducing exchangeable acidity and increasing basic cations. Soil OC% was greater in PLB treatments and the increase was 47.3% in PLB+CF and 38.9% in PLB when compared with the control. The application of PLB improved the CEC in these soils and the increase was significant in PLB+CF treatment. Greater dry matter yield was observed in PLB+CF treatment ($p<0.05$) for all crops when compared to the currently practiced PL+CF treatment. Improvements in soil quality with PLB could be the reason for better yields. Conversion of PL into PLB and their application in degraded vegetable cultivating soils brought significant improvement in soil quality and productivity compared to the currently adopted CF+PL soil fertility management practice in Marassana.

Key words: Intensive vegetable cultivation, Poultry litter, Poultry litter biochar, degraded soil, Soil quality, Productivity

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Identification of Causal Organism/s of Recently Recorded Diseases of Fishtail Palm (*Caryota urens*)

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Unreported diseases of fishtail palm (*Caryota urens L.*) were observed in Sabargamuwa, Western and Southern provinces of Sri Lanka. Infected palms showed leaf spots and leaf blight as symptoms. The present study was conducted to isolate the causal organism/s of these diseases and identify them by morphological and molecular methods and to prove the pathogenicity of the identified causal organism/s. pathogens were isolated from infected leaves on Potato Dextrose Agar (PDA). Two isolated fungal isolates (i.e., A and B) were identified by morphological and molecular identification. Pathogenicity was confirmed for both fungal isolates by detached leaf tests and pot experiments using a spore suspension (1×10^5 ml) of each fungal isolates A and B. Sterilized water was sprayed on healthy plants serves as a negative control. Genomic DNA of the fungal isolates were subjected to PCR using ITS1 and ITS4 primers and DNA sequencing and homology search was done. The conidia of fungal isolate A were fusiform, five-celled, with three median versi colored cells and two terminal hyaline cells, and the size ranged from $21.72 - 33.03 \mu\text{m} \times 5.58 - 37.78 \mu\text{m}$. The basal appendage was hyaline, tubular, and unbranched, whereas there were two to three tubular, unbranched appendages. The conidia of fungal isolate B were bi-celled, one septum, thick-walled, have dark brown pigmentation with longitudinal striations. According to BLAST homology search, isolates A and B were highly homologous with *Pestalotiopsis spp.* (98.83%), and *Lasiodiplodia thermobromae* (99%), respectively. Artificial inoculation of detached leaves and pot experiment reproduce the symptoms and inoculated pathogens were reisolated, confirming their pathogenicity. This is the first report of leaf spots and leaf blight on fishtail palm caused by *Pestalotiopsis spp* and *L. thermobromae* respectively in Sri Lanka.

Keywords: Fishtail palm, *Lasiodiplodia spp*, Leaf diseases, Pathogenicity, *Pestalotiopsis spp*

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Consumer Perceptions and Potential Buying Behaviour of Fresh Cut Vegetables: Findings of a Survey of Sri Lankan Households

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Demand for convenience is a characteristic of modern lifestyles. Convenient foods are expected to be safe, nutritious, and high-quality. Fresh-cut vegetables (FCVs) are a prime food tech solution for modern fast-paced lives. Consequently, there is a market niche for FCVs. While many developed countries have already introduced FCVs into their markets and perceive notable growth potential in the future, the Sri Lankan market has so far not shown such developments. The study aimed to explore consumer perceptions and potential buying behaviour of FCV market in Sri Lanka. The study was conducted as a cross-sectional e-survey in Sri Lankan households. Data were collected utilizing Google Forms, and participants were invited through online social networking platforms and emails on a voluntary basis. A total of 1486 responses were received. The respondents had an average age of 36 years, with the majority being female (90%) and married (75%). Potential buyers comprised 63% of the total sample. Among the potential buyers, 46% claimed that they would purchase a product once a week. The primary reason for not purchasing FCVs was linked to the perception of lower hygiene conditions (19%) among the available FCVs. The main driving factor for buying FCVs by potential buyers was convenience (65%). Expiry date (29%) followed by information about preservative treatments (26%) were the highest sought labelling information on the product packages whereas only 0.20% sought logos of quality standards. The majority of the participants (66%) preferred eco-friendly packaging over other types of packaging. In relation to disinfectant usage, 46% of the potential buyers preferred natural disinfectants and NaCl (40%) was the major choice of disinfectant. Based on the findings, it can be concluded that Sri Lankan household consumers prefer FCVs due to their convenience, and they focus on high-quality, food safety, and comprehensive product information.

Keywords: Fresh cut, Vegetables, Buying attributes, Consumer perception, Buying behaviour

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Relationship between Place Poverty, People Poverty, and Crop Diversification (CD) in Moneragala District

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Crop diversification (CD) involves shifting from subsistence food crops to market-oriented ones. Moneragala, the second poorest district in the country, has implemented CD programs to combat poverty. However, some areas have been slow to practice these programs, with farmers' still practicing traditional Chena cultivation. This study aims to explore the relationship between place poverty, people poverty, and CD in the district. While many studies focus on how CD helps alleviate poverty, this research examines poverty as a barrier to practice CD. Using a positivistic approach and quantitative research methods, data was collected from secondary sources and analysed using spatial statistics: Moran'sI statistic and spatial regression model. Results revealed CD clusters in the western part of the district, where less place poverty, and less people poverty. Conversely, place and people poverty clusters in the Eastern and Southern parts show less prevailing CD. This indicates that CD programs have not effectively reduced poverty in the area, as the clusters do not coincide. OLS model statistics demonstrate that place poverty variables are not statistically significant, meaning they do not sufficiently explain CD's spatial distribution. However, people poverty variables (Income, Food vulnerability, and Education) are significant and explain CD's spatial distribution. The negative relationship between people poverty and CD implies that an increase in CD leads to a decrease in people poverty and vice versa. While the model effectively explains CD's spatial distribution, it highlights that both place poverty and people poverty restrict access to CD in certain areas. The recommendations provided can contribute to the development of targeted interventions and policies that aim to alleviate poverty through the promotion of CD in the district. Future studies should incorporate field data and a humanistic approach to understand why farmers in impoverished areas are reluctant to adopt CD.

Keywords: Crop diversification, Place poverty, People poverty, Spatial statistics

Rapid Nondestructive Grading of Agarwood Oil Using Near-Infrared Spectroscopy

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Agarwood oil is produced by using resinous wood that forms in Thymelaeaceae family trees due to its self-defense mechanism at stress. Though the oil is extremely rare and highly valued, there is no quick quality detection methodologies have been developed to support the trade. This study presents rapid and noninvasive technique for grading agarwood oil utilizing shortwave Near-Infrared (NIR) spectroscopy by focusing on three distinct grades of agarwood oil (AA, AA+, and AAA). The samples were procured from an agarwood grower and perfume producer in Sri Lanka. Transmittance spectra were obtained at 558-1100 nm range for 4 mm path length by using a customized NIR instrument. Samples were replicated thrice and the reference analysis of the agarwood oil samples was carried out using Gas Chromatography-Mass Spectrometry (GC-MS) to validate the findings. Partial Least Square (PLS) regression was established and optimized using multivariate chemometric software Pirouette 4.5 (Infomatrix.inc Woodinville, WA, USA). GC-MS analysis revealed four common chemical compounds shared among all grades of agarwood oil, namely Pentanoic acid, n-Hexadecanoic acid, (3S,3aS,6R,8aS)-3,8,8-Trimethyl-7-methyleneoctahydro-1H-3a,6-methano azulene, and Longifolene. Based on the NIR spectral data and GC-MS analysis, PLS models were optimized, leading to the identification of the best configurations for each dependent variable. Remarkably, the optimized PLS models successfully predicted the Pentanoic acid content ($SEP=0.14751$, $R^2=0.743547$) accuracy. Notably, a specific wavelength at 1012 nm displayed a significant correlation to Pentanoic acid content ($R^2 = 0.9716$), suggesting its potential application in the development of a single-wavelength, cost-effective device for agarwood oil grading. The study underscores the substantial potential of NIR spectrometry as a practical tool for quality control and grading of agarwood during the oil production process and the trading.

Keywords: Agarwood oil, Grading, Near-infrared spectroscopy, Nondestructive, Gas Chromatography-Mass Spectrometry

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Changes in Total and Available Phosphorus Contents in Poultry Litter Biochar Co-pyrolyzed with Eppawala Rock Phosphate at Different Temperatures

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Availability of phosphorus (P) in Eppawala Rock Phosphate (ERP) and poultry litter (PL) can be increased by heat treatment. The objective of this study was to determine the effect of temperature on total and available P contents in poultry litter biochar (PLB) when co-pyrolyzed with ERP. Poultry litter was slow pyrolyzed at 350, 500, 650 and 900 °C, with 0%, 1% and 5% (w/w) ERP with a heating rate of 10 °C/min and residence time of 2 h. ERP was also heated to same temperatures without mixing them with PL. Total and Mehlich-3 extractable P (Av-P) contents were determined in the heat treated mixtures. Total P content in ERP was decreased significantly ($p<0.001$) when heated beyond 650 °C. ERP heated at 350 °C had significantly ($p=0.013$) higher available P content (0.807%) than untreated ERP (0.70%). A significant interaction effect ($p<0.005$) between temperature and PL:ERP rates on the Av-P in co-pyrolyzed PLBs was observed. While Av-P content did not significantly change when the temperature was increased in PLBs co-pyrolyzed with 0 and 1% ERP, it increased from 0.68% to 1.50% when PL was co-pyrolyzed with 5% ERP at 650 °C. Increasing the temperature further decreased Av-P content in PLB with 5% ERP. Total P content however was affected only by temperature main effect ($p<0.005$) where it increased by 25% from 3.2% at 350 °C to 4.4% at 650 °C and then decreased to 2.0% at 900 °C probably due to P volatilization at temperature beyond 760 °C. The present study confirms that co-pyrolysis of PL with ERP at 650 °C improves the P availability in PLB and the effect vary with the PL:ERP ratio. It was concluded that co-pyrolyzing PL with ERP is a potential technology to utilize ERP as a P source in annual crop production systems.

Keywords: Biochar, Co-pyrolysis, Eppawla rock phosphate, Volatilization

Development of Fiber-enriched Chicken Sausage by Incorporating Rice Bran and Underutilized Millets in Sri Lanka

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Chicken sausage is considered to be a delicacy and protein-rich addition to the diet, in particular for breakfast. The low content of dietary fiber in chicken sausages limits their demand and requires other foods additions to the diet. Fiber plus protein keep the body energized until the next meal. In particular, fiber-rich diet combined with other nutrients offer balanced nutrition and good gut health. Therefore, the objective of this research is to develop and characterize fiber-enriched chicken sausages by incorporating rice bran and underutilized millets in Sri Lanka. The three formulations of fiber-enriched chicken sausages were prepared by replacing 7% of chickpea flour and chicken with finger millet (*Eleusine coracana*), foxtail millet (*Setaria italica*), and proso millet (*Panicum miliaceum*) separately. Three more formulations were prepared by replacing 10% of chickpea flour and chicken with 7% of these millets each, along with 3% of rice bran. As the experimental control, a sausage was prepared without the addition of millets or bran. The prepared sausages were analyzed for their proximate composition, water holding capacity, sensory and microbial count. Water holding capacity of the sausages with only millets showed significantly higher values than control ($P < 0.05$). Crude fiber content of all sausage samples incorporated millets and rice bran showed significantly higher values ($P < 0.05$) than control, showing the highest fiber amount in sausage with finger millet with rice bran (2.89%). Total plate counts of all sausage formulations were below the limit 1×10^5 cfu. Sausages containing proso millet and foxtail millet exhibited the higher overall acceptability for organoleptic properties than the control. Therefore, millets and rice bran are potential candidates for enhancing the fiber content of chicken sausages, which can be incorporated into meals like breakfast.

Keywords: Finger millet, Proso millet, Foxtail millet, Underutilized, By-products

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Utilization of Broiler Slaughterhouse Wastewater Sludge to Formulate Low-Cost Ornamental Fish Feed

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Ornamental fish industry is an emerging sector in Sri Lanka which generates substantial export revenue. With the shortage of animal feed ingredients and the consequent surge in formulated fish feed prices, Sri Lankan ornamental fish farmers face a significant challenge in maximizing their profit. Repurposing broiler slaughterhouse waste as an animal feed ingredient offers an eco-friendly strategy to address this feed ingredient scarcity. Therefore, this study aimed to formulate a cost-effective ornamental fish feed utilizing dried broiler wastewater sludge as a feed ingredient. Three experimental feeds incorporating different levels of sludge (10%, 15%, and 20%) by substituting fishmeal were formulated, with a commercial fish feed as the control. Proximate composition, floatability, stability, and the presence of *Escherichia coli* and *Salmonella* sp. were analyzed. Crude protein (CP) values in all the experimental feeds were significantly higher ($p<0.05$) than the control (29.43%) while the highest CP value showed by 10% sludge inclusion feed (37.21%). As the presence of sludge inclusion rose, there was a significant reduction in the crude protein content, ($p<0.05$). Nevertheless, all the tested diets successfully met the ornamental fish's CP requirement within the range of 35-45%. Pellet stability displayed no significant differences among the experimental feeds ($p>0.05$), but the floatability of the commercial feed has surpassed significantly (100%) that of the experimental feeds ($p<0.05$). Importantly, all feed samples tested negative for the presence of *E. coli* and *Salmonella* sp. The results of cost analysis revealed that feed costs can be effectively decreased by incorporating broiler slaughterhouse waste as a partial substitute for fish meals. Therefore, the broiler wastewater sludge can be effectively utilized as a fish feed ingredient and this research highlights the potential of utilizing broiler wastewater sludge as a valuable resource in the realm of feed production, offering both economic and nutritional benefits.

Keywords: Broiler, Ornamental fish, Wastewater sludge, Pellet stability, Pellet floatability

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Agro-Voltaic Simulation for Dry Areas in Sri Lanka

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According to the United Nations, the sustainable development goals of food security and sustainable energy are in the top of the agenda. This research proposes a solution that addresses both of the above SDGs while providing a water supply that allows farming for three seasons, in contrast to two seasons as of now. In order to demonstrate the above objective, a simulation study was carried out in a tomato farm situated at the dry zone. In addition to the base case, an agro-voltaic solution was simulated by incorporating transparent solar arrays and solar pump. Tomato harvest yield under different irradiance and the amount of water quantity supplied to the crop per three days was simulated using the DSSAT agricultural simulation software. Power generation was also predicted by varying the number of strips of PV cells to obtain the required irradiance level. GRUNDFOS software was used to design the solar water pump. After conducting the economic analysis it was found that two-strip and three-strip PV panels in contrast to six strips in a typical solar module will provide the optimal agricultural and energy yields. As the proposed solution provides an optimum combination of power generation and food production, it would be a good source of income for farmers, while also contributing clean energy to the grid.

Keywords: Agro-voltaic, Optimum level, Energy and water scarcity, Dual benefits, solar farming, Economic analysis

Comparison of Rearing Substrates and Moisture Contents for Producing Black Soldier Fly Larvae as Animal Feed Protein

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The overdependence on imported animal protein ingredients and the current crisis with increasing feed costs justifies a sustainable supply of animal feed ingredients, particularly protein sources. The black soldier fly (*Hermetia illucens*) larvae (BSFL) are a promising insect protein that can be reared on various organic materials such as farm manure but is still novel to Sri Lanka. Considering the critical impact of substrate moisture content (MC) on BSFL production, the effect of substrate MC on the performance and nutritional quality of BSFL reared on various substrates was evaluated in two experiments (Exp.). In Exp. 1, BSFL were reared on five substrates; layer chicken feed (control), cattle manure, poultry manure (PM), swine manure, and vegetable waste (VW), and four MCs; 45, 65, 75, and 85%. Based on the bioconversion performance in Exp. 1, two optimum substrates; VW and PM, and two optimum MCs; 75% and 85%, were selected for Exp. 2., in which five substrate compositions (0% VW + 100% PM, 100% VW + 0% PM, 25% VW + 75% PM, 50% VW + 50% PM, and 75% VW + 25% PM) were prepared. Two MCs (75% and 85%) were maintained to evaluate varying MC on different substrate compositions rearing BSFL. Both experiments were conducted as two-factor factorial, completely randomised designs (Three replicates/treatment and 80 BSFL/replicate). Based on the results of bioconversion efficiency in Exp. 2, the optimum substrate composition and MC for BSFL production were 100% VW + 0% PM and 85%, respectively. The cost-benefit ratio (B/C) for 100% VW + 0% PM across different BSF production settings such as a commercial BSF production unit, mixed crop farm, animal farm and crop-animal integrated farm was compared. The results indicated higher B/C for BSFL production using 100% VW + 0% PM in both crop-animal integrated and mixed crop farms, whereas, in the latter, BSFL can be utilised *in situ* for feeding animals.

Keywords: Black soldier fly, Protein, Manure, Moisture, Poultry

Acknowledgement: This research was funded by New Bernards Animal Feeds (Pvt.) Ltd. Udubaddawa, Sri Lanka.

Use of Seed Priming Techniques for Improving Seed Germination in Selected Cucurbits and Oil Seed Crops

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Good quality seed production as planting materials is very important for a better agricultural production. However, part of those seeds gets rejected during the final stage of seed certification due to poor germination. Seed priming is one possible option to improve seed quality to overcome that problem. This study was conducted to identify the effects of Halo-, Hydro- and Osmo-priming methods on germination of accepted and rejected seeds of Bitter gourd, Snake gourd, Groundnut and Sesame. The experiment was conducted at the Seed Certification and Plant Protection Center, Gannoruwa in 2022. Seeds were primed with 2% NaCl (Halo), Distilled water (Hydro) and, 5% Poly-Ethylene Glycol (Osmo) for 16 hours at 25 °C and then air-dried back to the initial moisture content. Experiment was a two-factor factorial in a completely randomized design with three replicates having 100 seeds per replicate and the non-primed treatment was used as the control. The germination percentage was calculated and the results revealed that different priming methods had significant effects on seed germination. All three priming methods caused significant ($P<0.05$) increase in seed germination in both rejected bitter gourd ($F=8.06$) and snake gourd ($F=2.43$) seeds. Halo-priming exhibited the greatest improvement in the germination of the rejected bitter gourd seeds. None of the tested priming methods could improve the germination of rejected groundnut seeds ($P>0.05$). Osmo-priming accounted for significantly greater germination in accepted bitter gourd seeds. All three tested priming methods increased germination in accepted groundnut seeds while halo-priming accounted for the highest. None of the tested priming methods had any effect on accepted sesame seeds germination. Therefore, Halo-, Hydro- and Osmo-priming methods are good for improving the germination ability in rejected snake gourd and bitter gourd seeds. Nevertheless, these same three seed priming techniques are not applicable for improving germination in rejected groundnut and sesame seeds.

Keywords: Bitter gourd, Groundnut, Halo priming, Hydro priming, Osmo priming, Seedling vigor.

Effect of Supplementation of Gliricidia (*Gliricidia sepium*) Leaves in Guinea Grass (*Megathyrsus maximus*)-based Diets for Dairy Cattle: Diet Composition, Milk Yield, and Milk Composition

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The current research was conducted to investigate the effect of supplementing gliricidia on diet composition, feed intake, milk yield, and milk composition of lactating dairy cows. Nine crossbreed (Jersey × Sahiwal) lactating dairy cows at their mid-lactation were assigned into three groups in a completely randomized design. The three groups were fed separately with guinea grass-based diets supplementing varying levels of gliricidia (10, 15, and 30%; 22.7% dry matter). The animals were fed *ad libitum* and feeding was done twice daily over 26 days. The daily milk yield of each animal, feed intake, and the compositions of major milk constituents were measured daily. Animals were carefully monitored for any abnormal signs of behaviour during the experimentation period. The proximate compositions and energy contents (gross energy, MJ/kg) of gliricidia, Guinea grass, and the three experimental diets were also determined. Guinea grass contained approximately 6% crude protein, 1.6% crude fat, 37% crude fibre, and 15.2 MJ/kg energy. The supplementation of gliricidia significantly increased the crude protein (~10, 13, and 15% for 10, 15, and 30% supplementation levels, respectively), crude fat (~1.8, 2.1, and 2.5% for 10, 15, and 30% supplementation levels, respectively), and energy contents (~15.6, 16.0, and 16.2 MJ/kg for 10, 15, and 30 inclusion levels, respectively) of the basal diet while proportionately decreasing the crude fibre contents (34.4, 32.9, and 24.5% for 10, 15, and 30 supplementation levels, respectively). The average daily milk yield of the cows increased proportionately to the level of gliricidia supplemented in the basal diet. The mean increased milk production was 0.7 ± 0.11 , 0.96 ± 0.41 , and 2.23 ± 0.08 L/day for 10, 15, and 30% supplementation levels, respectively. Supplementation of gliricidia increased fat, solid non-fat (SNF), protein, and total solid contents in milk ($P>0.05$). Feed intake (44-50 kg/day) of the animals remained the same before and during the experimentation period suggesting no effect on feed intake. Results conclude that 30% inclusion of gliricidia significantly increases the nutritive value of the guinea grass basal diet and milk yield of lactating dairy cattle without any negative effects on feed intake.

Keywords: Crude protein, Dairy cattle diet, Lactation diets, legumes, Gliricidia supplementation

Enhancement of the Aroma Profile of Cold-Water-Soluble Instant Black Tea by Using Encapsulated Black Tea Aroma

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The value of cold-water-soluble instant black tea (CWS-IBT) can be further enhanced by the reincorporation of tea aroma generated during instant tea manufacture. However, the tea aroma generated from the spinning cone column machine during the extraction of soluble solids from tea is hardly usable for this purpose due to its much-diluted aqueous nature. Therefore, this study explored the potential of improving the aroma quality of CWS-IBT by incorporating encapsulated black tea aroma. Tea aroma extract mixed with maltodextrin and gum arabic was freeze-dried to obtain encapsulated black tea aroma. The minimum level of incorporation of encapsulated black tea aroma that distinctively enhances the aroma profile of CWS-IBT was determined by conducting two triangle tests with 0.5% and 1.0% (w/w) levels of incorporation of encapsulated black tea aroma using thirty untrained panelists. The aroma profile of the selected sample was analysed at 45-day intervals for three months. Solid-phase microextraction-gas chromatography-mass spectrometry technique was used for aroma profile analysis. Sensory data were evaluated using a standard table and physicochemical data were subjected to Analysis of Variance using Minitab (Version 17) software. Panelists were able to notice a distinctive difference in the aroma of the CWS-IBT incorporated with 1.0% of encapsulated black tea aroma. Compounds with pleasant odours such as geraniol ($8.34 \pm 0.78\%$), linalool ($6.05 \pm 0.88\%$), (E)-cinnamaldehyde ($5.88 \pm 0.36\%$), benzaldehyde ($3.60 \pm 0.30\%$), β -ionone ($3.47 \pm 0.03\%$), benzyl alcohol ($2.39 \pm 0.23\%$), and methyl salicylate ($1.41 \pm 0.19\%$) were among the 30 volatile compounds identified in the aroma incorporated CWS-IBT. These compounds were more stable during storage. Thus, the incorporation of 1.0% encapsulated black tea aroma into CWS-IBT is sufficient for achieving a distinctive enhancement in the aroma profile of CWS-IBT.

Keywords: Encapsulation, Instant black tea, Sensory evaluation, Tea aroma, Tea volatiles

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Determination of a threshold somatic cell count for identification of subclinical mastitis in dairy cows based on the CMT Score

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Mastitis has been reported as the major production related disease of dairy cows in Sri Lanka. Subclinical mastitis (SCM) is characterized by high somatic cell counts (SCC) in milk without any visible abnormalities in milk and udder and without any systemic signs. To mitigate economic losses and ensure safer dairy production in Sri Lanka, it is crucial to detect SCM in the early stages. The diagnosis of SCM often relies on SCC values that exceed the threshold level. There is a lack of precise information regarding a SCC threshold specified for the detection of SCM in Sri Lanka. Therefore, the objective of the present study was to establish a threshold SCC to identify the cows affected with subclinical mastitis based on the California Mastitis Test (CMT) scores. A total of 1661 lactating cows from three commercial dairy herds located in the Nuwara Eliya district of the Central Province, Sri Lanka were used in the study. Farms were visited during noon milking, and 20 mL of composite foremilk samples were aseptically collected for the CMT test, and the SCC measurement. CMT was performed by adding 3mL of CMT reagent to 3 mL of milk and results were read based on the mixture change, which was scored by the nature of the viscous gel. SCC was estimated using a somatic cell counter. Various threshold levels of SCC were considered for the CMT score of 0 (negative or healthy). The percentages of samples below and above each threshold level were compared among various threshold levels. Of the total of 1661 cows examined, 1118 (67.3%) were negative for SCM based on the CMT score (CMT 0). The threshold value that classifies the data within a cluster with minimum misclassification (90%) was obtained when the SSC count was greater than or equal to 375 000 cells/mL. Accordingly, 375 000 cells/mL is proposed as the threshold SCC to identify the cows with SCM.

Keywords: Subclinical mastitis, Somatic cell count, CMT test, Dairy cows

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Smart Agriculture: Computer Vision, Machine Learning, and IoT for Disease Detection in Greenhouse

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Modern smart greenhouses, equipped with cutting-edge Internet of Things (IoT) based environmental monitoring and controlling systems offer the potential to optimize crop growth for increased yield and quality. One such application involves the integration of computer vision (CV) and machine learning (ML) techniques to augment existing crop management systems, thus maximizing agricultural productivity. Implementation of early detection strategies for diseases and pests is one such application of CV/ML in Smart Agriculture. This study presents a cost-effective, energy-efficient disease detection system for local farmers. A unique feature of this work is combining automated aerial imagery with smartphone images for disease analysis. Data collection included plant image capture using a ZED camera and smartphone, covering top-view and leaf-level shots. Disease detection was accomplished using the Mask Region Convolutional Neural Network (Mask RCNN). Two models were used for disease identification: Inception v3 and a Custom CNN. The chosen Custom CNN model for disease classification was integrated into a mobile application. This application enables farmers to input leaf data and receive disease classification results. Additionally, the application provides disease descriptions, preventive measures, and treatment recommendations to aid farmers in managing plant health effectively. The performance evaluations of these two approaches reveal significant gains, with disease detection achieving an enhancement of 50% and disease classification reaching 87.5%. This research marks the nascent phase of aerial data analysis within greenhouse environments. The dataset generated with this study will enable the development of more sophisticated models with expanded capabilities in subsequent research efforts. As agriculture adapts to technological advancements, the merger of computer vision and machine learning techniques within smart greenhouses emerges as a promising avenue to bolster crop health and yield, ensuring sustained global food security.

Keywords: Smart agriculture, IoT, Computer vision, Machine learning

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Mobility of Trace Elements from Organic Amendments of Submerged Alfisols

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Incorporating organic amendments into submerged soils alter soil properties, thus impacting trace element mobility. We assessed the effect of rice straw, cattle manure compost, municipal solid waste compost, and rice husk biochar on the mobility of As, Cd, Cu, Pb, Se, V, and Zn in a submerged-alfisols commonly used for rice cultivation in Sri Lanka. An incubation study was conducted using the soil (Typic Rhodustalfs) collected from a paddy field in Maha Illuppallama. Air dried and sieved (<2mm) soils (1.3kg) were mixed with each amendment (2.38g/kg), separately. The soil in the vessels was submerged with a 2cm waterhead for 13 weeks. Porewater samples were collected and analyzed biweekly for concentrations of trace elements (Total As, Cd, Cu, Pb, Se, V, Zn), major anions (Br⁻, Cl⁻, F⁻, NO₃⁻, SO₄²⁻) and cations (Total Ca, Fe, Mg, Mn, Na). The geochemical modeling software, Visual MINTEQ 3.1 was used to model speciation changes at 1, 7 and 13 weeks after submergence (WAS). Porewater pH (6.98 to 8.82), redox potential (-251.7mV to +296.1mV), and concentrations of trace elements in porewater were not significantly different among the treatments. Concentrations of all the trace elements in porewater increased with WAS, except for V and As. The concentration of V in porewater was reduced with WAS and this was supported by geochemical modeling showing V(V) converting into less mobile V(III) through reductive dissolution. The concentration of As in porewater was below the detection limit (1.74µg/L) throughout the experiment. Geochemical modeling revealed As reduction from As(V) to more mobile As(III) was delayed by the amendments. The addition of organic amendments did not change the trace element mobility in the soil. The time of submergence (by average pe+pH=4.6) had a significant effect on increasing mobility of Cd, Cu, Pb, Se, and Zn and decreasing V.

Keywords: Trace element mobility, Organic amendments, Submerged soil

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Advancements in a Molecular Approach for Determining the Botanical Origin of Sri Lankan Bee Honey

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In the pursuit of sustainable agricultural systems, the botanical origin of bee honey plays a crucial role in its market value and consumer preference. The objectives of this study were to determine the association between pollen density and geographical origin, as well as to evaluate different pollen DNA extraction methods. Ten bee honey samples were subjected to pollen extraction using the Waiblinger protocol followed by four DNA extraction methods (DNeasy® Plant Mini Kit and three CTAB-based procedures), both with and without modifications. Significant variations in pollen density were observed quantitatively across geographical locations: Nuwara Eliya (290950), Gannoruwa (26086), Bowalawatta (39060), Ogastawatta (35055), Pilimathalawa (15400), Welimada (7395), Uva-Paranagama (1960), and Buttala (425) (pollen grains/10 g), and this can be attributed to different floral sources. Awissawella sample originated from *Hevea brasiliensis*, as honeybees were found to collect nectar from the extra-floral nectaries of its leaf petioles, indicating the absence of rubber pollen. Conversely, the Badulla sample contained a minute amount of pollen not visible to the naked eye. While no single method demonstrated superiority for pollen DNA extraction, an optimized CTAB protocol (125 mM Tris.HCl, 50 mM EDTA, 50 mM NaCl, 3.5% CTAB, pH 7.8, 4% β-mercaptoethanol) with an overnight incubation at 65°C, as measured using UV-VIS spectrophotometer, yielded the highest DNA purity for all samples (Nuwara Eliya: 1.06, Bowalawatta: 0.88, Ogastawatta: 0.91, Pilimathalawa: 0.90, Welimada: 0.95, Uva-Paranagama: 0.77, Buttala: 0.79). Buffer components of the optimized protocol were sufficiently effective in breaking down the outer cell wall of pollen grains. Pretreatment techniques prior to pollen extraction and incorporating additional modifications, including the use of higher concentrations of buffer components and longer incubation periods, resulted in higher DNA purity. This study emphasizes that DNA barcoding techniques enhance transparency, authenticity, and eco-friendly practices in honey production, benefiting sustainable agriculture.

Keywords: Authenticity, Botanical origin, Melissopalynology, Multifloral, PCR

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Isolation and Characterization of Non-tuberculous Mycobacteria (NTM) from Freshwater Ornamental Fish

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Piscine mycobacteriosis is a chronic, systemic bacterial disease of fish caused by nontuberculous mycobacteria (NTM). To investigate the occurrence of different species of mycobacteria in freshwater ornamental fish cultured in Sri Lanka, apparently healthy ornamental fish (family *Poeciliidae* and *Cyprinidae*) were collected from selected farms located in the Western, Central, North Central and North Western provinces during the period from January 2016 to February 2018. Visceral tissue (kidney, liver, spleen separately from large fish, as a pooled sample from small fish) and intestinal samples from each fish were subjected to acid-fast stain to detect acid-fast bacteria (AFB) and cultured on Ogawa egg medium for isolation of Mycobacteria. Presumptive mycobacterial cultures were subjected to genetic identification by PCR amplification of *16S rRNA*, *16S-23S ITS*, *rpoB* and *hsp65* genes. The identity of selected isolates was confirmed by sequence analysis of *16SrRNA* gene. Of 442 fish examined from 59 fresh water ornamental fish farms, 99 fish were AFB positive while 343 were AFB negative. A total of 138 fish (31.2%) belonging to seven different species yielded acid-fast positive cultures. Of 187 genetically confirmed *Mycobacterium* isolates recovered from 138 fish (including multiple isolates from some fish), 96 were identified by *16SrRNA* sequencing. The most frequently recovered species was *Mycobacterium fortuitum* (71%, n = 68/96). Other mycobacteria recovered included species of *M. fortuitum* group (n=21), *M. cheloneae-abscessus* complex (n=3), *M. marinum* (n= 2), *M. arupense* (n=1) and *M. houstonense* (n=1). Isolation of mycobacteria was significantly high from intestine samples (17.6%: 78/442) than pooled tissues ($P<0.05$, Chi-square test). It is evident that *Mycobacterium* is widely prevalent in apparently healthy ornamental fish sampled in this study. Potential risks associated with handling ornamental fish carrying NTM on human health should not be overlooked. Our findings highlight the importance of screening mycobacteriosis in ornamental fish stocks to understand the true prevalence of NTM.

Keywords: Nontuberculous mycobacteria, Ornamental fish, *Mycobacterium fortuitum*

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Developing Machine Learning Models to Predict Water Retention Properties of Soils of Sri Lanka

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Measuring soil water retention properties, such as volumetric water content (VWC) at field capacity (FC) and permanent wilting point (PWP), is a labor-intensive process, resulting in insufficient data for accurate irrigation scheduling. This study aimed to develop machine learning (ML) models to predict VWC at 10 (VWC₁₀), 33, (VWC₃₃), and 1500 kPa (VWC₁₅₀₀) of Sri Lankan soils using a data set of an extensive soil survey. Soil properties such as soil texture, bulk density (BD), soil organic carbon (SOC) were used with Multiple Linear Regression (MLR), K-Nearest Neighbor (KNN), Random Forest (RF), and Support Vector Regression (SVR) models. The predictive accuracy was evaluated using the coefficient of determination (R^2), Mean Absolute Error (MAE), Mean Squared Error (MSE), and Root Mean Square Error (RMSE) across the entire dataset and various textural classes. Among the models tested, MLR outperformed ML models, achieving a satisfactory accuracy ($R^2 = 0.63$) in predicting VWC₁₀ and VWC₃₃ with the sand, silt, and bulk density combination. Furthermore, the combinations of sand and VWC₁₀ and sand and VWC₃₃ notably boosted the predictive accuracy of VWC₁₅₀₀ across all tested models (RMSE 3-4 %), with SVM and RF emerging as the top performers with R^2 values of 0.85 and 0.90, respectively. Nevertheless, when silt, SOC, and BD were added to the sand and VWC₁₀ or sand and VWC₃₃ combination, there was only a slight improvement in the predictive accuracy of VWC₁₅₀₀. Results of the study revealed that the SVM and RF could be used to predict the VWC₁₅₀₀ of soils of Sri Lanka with higher accuracy using combinations of easily measured parameters like sand content and VWC₁₀ or sand content and VWC₃₃. Future research will aim to enhance the prediction models for VWC₁₀ and VWC₃₃ by including a larger data set covering diverse soil types.

Keywords: Machine learning, Field capacity, Permanent wilting point, Water retention

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Partitioning of Essential and Toxic Elements Between Rice (*Oryza Sativa L.*) Grains and Husks

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Rice is the prime source of essential trace elements for consumers as it is a staple food in many countries. However, deficiencies of some trace elements are common among rice-consuming populations. In addition, rice plants have a high potential of accumulating toxic trace elements compared to other cereals, leading to health issues. Such toxic elements can also be taken into the human body by indirect pathways, such as rice husks commonly used as animal feed. This study investigated the partitioning of nutrients and trace elements between rice grain and husk in six traditional and three improved varieties available in Sri Lanka. Acid-digested rice grains and husks were analyzed using an inductively coupled plasma mass spectrometer (ICP-MS). Major elements such as K, Ca, and Na accumulation in rice husks were higher than in grains by 3.4, 2.7, and 7.7 folds, respectively. At the same time, Mg showed comparatively similar values between husks and grains. Essential minor elements such as Zn, Cu, and Mo were evenly distributed between rice grains and husks, while Fe and Mn accumulation was about 4 and 15 folds higher in husks, respectively. These findings suggested that rice husk is likely a sink for essential element accumulation. Toxic trace elements such as Cr and Al showed five folds higher accumulation in rice husks than grains, while Rb and Sr accumulations were 2.5 and 13 folds higher in husks. Accumulation of Mg, Zn, Mn and Al in husk showed significant differences among rice varieties ($p<0.05$), but there is no significant difference between traditional and improved varieties. These findings suggested that rice husks potentially play a significant role in protecting rice grains from bio-accumulation of toxic heavy metals. On the other hand, it may cause essential trace elements deficiency in rice grains.

Keywords: Essential nutrients, Toxic elements, Genetically diverse rice cultivars, Protective cover in rice

Utilization of Waste Materials to Produce Silica Micro and Nanoparticles as a Slow Release Fertilizer

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Silica nanoparticles (*SNPs*) are considered as suitable delivery materials considering their unique characteristics. Mesoporosity, large surface area, size variation and manipulative chemical and physical qualities such as hydrophilic or phobic nature, electrostatic charge are some of the important features. *SNPs* are modified as nanofertilizers, as they can be either controlled release or engineered materials for various functions. However, their physiochemical properties including particle size, pore size, shape and morphology, specific surface area and surface charge, and functionalization can highly affect their adsorption and desorption capacities. In plants, silica is used for both mechanical/physical protection and increased pest tolerance. In this study, silica was selected as the base material to incorporate urea as a nanofertilizer. Silica was extracted from rice husk and coal fly ash under optimized conditions. Six types of silica particles in the size range of 80-400 nm were synthesized from extracted silica using modified template free sol-gel and precipitation methods. Among the six, four were in nanoscale with the particle size <100 nm. The percentage ratio of synthesized silica particles: base material mass ranges from 8 – 48%, based on both the nature of synthesis procedure and the silica source. 1 mg of silica particles revealed 20 mg of urea sorption capacity after simple immersion. In comparison with commercially available urea granules, urea desorption behavior was studied using colorimetric absorption of Urea-Ehrlich's reagent complex at 425 nm. Variation of production efficiency was observed based on the method and the material. Among the six types of urea adsorbed silica, not only *SNPs*, but also the silica particles in the 200 nm- 400 nm range showed slow releasing behavior for consecutive 8 day-period regardless of their particle sizes. This may be due to the effect of specific pore sizes, shapes, morphology, specific surface charge and surface area of these particles.

Keywords: Silica micro and nanoparticles, Nanofertilizers, Urea adsorption, Slow release fertilizer

Identification of Edible Macroalgae and Isolation Of Macroalgae-Endophytes in Hikkaduwa Coastal Area, Sri Lanka.

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Red, green and brown macroalgae (seaweeds) are the main groups of macroalgae. Some species of macroalgae are well known as a source of food for centuries. Although they are rich in nutrients, their edible uses are unexploited in Sri Lanka. The diversity of macroalgae is prominent in Hikkaduwa coastal area. Endophytes are endosymbiotic organisms associated with antimicrobial, anticancer and anti-insect properties due to their secondary metabolites. These properties of metabolites are important in food and pharmaceutical applications. This research was conducted to identify the edible macroalgae species in Hikkaduwa coastal area and to isolate the endophytes present in macroalgae. Macroalgae were collected with the prior approval of the Department of Coast Conservation and Coastal Resource and the Department of Wildlife Conservation. The collected macroalgae were identified using fresh specimens, photographs, herbarium specimens and available literature. The endophytes study was conducted by culturing them in potato dextrose agar medium after surface disinfection of macroalgae. Identified green algae were *Halimeda opuntia*, *Caulerpa imbricata*, *Caulerpa racemosa*, *Ulva lactuca*, *Valoniopsis pachynema*, *Valonia utricularis* and *Chaetomorpha antennina*. Identified red algae were *Chondracanthus acicularis*, *Gracilaria canaliculata* and *Gracilaria huangii*. *Sargassum elegans*, and *Sargassum crassifolium* were the species identified as brown algae. Macro algae, *Halimeda opuntia*, *Caulerpa racemosa*, *Gracilaria canaliculata*, *Ulva lactuca*, *Sargassum crassifolium* and *Sargassum elegans* species were identified with potential food applications. Growth of endophytes was observed in *Gracilaria* spp. In conclusion, edible macroalgae and endophytes are existing in Hikkaduwa coastal area. Further research and screening of macroalgae and endophytes are recommended.

Keywords: Edible Seaweeds, Endophytes, Macroalgae, Seaweeds

Biofilm Biofertilizer Can Produce Higher-Quality Rice Than That of Chemical or Organic Fertilizer Alone Application

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Biofilm biofertilizer (BFBF) is now being popularized for paddy (*Oryza sativa* L.) cultivation due to its ability to cut-down chemical fertilizers (CF), increase crop yield and soil carbon sequestration by ca. 50%, 20-30%, and 30%, respectively. About 16% of the total rice cultivation (0.7 Mha) in Sri Lanka has been applied with the BFBF practice and it is expanding gradually. Moreover, the BFBF practice has been reported to increase antioxidant content in rice grains while decreasing heavy metals compared to the CF alone practice, showing potential to produce higher-quality rice. The present study compared the primary metabolites i.e. carbohydrate, protein, and lipid contents in rice grains of three different fertilizer practices viz. (a) 100% CF (340 kg NPK/ha), (b) BFBF (66% CF + BFBF, 2.5 L/ha), (c) BFBF-based organic (Compost with N>1%, 500 kg/ha + BFBF, 2.5L/ha), (d) a reference treatment (66% CF alone), and (e) the control (no amendments). A field experiment was conducted in Agriculture schools at Vauniya, Pelwehera, and Agunakolapalassa. The five treatment plots were randomized and taken as a block design in each location, and the locations acted as replicates. Rice grain samples were collected at harvest and analyzed using Fourier-transform infrared (FT-IR) spectroscopy. The primary metabolites were quantified based on the characteristic diagnostic bands. Results showed that the BFBF practice (b) produced significantly ($P<0.000$) the highest amount of proteins and lipids in rice grains. The protein and lipid contents in the BFBF-based organic practice (c) were significantly ($P<0.000$) higher than that of the 100% CF practice (a) but lower than that of the BFBF practice (b). Moreover, the BFBF-based organic practice (c) produced significantly ($P<0.000$) the lowest amount of carbohydrates while the BFBF and 100% CF [(b) and (a)] practices produced comparable amounts. In conclusion, the BFBF can enhance the quality of rice in both chemical and organic fertilizer practices.

Keywords: Biofilm biofertilizer, Grain quality, Rice

Screening of Phyto-Pathogenicity of Potential Wood Degrading Fungal Isolates from Rubber Plantations

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Natural rubber plays a significant role in Sri Lankan economy. Continuous cultivation for a long period in same fields have depleted soil nutrient conditions. A large amount of wood masses and litter materials accumulate in the fields annually. The wood degrading fungi naturally living in the rubber growing soils play a major role in nutrient cycling and lead to a better soil fertility. Further introduction of wood degrading fungi is critical to increase their population in the soil. Screening of pathogenicity of the wood decaying fungi is important as some fungi may cause severe problems in the plants with the introduction in large scale. Seven morphologically different fungal cultures were isolated from decaying rubber logs and leaf litter samples collected from five rubber plantations in the Kalutara district. Pure cultures were prepared on Potato Dextrose Agar medium. Wood degradability of the isolates were tested using a standard protocol. Two wood decaying fungi namely: Isolate 1 and 2 were selected as best decomposers and subjected to the pathogenicity test. Pure cultures of each isolate were inoculated to the autoclaved pencil size fresh rubber root pieces in Polythene bags. Twenty replicates were maintained for each isolate and 10 root pieces with 8cm length were added for each bag. After growing the mycelium on the entire root surface, they were inoculated to three months aged rubber seedlings. Another 20 seedlings were maintained as controls without adding the inoculum. They were observed after 06 months for the symptoms or other abnormalities. According to the results of the pathogenicity test, the selected isolates did not develop symptoms. Hence, they can be identified as good decomposers without showing pathogenicity on rubber trees. Mass production of the fungi can be recommended with further studies for the acceleration of the natural decomposition process in the soil.

Keywords: Natural rubber, Pathogenicity, Soil nutrients, Wood degradability

Impact of Relaxing Trade Barriers between Sri Lanka and India: A Computable General Equilibrium Analysis

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Sri Lanka and India entered into the Indo-Sri Lanka Free Trade Agreement (ISFTA), marking their inaugural bilateral free trade agreement in 1998. Despite fostering an improvement in bilateral trade, the advancement has been muted owing to insular policies upheld by both nations. The inclusion of a negative list and import quota has positioned ISFTA more like a preferential trade agreement than a comprehensive free trade agreement. Amid the backdrop of fortified trade relations between the two nations, there arises a necessity to reevaluate the potential repercussions of easing trade constraints. In this context, an evaluation is undertaken to assess the influence of diverse policy reforms including liberalization of agriculture sector, food and agriculture sector, and food, agriculture, and manufacturing sector on the macroeconomic and trade landscapes of both countries, employing the global trade analysis project (GTAP) general equilibrium modeling framework. The study also extends to the implications for welfare and industry output. The findings of this study indicate that relative to the prevailing scenario, liberalization of the considered sectors serves to amplify both imports and exports, thereby engendering positive effects on the real GDP. This effect is discernibly more pronounced for Sri Lanka. Additionally, the research reveals that a mutually beneficial augmentation of welfare could be achieved by both nations through the liberalization of their agricultural and food markets. However, it is suggested that Sri Lanka could potentially encounter welfare losses in the event of liberalizing the manufacturing sector. Conversely, India experiences with the most substantial welfare gains upon the liberalization of its manufacturing sector. It is advocated that due consideration be given to the liberalization of the agricultural and food sector, facilitating the mutual gains from the free trade agreement.

Keywords: food and agriculture, general equilibrium, GTAP, Indo-Sri Lanka free trade agreement

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Occurrence of Aflatoxin M1 in cheese products commonly available in Sri Lankan market

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Aflatoxins (AFs) are a group of mycotoxins produced by certain fungi of *Aspergillus* spp. Intake of aflatoxin B1 (AFB1), B2 (AFB2), G1 (AFG1), and G2 (AFG2) contaminated feed can affect the health and productivity of animals. AFM1 is a hydroxylated metabolite of AFB1 formed inside the animal body which is excreted into milk of cows consumed AFB1 contaminated feed. Consumption of AFs contaminated dairy products causes negative health effects in consumers. This study determined the occurrence and levels of AFM1 in processed cheese (n=28), hard cheese (n=14), semi-hard cheese (n=5), and soft cheese (n=3) representing seven popular brands available in the local market. The samples were analyzed by an Ultra High-Performance Liquid Chromatography Fluorescence Detector method. AFM1 was detected in 40 samples (0.11-14.43 ppb; 80.0%) out of the 50 cheese samples analyzed, and 17 (34.0%) had AFM1 levels exceeding the maximum permitted limit set by Codex Alimentarius Commission (0.5 ppb). Further, 34 samples (68.0%) had AFM1 levels above the regulatory level of the European region (0.25 ppb) and 10 samples (20.0%) violated the Sri Lankan maximum limit of 1 ppb. Thirteen out of the 14 hard cheese (0.11-14.43 ppb) and all semi-hard cheese samples (0.29-0.65 ppb) contained AFM1. Most of the soft (66.7%; 0.35-0.45 ppb) and processed (71.4%; 0.11-1.35 ppb) cheese samples had AFM1. Hard cheese products which have more milk caseins and low water content had higher AFM1 levels compared to other cheese types. Many of the locally manufactured cheese products available in the Sri Lankan market may pose health risks to consumers. Therefore, it is important to establish regulations on par with international standards and monitor the compliance of products in the market. Further, regulations to control AFs in animal feed will support the efforts to minimize AF contamination in milk and dairy products.

Keywords: AFM1, cheese, UHPLC, consumer safety, food regulations

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Effects of Phosphorus and Zinc Application on Growth of Rice (*Oryza Sativa*) in Soils with Contrasting Phosphorus Levels in Sri Lanka

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Phosphorus (P) application can interfere with Zinc (Zn) availability for rice plant affecting their growth and yield. A pot experiment was conducted to investigate the effect of P and Zn application on growth of the rice plants in an Alfisol (S1) and Entisol (S2), with contrasting P levels. Rice (*var Bg 360*) were grown for 10 weeks under flooded conditions in pots (5.5 kg of soil per pot) with all possible combinations of four levels of P (0, 11, 33, and 99 kg ha⁻¹) and three levels of Zn (0, 2 and 4 kg ha⁻¹). Plant growth parameters were measured at the end of the experimental period. Mehlich-3 extractable P concentrations were 8.53 and 22.65 mg kg⁻¹ while Zn contents were 1.99 and 1.02 mg kg⁻¹, in S1 and S2 soils, respectively. Interaction effects of P × Zn rates were not significant on any of the plant growth parameters. Total dry matter content was significantly higher ($p<0.05$) in S1 than that in S2 at all P levels, but the differences of dry matter contents among the two soils were low at high P levels. The low total dry matter content in S1 could be due in part to differences in P and Zn availabilities in these soils. Irrespective of soil type and P application, total dry matter yield increased with Zn application, by 12% at 2 kg ha⁻¹ but only by 8% at 4 kg ha⁻¹ compared to that in 0 Zn level. These observations suggested that the application of Zn has beneficial effects in rice cultivation irrespective of the available P content in these two soils. However, to better understand the root causes for the observed effects, changes in P and Zn availabilities in these soils upon their application needs to be investigated in future studies.

Key words: Dry matter, Phosphorus, Plant growth, Zinc

Evaluation of Nutrients Enriched Biofertilizer Pellets on Growth and Yield Performance of Rice (*Oryza Sativa L.*) under Field Conditions

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Rice (*Oryza sativa L.*) is the staple food for over half of the world's population. The most significant agronomic practice in paddy cultivation is fertilizer application. Excessive applications of inorganic fertilizers lead to numerous negative environmental consequences. Adapting eco-friendly techniques, like the use of nutrients enriched biofertilizers, has identified as the best possible solution to overcome the above problems. Generally, the nutrient content of biofertilizers is low compared to inorganic fertilizers. This research was conducted to produce nutrients enriched biofertilizer pellets with different amendments and to investigate their performance on the growth and yield of the Bg 251 rice variety. Fish tonic, Eppawala Rock Phosphate, Potassium Feldspar and Dolomite were used as amendments to enrich biofertilizer. The experiment was arranged in a randomised complete block design with six treatments and four replicates. Plant height, number of leaves, number of tillers, flag leaf length, number of panicles per bush, number of seeds per panicle, and seed weight were taken from five randomly selected clusters in every plot. Statistically significant difference was observed in the number of seeds per panicle over the control. The number of tillers per bush and the number of panicles per bush were significantly different, while no fertilizer treatment (T_0) showed the lowest and fish tonic enriched pellets (T_5) showed the highest values. The mean yield per bush was between 16.8 g (T_0) and 30.3 g (T_5). A significantly higher vegetative and reproductive growth performance of rice was observed with nutrients enriched biofertilizer pellets over the control. Findings of the study reveal that the nutrients enriched biofertilizer pellets have influenced the growth and yield performances of paddy. This research concludes that the biofertilizer can be used for pelletizing after enrichment of nutrients, and it has potential to enhance the performance of the Bg 251 rice variety.

Keywords: Biofertilizer, Enrichment, Organic amendments, *Oryza sativa L.*, Pellets
Acknowledgement: Sara Bhumi Lanka Bioproducts (Pvt) Ltd.

Development of an Extended-release Insect Repellent Bio-composite by Encapsulation of *Acronychia pedunculata* Essential Oil into Tonsil 134 against *Sitophilus oryzae* (L.) (Coleoptera: Curculionidae)

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Insect pests are a persistent threat to stored grains, leading to substantial post-harvest losses. Due to the detrimental issues of synthetic pesticides, bio-pesticides have emerged as an alternative owing to their advantages in addressing those issues. Thus, the present study aimed to develop an extended-release insect-repellent bio-composite by encapsulating *Acronychia pedunculata* essential oil (APEO) into the adsorbent tonsil 134, against the rice weevil *Sitophilus oryzae*. Test insect cultures of adult *Sitophilus oryzae* were maintained under ambient thermo-hygrometric conditions. The APEO was extracted from leaves of *Acronychia pedunculata* via hydrodistillation, and the chemical composition was analyzed through gas chromatography-mass spectrometry (GC-MS). The area preference bioassay was conducted to determine the 95% repellent concentration (RC₉₅). Subsequently, APEO content equivalent to RC₉₅ was incorporated into the adsorbent and the prolonged repellent activity of the bio-composite was assessed through the cup bioassay. The GC-MS analysis of APEO revealed thirteen major compounds, with ocimene (33.8%) being the predominant. In the area preference bioassay, a 100% repellency was observed at the highest dose after a six-hour exposure period and the RC₉₅ value was recorded as 3.62 µL cm⁻². The cumulative release of APEO from the bio-composite was assessed using thermogravimetric analysis, which resulted in a cumulative weight loss of 52.26% by the end of 30 days. Fourier transform infrared spectroscopy confirmed the successful incorporation of APEO into the sorbent and its extended release over 30 days. Scanning electron microscopy analysis demonstrated no significant morphological changes between the pristine tonsil and the bio-composite. The cup-bioassay resulted in a percentage repellency of 100%, >90%, and 90–80% after each 10-day exposure period within a 30-day period, which correlated with the cumulative release of APEO. Thus, APEO-based bio-composite can be effectively used as an eco-friendly method to successfully control insect-pest infestations in stored-grain food systems for a prolonged period.

Keywords: *Acronychia pedunculata*, Tonsil 134, *Sitophilus oryzae*, Extended-release, insect repellent, Prolonged repellent activity

Riparian Vegetation Changes Along a Rural-Urban Gradient: A Case Study of the Kuru Ganga Tributary of the Kalu River in Sri Lanka

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A riparian zone, also known as riparian buffer, refers to the area of land situated along the banks of a river, stream, lake, or other water bodies. Considering the rural-urban gradient of the stream corridor landscape it can identify massive destruction of stream corridor ecosystem and serious damage to the riparian vegetation in stream ecosystem with increasing urbanization/anthropogenic activities. This study is focused on riparian vegetation changes along a rural-urban gradient in Kuru Ganga tributary in Kalu River, Sri Lanka. Relevant literature sources, legal documents, image classifications, belt-transect surveys, and field observations were used to conduct the study. As analysis methods: Simpson's Diversity Index, riparian vegetation analysis, and statistical analysis were used. Simpson's Diversity Index indicates rural segments range between 0.9-1 while urban segments range between 0-0.7. There is high vegetation species density and diversity in rural segment compared to urban segments. While the natural riparian vegetation of the study area consists of lowland wet evergreen vegetation, the riparian vegetation of average populated areas to densely populated areas mostly consists of home garden and agricultural species. Urban landscape of the study area stated a higher level of stream restoration requirements and the rural landscape of the study area still has healthy riparian vegetation conditions compared to urban. To conserve the riparian vegetation in both rural and urban landscapes government should strengthen the remaining laws and regulations and should give more power to responsible authorities to take legal actions in corridor demarcation. To achieve the sustainable status of stream corridor ecosystems there should be awareness programs for stream dwellers to maintain stream corridors and stream corridor restoration programs should be conducted to conserve native streamside flora in river basins in Sri Lanka.

Keywords: Riparian vegetation, Rural-Urban gradient, Simpson's Diversity Index, Kuru river basin, Environmental sustainability.

Development of a Novel Bioactive Margarine Rich in γ -oryzanol

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Rice (*Oryza sativa*) is a common food consumed and grown in Asia. Rice bran, the main byproduct of rice milling, is a rich source of vitamins, protein, and oil. It is also rich in bioactive substances such as tocopherols, tocotrienols, γ -oryzanol, phytosterols, polyphenols, and squalene, which have strong antioxidant properties. It has also been suggested that γ -oryzanol may have hypo-cholesterolemic effects. With an emphasis on cardiovascular health, the goal of this study was to determine whether rice bran oil (RBO) has the potential to replace traditional, saturated fatty acid-rich coconut and palm oils in margarine. RBO blends were developed and tested their physico-chemical characteristics at different levels: 5, 10, 15, and 20%. Furthermore, to compare the natural antioxidant capacity of RBO, another three different blends were developed that combined RBO with common antioxidants such Ascorbyl palmitate (0.015%), TBHQ (tertiary butylhydroquinone) (0.015%), rosemary extract (0.2%) and compared with 20% RBO 0.0075% Ascorbyl palmitate (half of the standard amount for margarine) as the final blend. The oxidative stability and γ -oryzanol content of RBO blends at 5, 15, and 20% did not differ significantly ($P>0.05$) from one another. Finally, the novel margarine was formulated with 20% RBO and 0.0075% Ascorbyl palmitate which showed an oxidative stability similar to TBHQ. Notably, the addition of RBO resulted in a substantial change in the fatty acid composition, with lower total saturated fatty acids ($42.61\%\pm0.06$) and more monounsaturated fatty acids ($22.4\%\pm0.02$) and polyunsaturated fatty acids ($10.34\%\pm0.01$). It is interesting to note that consumer preferences for the novel RBO margarine and the traditional table margarine did not significantly differ ($P>0.05$) in terms of flavor, aroma, mouthfeel, and spreadability. This study shows that it is feasible to incorporate RBO into the manufacture of margarine, resulting in a functional food product with an enhanced fatty acid profile and antioxidant potential.

Keywords: γ -oryzanol, Rice bran oil, Natural antioxidant, Oxidative stability



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PERADENIYA UNIVERSITY INTERNATIONAL
RESEARCH SESSIONS

**MANAGERIAL TURN
IN HIGHER
EDUCATION: THE
ISSUES AND
CHALLENGES FOR
HUMAN EXISTENCE**

Higher Education Reform Discourse in Contemporary Sri Lanka and Its Ideological Commitment to Commercialization

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This paper analyzes three prevailing assumptions in public conversations regarding higher education: that university arts graduates are unemployable; that the rate of return on investment in higher education is too low; and that the opposition to private higher education is the leftover radicalism of a bygone era. The material used for this analysis will include recent reports by NGOs and the state, and publications in selected news outlets. The paper will lay out the different factors that are constituent elements of the above assumptions and argue that they indicate an ideological commitment to the commercialization of higher education and is uninformed by actual conditions in Sri Lanka universities. Further such positions are also not formulated in relation to the larger education context of Sri Lanka. Referencing the emerging global literature on the commercialization of higher education, the paper argues that these assumptions are inadequately informed by an understanding of the actual social need for higher education in Sri Lanka at this historical juncture. The paper also discusses how commercial higher education is currently being critiqued at the global level as a failed model.

Keywords: Commercialization of education, Education reform, Free education, Higher education

Resisting Academic Hegemonies in Knowledge Production and Dissemination

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Global knowledge production is similar to colonialism in that the voices of scholars from the periphery (i.e., the global South) are more often than not subjected to linguistic and epistemic exclusion. Linguistic exclusion results from the hegemony of English as the language of international scholarship which places anyone not publishing in English at an immediate disadvantage. Epistemic exclusion takes many forms. The positions of privilege and power held by institutions of the global North, the intense competition to publish one's research in international spaces, and the transformation of knowledge into a commodity subject to quantification by abstract metrics, have placed peripheral scholars in positions of vulnerability, exploitation and subjugation. In addition, the control exercised by so-called high impact publishers through a network of "academic buddies" on the dissemination of knowledge has made scholarly imperialism a very real threat to knowledge production in the global South. As a peripheral scholar, I argue that we have a responsibility to recognize and resist forces of academic hegemony. We need to question who has the right to produce 'new' knowledge in local spaces; whose voices are heard in the dissemination of knowledge; and whether equitable access to knowledge is available. It is only when these questions receive satisfactory answers that the responsibility of ethics and care can be ensured in knowledge production, and peripheral cultures, people and scholars can be safeguarded from exploitation and misrepresentation.

Keywords: Academic hegemony, Epistemic exclusion, Knowledge as commodity, Peripheral scholarship, Scholarly imperialism

Crisis, IMF and Social Cleavages

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Sri Lanka is going through a devastating crisis of economic, social and political proportions. While the solution to the crisis is supposedly grounded in the International Monetary Fund (IMF) program of March 2023, the consequences of this policy trajectory have raised new questions about both the path of economic recovery and new social cleavages. What becomes of past attempts to address the concerns of women, working people, minorities and oppressed caste communities, excluded and oppressed by economic, social and political structures consolidated from colonial times into our post-colonial future? How will new social cleavages manifest themselves amidst the current conjuncture of the IMF solution taken forward by an authoritarian regime? This paper addresses the dangers of further polarization with a push towards an authoritarian neoliberal fix undermining decade of progressive struggles and engagement towards democratizing society. The tremendous austerity to address the “debt crisis” will not only undermine social welfare but also reshape ideas of co-existence, devolution and power-sharing. This paper drawing on political economic analysis of the ongoing debt restructuring process addresses the risks of restructuring the state itself during an economic depression. It delves into the far-reaching consequences of such restructuring producing new forms of social cleavages, including the reconfiguration of gender, class, ethnic and caste relations. The paper analyses the economic changes in Sri Lanka amidst contestation between autocratic rule and democratic struggles and articulates ideas of equality and freedom during this time of crisis.

Keywords: Class, Crisis, Democracy, Gender, IMF, Minorities

Economic Crisis, Poverty and Social Protection in Sri Lanka

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The economic crisis has resulted in an erosion of most of the gains by Sri Lanka on the front of poverty reduction. Poverty incidence has increased from about 4% to 26% as per the World Bank Estimations. The most recent LIRNEasia estimate shows that poverty has further increased and that about 7 million people now live below the poverty line. Looking after the poor and helping the newly added poor to survive and become economically productive again is an enormous task that is ahead of Sri Lankan society. The huge need for resources in order to manage one-third of the population that is in poverty, especially in the middle of an unprecedented debt burden, underscores the gravity of the problem. The paper argues that putting the economy back to a higher trajectory of growth is the key to poverty alleviation. It highlights the importance of striking a proper balance between economic stabilization and structural reforms following a consultative process and ensuring economic justice in steering economic recovery.

Keywords: Economic crisis, Economic stabilization, Poverty, Population

Contribution of Meaning and Purpose in Life to Achieving Psychological Well-being

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Psychological wellbeing is a crucial aspect that significantly impacts on the quality of life of an individual. When mental health is compromised, it affects thinking, behaviour and interactions. Sound mental health allows us to think critically, make informed decisions, cope with stress, act responsibly, and build meaningful relationships. An increasing number of organizations focus on mental wellbeing to minimize stress and enhance productivity in the workplace. Parents and educators often focus on emotional wellbeing of young people with a view to increasing resilience and resolve. Youth are at the apex of vulnerability as they are in the process of building an identity “who am I”, searching for role models, attempting to find meaning and purpose in life, keen to individuate from the influence of parents and educators. Youth tend to be impulsive, binary, seeking significance to be relevant, which increases their vulnerability, often falling prey to substance misuse, violent extremist groups and gangs, and mental health problems.

Keywords: Mental health, Psychological wellbeing, Resilience, Vulnerability, Youth

A Sociological Study of the use of Vocational Training Skills of Retired Soldiers in the Post-War Development and Reconstruction in Sri Lanka

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The Security forces can be described as a workforce that goes beyond the role of ensuring national security and contributes to the development and reconstruction process of the country. They are equipped with a variety of vocational training courses to satisfy the needs of the army. The main purpose of this study was to examine how such professional knowledge and skills can contribute to the development of the country and the current application of the vocational training skills they have mastered in the army to develop and rebuild the country effectively. The conceptual framework was developed according to qualitative research methodology, and data obtained from case studies and interviews are analyzed by using thematic analysis. Factors influencing early retirement include a lack of understanding of benefits, delays in promotions and training opportunities and not having enough time to spend with family. They do not have a satisfactory attitude towards the retirement guidance they received from the army. In this sense the majority of people are employed in temporary jobs and some are successful in post-retirement life. It is also evident that the social status and prestige gained in society while serving as a war hero have deteriorated. Although the government implements programs, they are not aware of them. Barriers to the utilization of training include a lack of a system to identify the professional skills of retired soldiers, a lack of exploration of opportunities in the civil and private sectors and politicization of services. The findings of the study further show that entrepreneurship training for all retired soldiers, streamlining existing mechanisms, creating new mechanisms and setting up a separate unit for retirees and adapting them to civil society, private and non-governmental contributions, and training courses can be identified as potential means to improve the current situation.

Keywords: Development, Post-war, Reconstruction, Retired soldiers, Vocational training

Role of Emotional Creativity on Achievement Motivation among University Students with Traumatic Experiences

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This study aimed to identify the role of emotional creativity in students' achievement motivation who have experienced traumatic events. Some less commonly recognized sources of trauma, including surgeries (especially during the formative years of life), sudden loss of a loved one, the dissolution of a significant relationship, or experiencing profound humiliation or disappointment, are noteworthy (Robinson et al., 2017). Many students from various faculties experience varying levels of such issues and academic motivation-related challenges within their program structure. The traumatic experiences students have faced and the post-traumatic symptoms create numerous psycho-social and emotional consequences among university students, potentially affecting their emotional creativity and achievement motivation. Ethical clearance was obtained from the Ethics Review Committee of the Faculty of Medicine (University of Peradeniya) to conduct this research. The present study employed a quantitative method approach, consisting of measures to assess emotional creativity, achievement motivation, and trauma symptoms in the sample. The sample studied by the researchers included 337 undergraduates from nine different faculties at the University of Peradeniya, Sri Lanka. The results of the current study show that emotional creativity has a significant correlation with achievement motivation. Emotional novelty does not exhibit a significant correlation with achievement motivation. Emotional effectiveness and authenticity demonstrate a significant correlation with achievement motivation. Only hyperarousal as a trauma symptom shows a negative correlation with achievement motivation. Regression analysis concluded that the impact of emotional creativity on achievement motivation falls between higher and lower levels. Moreover, the mediating effect of trauma symptoms on the relationship between emotional creativity and the outcome variable (achievement) was assessed. Trauma symptoms were found to mediate the relationship, influencing achievement motivation among undergraduates."

Keywords: Achievement motivation, Emotional Creativity, Trauma symptoms, University students

The Relationship between Emotional Intelligence and Psychological Wellbeing among Undergraduates at the University of Peradeniya, Sri Lanka

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Emotions focus on interdependent reactions in humans that are simultaneously physical, biological, cognitive, and relational. Emotional intelligence is the knowledge of how emotions operate within oneself. During the low stress period, stress, anxiety, and depression were associated with emotion perception, emotion regulation, emotion management, and emotion utilization. This research observed the relationship between emotional intelligence and psychological wellbeing among undergraduates. Its main objective is to seek the nature of relationship between emotional intelligence and psychological wellbeing. This research endeavour is to fill the Sri Lankan research gap. It utilized a convenient sampling technique and intended to draw a sample of 320 male and female undergraduates in four years representing eight faculties/departments, namely Arts, Medicine, Science, Engineering, Law Department, Management, Agriculture and Dental. These were chosen because they focus on different careers in the future and their current subjects are related to it. Research has been conducted from a quantitative approach, utilizing a quiz linked to the google form. SPSS is used to analyse data. Emotional Intelligence is measured by using the Schulte Self Report Emotional Intelligence Test (SSEIT) and the DASS-21 is used in this educational setting to assess the psychological wellbeing of students. Identifying high levels of stress, anxiety, or depression can help them to overcome mental health problems in their lives. The results show that there is a correlation between emotional intelligence and psychological wellbeing of undergraduates and there is a significant difference between emotional intelligence of undergraduates with levels of Depression, Anxiety and Stress. ($F=4.98, 4.18, 7.639, P<0.00$). The hypothesis predicted that subscales of emotional intelligence such as perception, regulation, management, and use of emotions would differ significantly across psychological well-being ($P<0.00$). The highest mean difference of emotional intelligence and psychological wellbeing is reported by the Faculty of Arts, while the lowest one is in the Faculty of Medicine which consists of 119.08, 34.18 and 90.33, 27.10 of means score respectively. There is a significant difference in the means of the emotional intelligence index between each faculty groups and year groups. For example, students from Arts and Medical. Emotional intelligence scores do not vary by socio-demographic factors such as religion, ethnicity, and family income rates of undergraduate students. However, the ANOVA results suggest that gender influences psychological well-being scores ($F_{2,318} = 0.169, P<0.001$).

Keywords: Anxiety, Emotional Intelligence, Psychological wellbeing, Stress, Undergraduates

Factors Women Consider While Purchasing Sanitary Napkins

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Consumer behaviour has improved significantly over the past decade. With several brands selling the same product and many other factors influencing their sanitary napkin purchasing behaviour, consumers have a wide range of options in today's competitive environment. For the survival of man, various products have come into the market for personal convenience. Accordingly, with the advancement of the world regarding the monthly menstruation that women usually face, various products have come into the market to help women carry out their daily activities without any hindrance. Among them, there is still a high consumption to sanitary napkins in countries like Sri Lanka. However, due to the economic crisis that arose in Sri Lanka in the last season, the prices of many commodities were reported to have increased. This study focuses on two main research objectives: the factors influencing consumer choices when purchasing sanitary napkins and the impact of tax revisions on sales volume. The study collected data using a simple random sampling method from 100 women under the age of 40 residing in Radawana North, Malwana, and Kirindiwela, all falling under the jurisdiction of the Dompe Divisional Secretariat in the Gampaha District. Additionally, 24 shops selling sanitary napkins were selected as sample sources to further investigate these concerns. The questionnaire method and interviews have been used to collect data, and relevant data has been presented using tables and graphs and has also been analysed by factor analysis and chi-square test. Accordingly, it was found that quality, economic and community and social factors influence the purchase of sanitary napkins, but mainly economic factor influence. Accordingly, it is necessary to reduce the possibility of sanitary napkins, an essential product of women, becoming luxury goods and to improve related products.

Keywords: Consumer behaviour, Consumers, Menstruation, Sanitary napkins, Women

Determinants of Corporate Income Tax Gap in Sri Lanka

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Corporate income tax (CIT) is a key income tax in Sri Lanka and it generally accounts for about 58% of total income tax revenue and about 9.8% of total tax revenue. However, the ratio of CIT to GDP has fallen from 2.5% in the early 1980s to 1.3% in recent years. It is argued that factors related to structural variables, policies, compliance and administration of taxes have been contributing to the continuous loss of potential tax revenue. The objective of this study is to find the determinants of CIT losses (gap) which have been calculated using standard methods of tax loss computation. The CIT gap is defined as the difference between the potential taxes that companies should pay and the actual taxes collected by the revenue authorities. The potential CIT revenue depends on standard tax base and tax rate variables. However, actual tax revenue depends on the altered tax bases after various exemptions and deductions, tax rates after incentive schemes, acts of tax evasion and tax fraud, inefficiency in revenue collection authorities, corruption, etc. In this specification, we decompose CIT losses into five components: gap due to tax exemptions, deduction and qualifying payments, special rate concessions, under-reporting and collection failure. From the theoretical specification, we derive a testable equation of CIT loss, which presents CIT loss/gap as a function of standard tax variables such as tax base and marginal tax rate and deviation from such standard variables due to tax incentives and concessions and tax fraud and inefficiencies in collection. We use company-specific data of 1015 companies in a year available for seven assessment years from 2010/11 to 2016/17. The use of log dependent variable eliminates the companies with zero tax losses in the estimation. Panel Least Squares method and fixed effect model are used for the estimation based on Hausman test results. We find that income elasticity of CIT loss is high and it indicates 1% increase in tax base result in 1% increase in tax loss. Further, standard tax rate reduces CIT losses. However, special tax rates, income concessions, tax fraud and abuse of tax incentives have a positive effect on the corporate income tax losses.

Keywords: Corporate income tax, Determinants of tax gap, Panel estimation, Tax gap

The Impact of the Philosophy of Education of Radhakrishnan in the Modernization of India

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The contemporary Indian philosophy of education is seen as a central aspect of moral and ethical values and holistic education of students. It enables students to develop a sense of obligation towards society as well as which emphasizes the growth of the full person. Sarvepalli Radhakrishnan was a creative thinker of contemporary India. Radhakrishnan's educational philosophy was a well-structured and comprehensive curriculum. He believed the significance of not just general education but also liberal education and professional education, understanding that each played a vital role in shaping well-rounded individuals. He recognized the value of extra-curricular activities and various methods of teaching. The objectives of the research are to analyze the philosophy of education of Radhakrishnan and to evaluate the impact of Radhakrishnan's philosophy of education in the modernization of India. Data for the research was collected from primary and secondary sources and analyzed qualitatively. Primary data was collected from original texts written by Radhakrishnan. Secondary data was collected from different texts, research articles, journals, and e-papers written by scholars about Radhakrishnan. Historical methodology, analytical methodology, and descriptive methodologies were used as research methodologies. Here historical methodology was used to research the biography of Radhakrishnan. The analytical methodology was used to analyze Radhakrishnan's philosophy of education. The descriptive methodology was used to describe the impact of Radhakrishnan's philosophy of education in the modernization of India. Radhakrishnan's educational theory strongly emphasizes the value of comprehensive and multifaceted learning, which promotes independent thought, creativity, and critical thinking. Radhakrishnan's educational theories have greatly aided India's modernization by advocating an all-encompassing, welcoming, culturally rooted, and socially responsible approach to education. In conclusion, contemporary Indian philosophy of education pursues to create a transformative educational experience that enables students to become responsible, empathetic, and engaged citizens who can contribute to the betterment of society. Radhakrishnan made substantial contributions to the philosophy of education, and the educational system of India is a beneficiary of his ideology.

Keywords: Curriculum, Ethical values, Modernization of India, Philosophy of Education, Teaching method

Technological War between the US and China: A Study of a Small State's Response

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This study examines the responsive situation of a small state, Sri Lanka, in the context of the US and China power conflict. The study analyzes the situation through an offshoot of the realist theory; the Strategic Triad, because the study has revolved mainly around the power-struggle of three states: the US, China and Sri Lanka. The study is based on secondary data analyzed through the method of textual analysis by the software tool “QDA Miner Lite”. The study also examined diplomatic documents and speeches on the tech war through the textual analysis software. The research has found that the superpower states such as the US and China use technology as a tool to win the power struggle and associated gains. This technological war and power struggle between superpowers put small states in a more oppressed and unfavorable situation in which they are compelled to choose a side to survive, which highlights the anarchical environment of international society.

Keywords: China, Power-struggle, Small States, Sri Lanka, Tech war, US

The Function of *Vitakka* as Wisdom or Knowledge

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Thought (*vitakka*) is commonly and frequently used among everyone of different religions. Nevertheless, there is a lack of knowing that thought is related to wisdom or knowledge. Accordingly, this study aims to analyze the relationship of *vitakka* to wisdom or knowledge. In agreement with the discourses and *Abhidhammic* analysis, *vitakka* representing *sammāsaṅkappa* contains the analysis of the path constituents and the truth by means of analysis. Particularly, it will investigate why *vitakka* and knowledge are similar in the Commentary and why *vitakka* is an essential requirement of wisdom. The combination of different research types - textual method, descriptive research and qualitative research - is adopted in the current study. In the classification of tranquility and insight, right view and right thinking which comprise the wisdom aggregate are insight and they can be called elements of the insight path. *Sammāsaṅkappa* has the characteristic of focusing rightly. Right thinking has three functions: abandoning wrong thinking, causing the cessation of the object, and focusing particularly on co-nascent states. In accordance with the *Saddhammapakāśinī*, since *vitakka* resembles knowledge or insight (*ñāṇa*), it is difficult to differentiate *vitakka* from knowledge in the context of the path. Furthermore, there is no function of insight knowledge which is devoid of *vitakka*. Insight with the help of *vitakka* can perform its own function. According to the *Visuddhimagga*, in the above first two constituents of the path, wisdom (*paññā*) cannot define an object by itself as impermanent, painful and non-self, but it can do so when applied thought repeatedly strikes at the object. This research shows that *vitakka* and *ñāṇa* are grouped together because they have similar functionality. It was substantiated that to possess both wisdom and insight knowledge and to develop insight meditation, the function of *vitakka* is important to the connection with *vitakka* and wisdom as well as insight knowledge.

Keywords: Insight knowledge, *Sammāsaṅkappa*, *Vitakka*, Wisdom aggregate

The Importance of Sigālaka Sutta in a Competitive World

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Buddhism is a unique practice that is not only reflected as a religion to follow but also a tremendous path to achieving enlightenment and escaping from the human birth cycle. Buddhist thoughts have been imbued in every aspect of people's lives which steeps through state affairs, domestic and social life. Most importantly, its ethics and values are aided immensely to shape society and remarkably impacted on people's day-to-day lives. The research draws attention to how discipline can be maintained in the contemporary society by fulfilling one's duties, and responsibilities as Buddha described in the *Sigālaka Sutta*. However, most scholars have focused on the six directions of duties, which Buddha has explained in the Sutta, without paying attention to how it could be applied to the contemporary human life. Thus, specifically, this study tries to understand how crucial it is to follow the social ethics and discipline discussed in the *Sigālaka Sutta* in a competitive world since its validity in the context of modern society cannot be denied or disputed as *Venerable P. Gnanaram* has stated. Therefore, the main objective of this research is to explore how imperative it is to apply the reciprocal relations among various members of a society in a competitive world as Buddha emphasized in the *Sigālaka Sutta* which leads to harmonious society. The secondary objective includes a critical analysis of why bilateral commitments of mutual interest are necessary for every social unity as Buddha advocated. Accordingly, secondary data is used, obtained from both published books and articles, with special reference to the book 'Buddhist Rules for the Laity' by D. J. Subasinha and the book 'Buddhism and Confucianism' by Dr. Gallelle Sumanasiri. As further data were gathered, it was brought to light that the Buddhist rules contained in the *Sigālaka Sutta* for laity are by no means outdated but it incredibly guides individuals to have a fruitful and happy life by practicing reciprocal relations among various members of a society.

Keywords: Buddhism, Duties, Discipline, Harmony, *Sigālaka Sutta*

A Historical Analysis of the Social Groups and Rankings System and its Practice in Ancient Sri Lanka: From the 10th Century up to the 15th Century A.D.

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In this research paper, the occupation-based complex social groups and rankings system in ancient Sri Lanka is explored and its socio-cultural significance is studied. The primary objective of this study is to gain a comprehensive understanding of the social groups and rankings system which existed within Sri Lankan society during the ancient era. This investigation spans the period from the 10th century A.D. to the 15th century A.D. We aim to portray the social roles associated with different social groups by analyzing diverse scholarly perspectives. Furthermore, a thorough examination is conducted to elucidate the privileges and social constraints linked to each social group. The research was undertaken employing historical methodology, and pertinent data was gathered from both primary and secondary sources, subject to rigorous historical analysis. The central focus of the research revolved around the emergence of the social groups within Sri Lankan society during the designated period, serving as a guiding problem to propel the investigation forward. In conclusion, this research paper presents a comprehensive analysis of the social groups and rankings system in ancient Sri Lanka, focusing on the intricate interplay between professions and its influence on the shaping of the social groups and rankings system during this historical epoch. It becomes evident that in social groups and rankings system, Sri Lanka is evolving based on professions, with notable influence from Buddhism, and is further evolving through the establishment of social divisions aligned with the Indian model.

Keywords: Ancient Sri Lanka, Professions, Rankings system, Socio-cultural significance, Social groups

Identification and Preservation of Classical Roman Architecture in the Kandyan Landscape

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This study focuses on preserving the classical Roman architecture within the historically rich Kandyan Landscape, which was declared a UNESCO World Heritage Site in 1988. The landscape has been influenced by various historical rulers, including local Buddhist leaders as well as the Portuguese, Dutch, and British. Among the architectural styles, Kandyan architecture has notably blended with classical architectural characteristics, adding significant value to the region. However, the study highlights a key research gap concerning the lack of site-specific Roman architectural information within the Kandyan landscape and the need for effective preservation mechanisms. The objective of this research is to identify features and sites and propose viable mechanisms to preserve the classical Roman architecture found in the area. Data collected from field surveys, stakeholder interviews, and observation was conducted and analysed using descriptive and Microsoft Excel methods. The study identified 11 sites within a 10-kilometre radius from the centre of Kandy city for in-depth analysis, revealing considerable Roman architectural features such as thick walls, arches, round arched windows, and Roman Tuscan columns. The preservation of these architectural sites faces several challenges, including a lack of financial resources, limited public understanding of their cultural and historical significance, insufficient rules and implementation, a shortage of skilled experts, and the impact of urbanisation and development. To address these challenges, the study proposes implementing the Kandy Heritage Foundation proposed by UNESCO. These include launching public awareness campaigns to highlight the importance of preserving heritage monuments, introducing new rules and regulations, fostering academic and international partnerships, and establishing community-based organisations to actively involve local communities in preservation efforts. Through the implementation of these recommendations and the proposed preservation mechanisms, the study aims to safeguard the ancient architecture within the Kandyan Landscape, preserving its historical and cultural significance for future generations.

Keywords: Classical Architecture, Heritage, Kandyan landscape, Preservation

Different Narratives in Times of Uncertainties: Identity Politics at the Contested Heritage Site in Kurundimalai, Sri Lanka

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This study mainly explores the dynamics of identity politics surrounding the contested heritage site of Kurundimalai in Mullaitivu, Sri Lanka. The historic significance of Kurundimalai as a pilgrimage site and its association with multiple religious and ethnic communities have resulted in a complex interplay of identity politics, fuelled by historical narratives, cultural symbolism, and territorial claims. This study aims to shed light on the various dimensions of identity politics in Kurundimalai, the underlying factors contributing to the contestations, and their implications for social cohesion and sustainable peace building in the region and the country. This research employs the mixed-method approach, combining desk research, interviews, and participant observation. The desk research involved a comprehensive review of existing literature, reports, and historical accounts related to the contested heritage site in Kurundimalai. Semi-structured interviews were conducted with key stakeholders, including religious leaders, local communities, and relevant authorities. Participant observation was carried out to gain first-hand insights into the socio-political dynamics and interactions at the heritage site. In the conceptual framework of this study, fundamental theoretical examination of the four notions of power, nationalism, contested heritage, and heritage conservation have been used to understand the behaviour of identity politics around the contested heritage site.

Keywords: Contested heritage, Historical narratives, Identity politics, Nationalism, Territorial claims

Issues Encountered by ESL Instructors When Striving to Provide an Inclusive Learning Environment for Their Students during the COVID-19 Pandemic

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ESL instructors aim to provide an inclusive learning environment for their students, to help them succeed academically, boost their confidence, equip them with the necessary skills to face the diverse world and inspire them to learn the language beyond the classroom. This research employed a qualitative method to examine the issues they encountered when striving to provide an inclusive learning environment to their students during the COVID-19 pandemic. The study was conducted at the Faculty of Arts, at the University of Peradeniya, following its post-pandemic reopening. Prior to the university's closure, the first-year undergraduates were grouped according to their competency using a placement test, with many students placed at the basic competency level. Hence purposive sampling was employed, selecting 15 ESL instructors who taught students in the basic competency level for this study. Interviews were conducted with these 15 ESL instructors and content analysis was employed to analyze these qualitative data. According to the results of the study, technological challenges such as students lacking the necessary devices for online learning, poor internet connectivity, low student engagement due to lack of face-to-face interactions, distractions at home, lack of individual attention, issues in assessment and evaluation such as adapting assessments to suit the online format, ensuring authenticity, and providing timely feedback to students were revealed as the issues encountered by ESL instructors when striving to provide an inclusive learning environment to their students. While online teaching/learning enabled students to continue their education during the pandemic, it was found to be less than ideal in the Sri Lankan context. Although the pandemic has currently subsided, there is no guarantee against future disruptions. Therefore, this research provides valuable insights for policymakers and educational professionals to develop strategies that ensure an inclusive learning environment for all students, regardless of the circumstances in the country.

Keywords: Covid-19 Pandemic, ESL Instructors, Inclusive Learning Environment, Issues

Navigating Commercial Higher Education and Quality/Equity Debt: A Philosophical Inquiry

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Higher education faces the dual challenge of commercialization and ensuring quality and equity. This study delves into this interplay, drawing from Dewey, Michel Apple, and Nussbaum's philosophical perspectives. It analyzes the philosophical underpinnings of commercial higher education and quality/equity debt, aiming to understand their impact on educational values. By examining insights from these philosophers, the study bridges the gap between ideals and practical solutions, offering guidance for modern higher education challenges. The methodology employs a multi-dimensional approach. It begins with an in-depth analysis of Dewey, Apple, and Nussbaum's works to extract educational insights. An extensive literature review explores the effects of commercial higher education on quality and equity. Complementing this, empirical data is collected through surveys and interviews with educators and students, providing real-world perspectives on challenges and solutions. Dewey's emphasis on experiential learning lays the foundation for transformative pedagogy. Infusing project-based learning, interdisciplinary studies, and collaborative inquiry counteracts education's commodification, fostering engaged learners. Apple's critique of educational inequities emphasizes proactive measures for equitable access. Need-based scholarships, faculty diversity, and inclusive curriculum align with Apple's vision of education as empowerment. Nussbaum's capabilities approach underscores holistic development. Prioritizing student well-being, mental health support, and character education addresses quality/equity debt by nurturing contributors to society. Integrating these insights enables institutions to transcend commercialization and quality/equity debt challenges. This aligns with Dewey, Apple, and Nussbaum's ideals and propels higher education toward justice, inclusivity, and enlightenment. As higher education evolves, this study guides the bridge between ideals and practicality, ensuring education's transformative impact.

Keywords: Dewey, Higher Education, Nussbaum, Quality/Equity debt

Performance-Based Incentive Scheme for Sewing Machine Operators: The Case of Sri Lanka

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The payment scheme is one of the main organizational issues that de-motivate workers, especially sewing machine operators, which generates a negative effect on productivity. Overtime work payments and group incentive payments have been identified as additional income sources for sewing machine operators at present. But long overtime work results in negative informal institutional issues and health problems that influence labour productivity. Management of apparel factories used to pay group incentives upon the achievement of production targets. In group incentive methods, all the sewing machine operators are paid an equal amount of money upon the achievement of the production target regardless of the difficulty of operations they performed. The contribution of each machine operator to the achievement of the production target is different. In this framework, equal payments demotivate hard workers making them contribute below their potential. The objective of this research is to explore the present payment system and labour productivity of machine operators in Sri Lankan apparel factories and propose an alternative payment scheme to incentivize them to operate at their full potential. This study uses the information of an experiment conducted from February to October 2017 at 10 sample apparel factories. Performances of 870 sewing machine operators were measured before and after the implementation of incentive system. The sewing machine operators' contribution to production lines evaluated at their existing performances under overtime work and group incentive scheme were not satisfactory. Performance is the ratio between real average time to perform the operation and the standard operational time. Empirical studies showed at least 5% improvement in line performances in each factory. Applying research information in a theoretical and empirical framework, this paper shows that labour productivity and thus profits of the firm and workers' benefits can be improved by a non-linear performance-based incentive scheme. Socio-economic gaps created by financial differentiation inspire the class mentality incorporated with psychosomatic emotions such as self-dignity and ego, stimulating them to contest with themselves to climb up the incentive grade ladder independently and inspirationally.

Keywords: Incentive payments, Labour productivity, Organizational issues, The apparel industry in Sri Lanka

The Effectiveness of Drama Techniques in increasing awareness of Child Sexual Abuse Prevention in Children with Down Syndrome

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Children with disabilities have a higher risk of becoming victims of sexual abuse (SA) than children without disabilities due to a lack of knowledge regarding sexual health and preventive measures. Children with Down Syndrome (DS), with their limited capacity for understanding, comprehension, social maturity, body awareness, and boundaries exposure to multiple adults and caregivers increased their vulnerability. Education on sexual health and abuse prevention is effective in the prevention of SA among risk populations. Although a variety of resources have been created to help improve the sexual health of people with disabilities, one area that is seriously lacking is effective methods in teaching DS children about sexual health and abuse prevention. Thus, the present study aimed to examine whether drama techniques can be used effectively to increase the awareness of how to prevent and protect from SA among DS children while testing the hypothesis that drama techniques are effective in increasing awareness of the prevention of sexual abuse in children with DS. A purposive sample of 30 DS children with mild to moderate levels of severity was selected from two special education institutes in Kandy, Sri Lanka. Pre-existing categorization within the institution was used for sampling. The study used a within-group pre-test post-test experimental research design with the Be Safe Tool designed and adapted to Sri Lanka by Pathirana (2004) with the Canadian Red Cross. The tool consisted of items assessing the awareness of good and bad touch, secrets, and primary prevention strategies. Five intervention programs using drama techniques including puppets, role play and story-telling were conducted over three weeks. Collected quantitative data was analyzed using a paired sample T-test with SPSS. The results from the pre-test ($M=13.5$) and post-test ($M=21.6$) indicate that drama techniques have significantly impacted increasing the awareness of child sexual abuse prevention in children with DS, $t(29) = -11.0, p < .001$.

Key words: Child sexual abuse, Down syndrome, Drama techniques, Puppets

LGBTIQ Community Activism at the Gotagogama Protest of 2022 in Sri Lanka: A Study on Dynamics and Implications

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This qualitative study focused on exploring the political activism of the LGBTIQ community within the context of the ‘Gotagogama’ Protest in Sri Lanka. Data was gathered through interviews and analysed thematically, with content analysis of YouTube videos and other relevant secondary data sources supplemented. The study's goal was to explore into the experiences, contributions, and issues faced by many identities within the LGBTIQ community throughout the protest movement, including lesbian, gay, bisexual, transgender, intersex, and queer individuals. The findings provide light on the community's tenacity, determination, and achievements in the pursuit of recognition and social change. Drawing upon sociological theories such as Social Movement theory, the study provided a framework to understand the impact of the LGBTIQ community's activism on Sri Lanka's political landscape, encompassing policy changes, shifts in societal attitudes, and alterations in public discourse. The research acknowledged both the accomplishments and limitations of the LGBTIQ community's activism within the protest, while also shedding light on the various barriers and discrimination they encountered. By offering comprehensive insights into the unique context of the Gotagogama Protest in Sri Lanka, this study made a substantial contribution to the existing body of knowledge on LGBTIQ activism. It underscored the importance of inclusive and diverse movements in the pursuit of social justice and equal rights. The study not only illuminated the experiences, difficulties, and triumphs of the LGBTIQ community during the demonstration but also examined how their activism influenced the political environment, including changes to laws, social norms, and improvements in public discourse. The study's conclusions included recommendations for promoting a more accepting society and continuing to support the activism of the LGBTIQ community.

Keywords: Gotagogama, LGBTIQ community, Political activism, Social movements

Exploring Reasons for Low Women's Employment in the Hotel Industry: A Case Study of Southern Province of Sri Lanka

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Despite the considerable growth of Sri Lanka's tourism industry over the years, the engagement of women in the hotel sector workforce remains notably low. This study delves into the complexities of this persistent issue, focusing on the Southern Province as a microcosm of the broader situation. By employing qualitative research methods, the research seeks to unveil the intricate web of underlying causes and barriers that contribute to this gender disparity. In order to comprehensively investigate this phenomenon, we conducted semi-structured interviews with 10 female employees actively working within the hospitality industry and 5 women who are not part of the sector. The research site comprises three graded hotels in the Southern Province of Sri Lanka, providing a localized yet representative perspective. It becomes evident that long-standing misperceptions, deeply rooted patriarchal attitudes, and socio-cultural influences intertwine to create an environment where women's participation in the hotel sector remains limited. Importantly, the voices of female employees highlight a paradoxical situation: while they express job satisfaction and a desire to continue in the industry, they also share experiences of societal resistance and negative perceptions associated with their hotel employment. Moreover, certain segments within the industry exhibit hesitancy towards the integration of women, acting as internal barriers to their entry and advancement. Furthermore, this research underscores how societal norms tied to marriage place additional challenges on women in the hotel industry, further perpetuating gender stereotypes and constraining their involvement. The scarcity of female enrollment in hotel schools compounds these challenges, resulting in a dearth of qualified female professionals and ultimately contributing to the perpetuation of low employment levels. By advocating for industry-driven measures to challenge misperceptions, promote inclusivity, and tap into the full potential of women in the sector, this research aligns with broader international findings.

Keywords: Gender Disparity, Hotel Industry, Sri Lanka, Social Barriers, Women's Employment

The Impact of Family Factor on Women's Labour Turnover Intention in the Sri Lankan Apparel Industry

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A higher percentage of labour turnover is a key reason for the nonexistence of well-experienced highly skilled women workers in the Sri Lankan apparel industry. Low-experienced workers result in low labour productivity in the industry. In this scenario, the problem of this research is why women workers used to leave the apparel industry within a short period. Consequently, the objectives of the study are to identify the factors that influence labour turnover intention and to measure those factors in quantitative dimensions. An empirical study was conducted as the methodology to achieve the objectives. In this case, the views of sewing machine operators were explored. Accordingly, responses from 1004 women workers in the apparel industry, were collected. In the survey questionnaire, twenty pre-identified reasons through preliminary study and literature review were given to participants for prioritizing as first choice, second choice and third, as per their preference. The percentage values were calculated by dividing the total of the products of frequency and weight factor of each first, second and third choices of each reason by the entire number of responses. According to the results, the main reason for industrial women workers to leave the industry within a short period was marriage. Some 21% of the responses of industrial women workers pointed out marriage as the institutional reason for them to leave the industry. Child care had been identified as the second major institutional reason with 17% of responses. Work-family conflict and poor social recognition were the next important reasons for women's labour turnover intention. According to the empirical study, around 64% of the responses for women labourers to leave the apparel industry within a short period are incorporated with the family. In a patriarchal social context, Sri Lankan women are highly dedicated to family commitments. According to current practices in the apparel industry, it is questionable whether the industrial management has been able to realize the impact of family factors on labour turnover.

Keywords: Labour Turnover, Labour Productivity, Sri Lankan Apparel Industry, Work-family conflict

Artificial Intelligence (AI) and Legal Education: Some Cautionary Reflections

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Artificial Intelligence (AI) is having a significant impact on higher education. Many students are now using tools such as *ChatGPT* for educational purposes, while teachers are also making use of these tools for teaching purposes. The legal profession is already heavily impacted by AI. While legal trials are being conducted with the assistance of AI, numerous authors have started to show how lawyers and law students can make use of AI tools to enhance their legal and research-related work. This paper examines the impact of AI on legal education in Sri Lanka, especially from the perspective of a legal academic. It will first revisit how legal education has generally been understood and conceived by legal educators, both globally and in Sri Lanka. The paper will thereafter consider whether, or to what extent, legal education – from the perspective of both the student and the teacher - seems to be changing due to the rapid development of AI. The key question that this paper seeks to address is: what is ‘legal education’ in the age of AI, and how may legal academics respond to the exponential growth of AI? The paper will be based on published literature, while reference will be made to the author’s own experiences and views gathered from students. The paper argues that legal educators will have to come to terms with AI and make the best use of it, while maintaining the highest standards of ethics and professional integrity, which is bound to be an extremely challenging task.

Keywords: Artificial Intelligence (AI), Ethics, legal education, Legal skills, Legal research

A Study on Anatomy Question Making and Performance Improvement in Undergraduates

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In contemporary education, student-centered active learning has emerged as a favored approach over conventional teaching methods. Making questions demands precise subject knowledge. Creating practical examination questions using cadavers needs good dissection skills and precise identification of structures. Based on this, a group activity was given for first year dental undergraduates for the head and neck anatomy course. The objective was to determine whether making questions would lead to an improvement in students' performance. A total of 120 students were divided into groups A and B, each of which had five cadaver groups. A pre-test was done using Extended Matching Questions (EMQ). A preparation time was given for studying, dissection and creating an Observed Structured Practical Examination (OSPE) using their cadaver and an EMQ on a given topic. Two groups did the activity on separate days. EMQs were displayed to all, followed by rotation among pre-prepared OSPE stations within the given time. Following a discussion time, each group submitted their answers. They delivered a presentation elaborating the answers to their own questions. During this time, both teachers and a designated peer group evaluated them on the question quality and presentation skills, alongside random exchange and marking of answer scripts. On the following day the questions formulated by Group A and B were exchanged using a Learning Management System (LMS) for an individual post-test. Analysis of student performance revealed a significant improvement after the activity, with a mean score difference of 2.420 ($p = 1.095531 \times 10^{-9}$). Students' online feedback revealed that making questions was more beneficial than presentation and discussion. All respondents rated 3 and above in Likert scale for soft skill improvement. Majority (86%) had favored group/self-directed activities over lectures. This study showcases the potential of collaborative and active learning methods to improve knowledge retention, application and soft skills.

Keywords: Anatomy, EMQ, OSPE, Question making, Students' performance

Museums as a Tool for Cultural Heritage Management in Sri Lanka

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The general objective of this research paper is to develop an appropriate method to manage the cultural heritage in Sri Lanka through museums. Therefore, this research focuses on identifying museum objects with more narrative strength to exhibit the significance of cultural heritage through museums, promote "the museum visiting culture" in Sri Lanka, develop museum education while understanding the link between objects and the site, and understand the importance of having museum monitoring methods and policies to manage the museums efficiently for the well-being of cultural heritage management in Sri Lanka. As a methodology, a literature survey, participant observation, and interviews were carried out to collect data. The collected data were analyzed through SWOT analysis. Moreover, object domain analysis was conducted for the selected objects in museums through judgmental sampling to identify the narrative strength of the objects. In this research, the concepts of memory, identity, and heritage management were focused. This research highlights the importance of a proper museum monitoring method, the significance of identifying the narrative strength, how to link the exhibits with the site through available ability and resources, and museums' responsibility to their public and collections. This approach could create a sense of tangible and intangible heritage at the particular site and be directed to contribute experiences for visitors concerning object, cognitive, and social occurrences. This research is directed towards museums as a tool for cultural heritage management in Sri Lanka and will help to develop museum management policies and museum monitoring methods through the memory and identity associated with museum exhibits.

Keywords: Cultural heritage management, Identity, Memory, Museum, Narrative strength

The Distribution of Prehistoric Sites in the Central Highland with Special Reference to *Sindurankanda, Udunuwara, Sri Lanka*

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The earliest prehistoric investigations on the Island were conducted by E.E. Green from the *Peradeniya* area in 1885. Subsequently, other researchers documented the occurrence of prehistoric tools in the Districts of *Matale*, Kandy, Nuwara Eliya and other areas. Commonly, the evidence was found in high-altitude caves and open-air sites. The site is situated at *Sindurankanda, Udunuwara*, where the State Department of Archaeology and the Central Cultural Fund conducted surveys in 2014 and 2020, respectively. The authors and a few academic staff members carried out a systematic exploration of the area, collected data, and recorded the material culture which was examined and interpreted. The exploration has yielded quartz fragments (wastes, potential, and used tools) comprising very few Mesolithic tools and a few snails (*Cythopoma* sps.). The site contained a rock summit, a water canal below the rock, and raw material (clear, milky, and pink quartz) that shows a factory site and a community gathering location. The elevation at *Sindurankanda* is ca. 700m. Evidently, the Mesolithic inhabitants preferred to reside ca. 1000m above the sea. Observing the other sites in Kandy, many quartz tools were found in *Dotulugala*, the Knuckles range, and the *Bambaragala Rajamahavihara* area. Horton Plain consisted of the evidence of microlithic tools. Some prehistoric tools have been reported from *Gampola*, *Nawalapitiya*, and *Nuwara Eliya* while *Peradeniya*'s findings were not considered reliable tools. Fauna and flora play a significant role in the Mesolithic subsistence pattern. The authors observed the nature modification during the exploration because of colonial coffee and tea plantations, and later cultivation. Consequently, secondary vegetation is predominant. The implements measuring length < 4.5cm, showing Microlithic technology, and can be relatively dated to the Mesolithic Period (10,000-1800BP). Moreover, human-made landscape modifications have resulted from the loss of a surface material culture in the area.

Keywords: Mesolithic Period, Landscape modifications, Prehistoric investigation, *Sindurankanda* exploration

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A Study of Continuity and Transformation of Archaeo-historical Context of *Sindurankanda* and its Hinterland

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The Central Highland region constitutes a significant area in the historical and archaeological landscape of Sri Lanka. It encompasses a rich tapestry of archaeological sites that span various techno-cultural phases, thereby offering invaluable insights into the historical evolution of the region. Particularly, the *Sindurankanda* area serves as a compelling locus for investigating the processes of cultural evolution, extending from the prehistoric era to the contemporary period. Employing diverse archaeological field survey methodologies, this study seeks to discern the patterns of cultural continuity and transformation of the area. Preliminary explorations in *Sindurankanda* have yielded a considerable number of quartz artefacts, which can be categorized into distinct groups, including waste materials, potential tools, and tools. The identification of Mesolithic implements is notably challenging, primarily due to the abundance of quartz waste, suggesting the possible existence of a quarrying site where the summit of the rock may have functioned as a communal gathering place. Numerous caves, some with *Brahmi* inscriptions, further affirm the human presence in the region, giving rise to a rich tapestry of folklore and narrative traditions, often intertwined with the legend of *Ravana*. Furthermore, archaeological findings provide compelling evidence of the inhabitants of the Kandy region engaging in long-distance trade as early as the 1st century BC. This assertion is substantiated by an inscription discovered in *Wegiriya*, located in *Udunuwara*, which attests to the multifaceted skills possessed by individuals in crafts such as lapidary work, pottery, and ivory craftsmanship. The research area is replete with a multitude of *Rajamahaviharas*, *Purana viharas*, temple villages, *Devalas*, and *Devala* villages, all dating back to the Gampola and Kandy periods. These entities assume profound significance in studying ancient built environments and the cultural landscapes associated with religious and sociocultural spaces. It is imperative to note that the entire landscape has undergone profound transformations, primarily due to coffee and tea plantation practices during the colonial era.

Keywords: Archaeo-historical, Cultural, Evolution, Sindurankanda, Transformation

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Gender: A Factor in False Memory Creation in Eyewitness Testimonies

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Extensive research has highlighted the risk of using eyewitness testimonies in legal contexts due to human memory's fallibility. To address this, factors contributing to inaccuracies, including false memories, need examination. This study focuses on studying gender differences in the creation of false memories and uncovering a relationship between the gender interactions of the eyewitness and the interrogator in creating false memories. For this purpose, the current study adopted an experimental design, where 60 male and female participants were interrogated after watching a video of a robbery by both male and female interrogators. Measures such as double-blind design procedures were taken to minimize any extraneous or mediating effects. Data was analyzed through chi-square tests of independence. The results showed that female eyewitnesses exhibited a higher frequency of errors stemming from false memories compared to their male counterparts and that when questioned by female interrogators, male eyewitnesses provided more accurate responses and avoided false memories. However, the underlying causes of these significant gender-based differences warrant further exploration in future studies. This research has implications for the legal and law enforcement sectors, shedding light on areas that require heightened attention and precautions. Furthermore, the findings underscore the competence of female interrogators, suggesting that they are equal, if not superior, in performing interrogative tasks within law enforcement agencies.

Keywords: Eyewitness testimonies, Gender interactions, Gender, Interrogation
False memory

Building Social Cohesion: Contribution of Intermarriages (A Social Anthropological Study on the Village in Munneswaram)

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This study intends to explore Sinhala-Tamil intermarriages and social cohesion. Accordingly, the study intended to study how caste, religious integration, and social relationships affected the formation of social cohesion in the area. The data was obtained through semi-structured interviews, key informants, and observations, and the data was analyzed using the narrative analysis method. The sample that was selected via purposive sampling method comprised 30 intermarried families living in the 568, GS Division in Munneswaram. Emile Durkheim's theory of social integration is critical in addressing this field of knowledge. The study revealed that the civil war, unemployment, dowry, landlessness, marginalization, and social exclusion paved the path to inter-ethnic marriages. However, inter-ethnic marriages constituted a serious threat to the existing tradition. In addition, because of inter-marriages, there were close social ties between Tamil and Sinhala neighbors and relatives. In terms of the religious component, these marriages had created religious coherence between the two ethnic groups, opening the way to creating peace inside the family institution, and religious solidarity between the Hindus and the Buddhists flourished in Munneswaram. The distinctive aspect of these marriages was the production of children who were multiculturally socialized, as they had to study and adapt to two religions in the family institution. The children in these families are promoted as children with multi-religious outlooks through practices that abstracted from the philosophical basis such as religious activities, rituals, and ceremonials.

Keywords: Caste, Intermarriage, Integration, Social Cohesion, Socialization

Acknowledgement: *I would like to extend my gratitude to University of Peradeniya for allocating a grant for this research study.*

Resilience and Responses: Exploring the Multifaceted Impact of COVID-19 on Economic, Mental Health, and Cultural Realms among Sri Lankans across Three Pandemic Waves

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The global aftermath of COVID-19 has significantly transformed socio-economic structures, especially in disadvantaged Sri Lankan communities. This study investigates how the pandemic's effects on economic conditions and cultural engagements can influence individuals' mental well-being. The research involved an extensive household survey across all nine provinces, using a semi-structured questionnaire. A total of 3020 households were sampled using a multi-stage clustering method, and data were collected during three pandemic waves. The collected data underwent descriptive statistical analysis, presenting results as proportions of the total population. Findings revealed that over all three waves, more than 60% of households fell into the low-income category. Employment routines changed for over 50% of participants during each wave, often involving reduced work hours or permanent layoffs. Additionally, more than 70% of respondents experienced decreased or halted monthly income throughout the pandemic, citing reasons like reduced salaries and fewer working hours. During all 3 waves, 70% experienced income reduction and, 53% among them reported increased loneliness, 59% felt greater emptiness, and 55% experienced decreased social connectedness. 61% of the population reduced social gatherings during all waves, resulting in elevated loneliness (51%), decreased social connectedness (52.7%), and increased emptiness (53.5%). Similarly, 77% reduced participation in cultural festivities and 50% among them rise in loneliness and a 56.3% increase in emptiness, coupled with reduced social connectedness by 52%. 80% of respondents reduced spiritual practices, leading to increased loneliness by 52.3%, heightened emptiness by 57.2%, and a decline in social connectedness by over 50%. The study highlights the interplay between economic stability, cultural involvement, and mental health. Reduced income and limited cultural interactions contributed to heightened loneliness, emptiness, and reduced social connectedness. This research holds broader relevance for similar contexts and crisis survey methodologies, emphasizing how the pandemic's impact permeated economic, cultural, and mental aspects. Recognizing these connections aids societies in navigating challenges and bolstering resilience in adversity.

Keywords: COVID-19, Cultural impact, Economic impact, Mental impact, Quantitative study, Sri Lanka

Acknowledgement: This study is based on the data collected from the AI4COVID research project and was supported by the International Development Research Centre (IDRC), Canada.

A Philosophical Analysis on the Aesthetic Foundation of the Sri Lankan Mask Tradition with Reference to Aristotle's Mimesis

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The Greek version of Aristotle's Poetics discusses poetry, other art forms, and the idea of "mimesis," which is Greek for "imitation," as they relate to his aesthetics. His definition of aesthetics included mimetic art forms including poetry, music, theatre, and painting. Masks, a type of mimetic art, are a cover for genuine personalities and a depiction of many ceremonial behaviors. The dramatic exorcism act known as "Sanni Masks" is a part of the Tovil rituals in Sri Lanka and represents the illnesses of eighteen demons. The research problem of this study is, how can we understand the Sanni Masks' aesthetics and philosophical background in relation to Aristotle's concept of mimesis. The research paper describes that the concept of mimesis and its relevance to the Sanni performances in Sri Lankan Sanni ritual practices. The main objective of the study is to identify the philosophical and aesthetic approach to the Sanni masks and to explore the Sanni masks in standard aesthetic theory of mimesis. *The Ritual Drama of the Sanni Demons* (1969), *Folk Drama of the Ceylon* (1952), *Ceremonial Dances of the Sinhalese, Masks* (1994), *Aristotle's Theory of Poetry and Fine Art* (1951), *Aristotle's Art of Poetry* (1940), *Masks and Masks System of Sri Lanka* (1978) have been used as the literature. These data were gathered as part of a qualitative study utilizing the textual analysis approach, and contextual analysis was used as secondary sources to draw a conclusion. In conclusion, Sri Lankan Sanni Masks comprise imitation dramatic acts that aim to heal people by curing the eighteen diseases caused by demons. These Sanni Mask performances entertain the general public while conveying the Buddhist philosophy behind Sinhalese ceremonies and psychological underpinning of Sri Lanka.

Keywords: Aesthetics, Mimesis, Sri Lankan, Sanni Masks, Philosophy

Ambedkar: Double Struggle against outside and inside

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Ambedkar was involved in two struggles simultaneously: the struggle against British colonialism and Indian caste oppression. In other words, on the one hand, he fought against British colonialism to liberate Indians from British colonial hegemony; on the other hand, he fought against the oppressing caste structure in India to liberate untouchables from Hindu caste hegemony. Therefore, he had to struggle against the leadership of the Indian independence struggle to realize the objectives of the second struggle. His idea was that to emancipate the people of oppressed castes, there should be a double struggle by breaking both the colonial regime and the Congress Party as well. As Arundhati Roy insists in *The Doctor and the Saint: Cast, Race, and Annihilation of Cast, the Debate Between B.R. Ambedkar and M.K. Gandhi*, there is no single sentence for the annihilation of caste in the Collected Works of Gandhi. As a part of the struggle for the annihilation of caste oppression, he struggled to remove the expressions in Vedic texts that defended caste discrimination. After the failure of that struggle, he himself converted to Buddhism and proceeded to convert some 500,000 of his supporters to Buddhism, and he wrote *Buddha and his Dhamma*. However, he was unable to trace the caste elements in the practice of Buddhism. The objective of this study is to understand, firstly, the contradictions between Gandhi and Ambedkar in their struggles against British colonialism and caste oppression, and secondly, Ambedkar's own contradictions in giving prominence to Buddhism over Marxism as the solution to the Dalit question. The ideas and arguments in Ambedkar's books, biographies, and critiques formulated by scholars like Trevor Ling, Arundhathi Roy, and Ranjith Guha have been used to explore the dialectical development of contradictions between Gandhi and Ambedkar and between Buddhism and Marxism that Ambedkar addressed.

Keywords: Ambedkar, Buddhism, Caste, Gandhi, Marxism.

Copyright Law and Enjoyment of the Right to Information: A Study of Justifiability and Reasonability of Sri Lankan Law on Copyright Law

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This study was on justifiability and reasonability of the copyright law of Sri Lanka in the context of globalization of economic activities and business. The rationale of the study was based on the observation that manual labour had been increasingly replaced by mental labour in which productivity is dependent on the availability of information. It is generally observed that copyright law has become a hurdle in nurturing mental labour. Further, there is a dearth of studies which examine copyright law from a critical normative perspective. In the above context, the present study provides a normative and comparative discussion and analysis of different frameworks of copyright law from a critical perspective. The study found two pieces of law which have been framed after Trade Related Aspects of Intellectual Property Rights (TRIPs) agreement of the World Trade Organization (WTO) and the World Intellectual Property Organization (WIPO) model. Further, it is found that law enactment in the field of copyright law had been carried out without proper consultation with the public and assessment of its developmental needs. The study found WIPO model was more beneficial to countries like Sri Lanka and it included provisions enabling translation and reuse within a shorter period of time. However, the TRIP model had done away with those developing country-friendly pieces of copyright law provisions making access to knowledge and information and their reproduction a daunting task for those eying the development of mental labour as required by the present global market.

Keywords: Copyrights, Mental labour, Normative perspectives, TRIPs, WIPO model

Language Spoken at Home and Economic Wellbeing in Sri Lanka: An Analysis Based on Survey Data

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This study examines how language spoken at home, economic activities and personal and national economic wellbeing are interrelated in Sri Lanka. This study uses survey data collected from 905 respondents chosen from nine locations. The percentage of responses was measured using a 1-7 Likert scale. For this purpose, we used five distinct languages frequently spoken at home such as Sinhala, Tamil, English, Malayalam and Telugu and their bilingual arrangements. The study found that when compared to the high percentage of Sinhala-speaking persons who view the language spoken at home as relatively important for economic activities such as income earning, studying, finding jobs, doing trade or business, and getting access to public services, the percentage of Tamil-speaking persons who recognize language spoken at home important for economic activities are significantly low. The minority languages, Malayalam and Telugu, speaking communities also recognize the importance of language spoken at home for economic activities at low levels. However, the relatively higher importance given by respondents to the language spoken at home in doing trade and business indicates that these minority language groups may have better opportunities in trade or business when using their own language. In bilingual arrangements, on average, Tamil-Sinhala speaking persons report a lower satisfaction rate on their living standards than Sinhala or Tamil speaking persons. The Sinhala-English and Tamil-English speaking persons have higher rates of satisfaction with their living standards compared to persons who speak Sinhala or Tamil at home. The Malayalam-Sinhala bilingualism makes Malayali persons slightly better off in terms of life achievements than the Malayalam-Tamil bilingualism. Further, Telugu-Tamil bilinguals indicate that they are better off with the Telugu-Tamil combination than the Telugu-Sinhala combination.

Keywords: Bilingualism and Economic wellbeing, Economic activities and Language spoken at home, Language and Economics

Effectiveness of an Awareness Program on LGBTQ to Change Attitudes and Knowledge of University Undergraduates about LGBTQ Community

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The LGBTQ+ community has historically faced various forms of discrimination, prejudice, and stigma. One of the main issues identified is the lack of understanding about and the negative attitude towards the LGBTQ+ community in general, including their fellow students. The purpose of this study is to examine the effectiveness of an LGBTQ+ awareness video in changing university undergraduate students' attitudes and knowledge regarding the LGBTQ+ community. The study used a pre-test/post-test designed to assess the impact of the awareness program on the participants' attitudes and knowledge. A sample of university undergraduates ($n=150$) was recruited from all public universities, representing diverse disciplines and backgrounds using the convenient purposive sampling technique. The awareness video focuses on LGBTQ+ terminology; challenges; social; and physical differences; and causes. The participants completed a pre-test survey assessing their attitudes and knowledge about the LGBTQ+ community prior to the awareness video introduced by the researchers. They also completed a post-test survey designed to evaluate any changes in their attitudes and knowledge. Interviews were conducted with people who showed a significant difference and those who did not show any difference. SPSS and Thematic analysis were used for data analysis. NVivo was used to transcribe the interviews into text. Pre- and post-tests showed a mean difference of 16 in knowledge and a mean difference of 17 in attitudes. Through thematic analysis, it appears that despite the increase in positive attitudes through the video, society is reluctant to accept the LGBTQ+ community based on cultural and moral factors. Accordingly, the findings of this study indicate that the awareness program significantly influenced university undergraduate students' attitudes and knowledge regarding the LGBTQ+ community. The study suggests that there is potential to reduce discrimination against LGBTQ+ people by improving awareness, dispelling myths, and fostering inclusive university environments. Future research should aim to replicate these findings in broader and more diverse samples.

Keywords: Attitudes and knowledge, Awareness program, Discrimination, LGBTQ community, Mitigation, University undergraduates

The Role of Home Gardens in Enhancing Household Food Security: A Case Study in Waratanna Grama Niladhari Division

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In light of the growing worldwide challenges to agriculture and food supply, this study focuses on the role of home gardens in enhancing household food security. It evaluates the effects of home gardens on food security while concentrating on the geographical aspect of the man-environment connection about home gardening. The conceptual framework illustrates the vital connection among home garden products, food production, household consumption, and income generation, emphasizing their crucial role in bolstering food security. The study investigated the impact of home gardening on household food security in the Waratanna Grama Niladhari Division. The random sampling method was used to select samples. Data was collected through questionnaires and observation, and both qualitative and quantitative analysis methods were employed. Qualitative data revealed food production and consumption from home gardens, while quantitative data analyzed the Pearson Correlation Coefficient and income. The analysis was descriptive and statistical. The selected gardens included diverse plant species, while livestock integration in them was less common. The vertical structure of home gardens includes five strata, which aid in planning and designing functional gardens, contributing to household food security. The study highlights that home gardening serves as the primary food source for households, providing staple foods such as vegetables, leaves, fruits, herbs, and spices. Moreover, home gardens significantly contribute to household income, offering fresher and healthier food options and helping reduce food costs. Spices emerge as the most profitable crop. Pearson Correlation coefficient shows the relationship between species, livestock and land size. Species and land size have a positive correlation (0.285) but livestock and land size have a negative correlation (-0.962). The study highlights the significant role of home gardening in enhancing the quality of life for families by ensuring food security and increasing the income and recommends scaling up and expanding the programs of home gardening.

Keywords: Food security, Home gardening, Household income, Spices

Politics of Policy: Nation, Market, and Free Education in Sri Lanka

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Our objective in this paper is to begin a dialogue on the political nature of the current status of higher education and the proposed reforms of the Parliamentary Select Committee. We will do this as a historical and analytic study of the history of Higher Education and the current juncture. We need to place the current moment in its historical context. We look upon the early stages of the education, predicated on the principles of free education, as inclining toward nation-building, and the latter as both neo liberal and nationalist. We take nation building and nationalism as related processes but distinct in their historic specificity. This is not a binary, but an imbrication of the two in each other. Through this we can locate free education ideologically and look at how the current managerial/neoliberal turn affects the country's people and the polities at large. It is also very important to understand this moment, as education and higher education are on the cusp of change. What is the future of the university system in Sri Lanka is the broad question raised here. We will study the Kannangara report and other policy documents of early university education, and the historicity of the managerial/neoliberal turn, with specific focus on the policies of the post-2000 era to the present. We will also scrutinize the Parliamentary Select Committee's Report of 2023 which proposes sweeping changes in education. With the managerial/neoliberal turn in education, particularly higher education, we are entering an era in which the state university system is placed in a very precarious position. We need to engage with the policies that shape our reality in the universities and take control of some of the policies in order to shape our destinies toward a democratic future.

Keywords: Education, Kannangara Report, Nation, Nationalism, Neoliberalism, Policy

Exploring the Role of Business Leaders in Outcome-Based Education for Human Capital Transformation: A Systematic Review

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The education system is a fundamental asset of any economy. Similarly, advancement of the economy is significantly thrusted by the pivotal role played by its human resources. In the contemporary age, the proper execution of Outcome-Based Education (OBE) is poised to steer the educational system in the correct track. OBE primarily focuses on what is essential for all learners to be able to do because of education and then organizes all other aspects of the education system around intended learning outcomes. All other decisions about the content, teaching learning activities and student assessment tasks are driven by learning outcomes in OBE. The adoption of the OBE approach is made to improve the larger bond between academic institutions, business, and society. For an effective OBE system, defining learning outcomes is crucial, and it should represent the real requirements of the labor market. For that, educators and business leaders need to work collaboratively. However, there is very little discussion on ‘the role of business leaders in OBE for human capital transformation’. Therefore, this study attempts to explore the role of business leaders in OBE for human capital transformation. To achieve this, a descriptive analysis was conducted on the content of recently published research papers, books, and policy documents, relating to OBE and human capital transformation. Major roles of business leaders were identified based on the theory of constructive alignment, and other roles were reported under the theme of ‘general’. This study explores the role of business leaders in the OBE system. Business leaders are essential contributors, actively engaging by offering their expertise to decide learning outcome, sharing their wealth of experiences with students, facilitating hands-on learning opportunities, and actively participating in the evaluation of student progress to validate their achievement of relevant skills and knowledge, serving both as employers and seasoned practitioners. This collaborative synergy serves as a bridge to address students' skill gaps. Consequently, this study holds paramount importance for educators, business leaders, students, educational administrators, and policymakers alike. It is important to acknowledge that this study draws from secondary data, and therefore, it is recommended that future research be conducted with primary data sources for a more comprehensive perspective.

Keywords: Business leaders, Human capital transformation, Outcome-Based Education

Why Do We Need Buddhist Chaplains in Sri Lankan Universities? A Comprehensive Exploration of Their Role, Significance, and Impact on Student Well-being and Spiritual Support

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This research paper explores the necessity of introducing Buddhist chaplains in Sri Lankan universities, focusing on their role, significance, and impact on student well-being and spiritual support. The role of a chaplain is widely used across the world, notably in Europe and America, and it serves a purpose in many different contexts. This study looks into the potential benefits of integrating Buddhist chaplaincy for well-being, concerns faced by students, and ragging-related violence in Sri Lankan universities. The paper highlights the numerical roles that Buddhist chaplains can undertake, such as giving spiritual care, counseling, guided meditation, and community service. Despite the prevalence of Theravada Buddhism in Sri Lanka, the role of lay Buddhists in religious activities has left a void in chaplaincy services, especially concerning youth-related challenges. This paper intends to examine how the integration of Buddhist chaplaincy within Sri Lankan universities contributes to the development of students' emotional resilience, spiritual growth, and propensity towards seeking support, in addition to fostering interfaith understanding, tolerance and societal harmony. Methodologically, the research adopts a qualitative approach, relying on textual analysis and theme exploration from relevant literature from the last decade. The study draws insights from renowned universities worldwide, such as Harvard and Yale, where chaplains have effectively contributed to student well-being and religious harmony. This research also identifies challenges in implementing chaplaincy, including language barriers and ethnic tensions. However, it also highlights the transformative potential of such a role in fostering understanding, resilience and well-being among students, thereby contributing to a harmonious society. In conclusion, the paper advocates incorporating Buddhist chaplaincy into Sri Lankan universities to address various student concerns, promote interfaith dialogue and enhance well-being. Adapting the chaplaincy role to the local context can catalyze positive change and contribute to holistic student development.

Keywords: Buddhist chaplains, Religious harmony, Sri Lanka, University, Well-being

A Study on the Potential of Fansubbing as English Language Learning Activity: Fansubbers' Perspectives

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The study of the English language can assist learners in understanding and enjoying the culture of the target language community and in sharing what they enjoy in their language community or other communities with the world through translation. In developing the success of language learning, there are numerous means outside the traditional classroom walls by which learners can learn a language more practically while enjoying the learning process. Fansubbing, or amateur production, is one such activity which is a newly added area into the subject domain of Audio-Visual Translation, in which a foreign film or foreign television program is translated by fans and subtitled into a language other than that of the original. The present study particularly focuses on the potential of fansubbing as a language learning activity with special reference to the English and Sinhala languages in the Sri Lankan context. An exploratory questionnaire was distributed among ten selected fansubbers of *baiscope.lk*, a website that provides Sinhala subtitles for a wide range of English movies/TV series/programs in Sri Lanka. One reason behind selecting the aforementioned sub-community of fansubbing is that it was chosen as the 5th among the most popular websites in Sri Lanka according to the Asia Pacific Institute of Digital Marketing. Data gathered through the questionnaire were then analysed using the Content Analysis Method. The objective of this study was to collect data concerning fansubbers' involvement in fansubbing, their point of view on this fansubbing activity in general, and their perspective on it being utilised for language learning to determine its potential for application as a language learning activity. The results revealed that most of the questionnaire respondents agreed with fansubbing as a language learning activity and that they experience benefits both linguistically and socially as a result of fansubbing.

Keywords: Amateur Translation, Audio-Visual Translation, English Learning, Fansubbing, Subtitling

An investigation on Non-Linguistic Cognitive Benefits of Bilingual Adolescents to Introduce an Appropriate CLIL Model for the Bilingual Education Programme in Sri Lanka

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Bilingualism is the ability of the user to use two languages for communication. Self-Efficacy is described as a Non-Linguistic Cognitive benefit of being Bilingual. Adolescence is the age that an individual realizes the value of use of English as a connecting language in communication. In past studies, since it is revealed that Early Bilingualism gives more cognitive benefits, a hypothesis was tested in this research and the Academic Self Efficacy levels were measured in a survey. The study carried out to compare the significant differences among the Bilingual Adolescents exposed to two languages under the four diverse age slots of life during their childhood which were identified as FB, KG, PS, BE. The Convergent parallel Mixed Methods Research Design was used, employing 300 bilingual adolescents from six selected 1AB schools, and 8 bilingual adolescents were observed and interviewed in a multiple case study. Quantitative data were analyzed in SPSS, One Way ANOVA and no significant differences were noticed to say that the age of bilingual exposure could be a reason to outwit early bilinguals than late bilinguals. Through data triangulation, the learning environment, the motivation of the school, the economic and social backgrounds of the parents, and the competition for university entrance were identified to be the most striking factors, than the effect of the age they were first exposed to a bilingual environment. To improve the academic consilience of language teaching process in Sri Lanka, it is crucial to develop a suitable CLIL (Content and Language Integrated Learning) model which meets future endeavors of Social Sciences in the country.

Keywords: Academic Self- Efficacy, Age of Bilingual Exposure, Bilingualism, Content and Language Integrated Learning Model, Non-Linguistic Cognitive Benefits

Effectiveness of Traditional and Skills-oriented Teaching to Enhance Generic Skills in Chemistry in Junior Secondary Schools: A Case Study in Central Province, Sri Lanka

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In the teaching-learning process, assessments have become an essential key topic. It is very important to revisit the instructional and assessment systems from the 21st century perspective as it demands real-world learning with skills as learning outcomes. This study examines the effectiveness of traditional teaching and assessment versus skills-oriented instruction and assessment in enhancing generic skills in learning Chemistry in junior secondary schools in the Central Province of Sri Lanka. This is an experimental study employing a mixed methods approach. Two sub-units from the Grade Seven Science curriculum were selected for instruction. Nine schools were selected from the Central Province with a sample size of 636 students by convenience sampling. Two parallel classes of Grade Seven in each school were selected. A Pre-test was administered to both classes to ensure comparability of the groups. One class was considered as a control group and the other class as an experiment group. In the 2nd sub-unit these groups were interchanged. The first lesson was conducted using a traditional method for the control group, while using a skills-oriented instructional and assessment method for the experimental group. The parallel classes were switched over in the second lesson employing the same teachers. After the teaching-learning process, post-tests were administered to both groups for both lessons. While conducting both traditional and skills-oriented learning, generic skills were observed by the researcher with the help of three other teachers with scoring rubrics. The difference between the mean scores of the pre-tests, the post-test, and the generic skill test were compared. According to the results, skills-oriented groups showed significantly higher performance than the traditional group. Furthermore, the observational data analysis demonstrated that the students of the skills-oriented instructional group demonstrated better orientation to real life situations. The findings from focus group discussions with students and teachers revealed that the skills-oriented instructional and assessment cultivate much higher generic skills than traditional instruction and assessment. Thus, it is concluded that the skills-oriented instruction and assessment methods could be successfully applied for conceptualization developing generic skills in Grade Seven Science in the selected schools.

Keywords: Generic skills, Scoring Rubrics, Skills-oriented, Traditional Instruction and Assessment

Exploring Fertility Dynamics: A Comparative Analysis of Ethnic Groups in Segregated and Integrated Living Spaces in Sri Lanka

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There is a social claim that the fertility of minority ethnic groups is increasing at a rate greater than that of the majority Sinhalese in Sri Lanka. Addressing this issue is important because it affects the ethnic integrity of the society. Despite there being substantial studies on fertility in Sri Lanka, previous research has not looked into the spatial and ethnic differences of fertility, despite its significance. This research aims to analyze ethnic fertility differences from a spatial perspective. The data was collected from 480 women aged 18 to 81, spanning three generations where different ethnic groups live integrated and different ethnic groups live segregated. Summarizing the study's results, it can be concluded that ethnic differences in fertility vary according to spatial context. In integrated spaces, there are no significant ethnic differences in fertility. However, ethnic differences in fertility becomes distinct when ethnic groups live in segregated areas. Sinhala women, compared to minorities, exhibit significantly lower levels of fertility when living in segregated environments. Previous studies have also reported a decreasing number of childbirths among Sinhalese over the past several decades, with no underlying reasons identified. Moor women, on the other hand, have the highest level of fertility, compared to Sinhala women. Factors such as higher fertility levels among the Moors and deliberate avoidance of family planning due to community pressures, as highlighted by community leaders, are crucial contributors to high fertility among the Moors. It is important to note that this difference may not persist into the future, as it is primarily present among older generations of different ethnicities and not as prominent among the younger generation. As a result, it can be inferred that ethnic differences in fertility will likely diminish in the country. However, the level of fertility has transitioned from below to above replacement level across all ethnic groups in each space. Thus, it is recommended that further studies be conducted with a theoretical framework rooted in ethno-nationalism and majority-minority concepts.

Keywords: Ethnicity, Ethno-nationalism, Fertility, Minority-majority, Spatial approach

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Digital Immigrants: How to Survive in an Open and Distance Learning Environment (A Semi-Structured Literature review)

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Digital immigrants, who were not born in a digital world, face a challenge in adapting to the present digitalized learning environment. It is more challenging for them to survive in an Open and Distance Learning (ODL) environment, which is commonly utilized in every national university in the post-Covid 19 era. Therefore, it is crucial for both teachers and digital immigrant students in higher education to understand emerging challenges in their learning environments and how to overcome those challenges. This study was conducted as a semi-structured literature review based on two objectives: to examine the challenges faced by digital immigrants in an ODL environment and to investigate strategies to mitigate those challenges and become active learners. After formulating the research objectives, the literature was examined using key words such as digital immigrants, higher education, open and distance learning, and challenges faced by digital immigrants. 66 articles were identified under the process of identification which was done through database searching. 20 articles were included in this review after excluding the articles that are not relevant to the present research scope. Most of the literature was presented in online journals and after a thorough investigation, analysis, synthesis and disseminating the findings were done. The data gathered through the systematic review was analyzed under two themes (Challenges faced by Digital Immigrants in an ODL environment & Strategies to mitigate Challenges faced by Digital Immigrants in an ODL environment) utilizing the thematic analysis method. The findings of the study revealed communication issues, lack of interaction, lack of confidence, lack of technological competency, and lack of interest as the student related challenges that are faced by digital immigrants. Connectivity issues and teacher related issues also stand as challenges for digital immigrants. Using blended learning approaches instead of limiting to online modes, utilizing social network tools, strengthening their own skills such as emotional intelligence and critical thinking, and creating authentic learning situations to relate their own experience to learning will support to mitigate the afore-mentioned challenges. Based on the research findings, it is crucial to identify the nature of the learning styles of digital immigrants and their expectations towards learning methods when facilitating them in an ODL environment. Using effective blended learning methods and providing continuous guidance with authentic examples will enable them to survive in their learning journey within the ODL environment.

Keywords: Blended Learning, Digital Immigrants, Open and Distance Learning (ODL), Social Network Tools, Student Related Challenges

Impact of Domestic and External Public Debt on Inflation in Sri Lanka

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Inflation is one of the key macroeconomic indicators of an economy, and it has close links with the macroeconomic fluctuations. Countries with a deficit budget like Sri Lanka are in a state of borrowing both domestically and externally in order to finance government spending. If the government uses its borrowings productively, then debt generates economic growth and reduces inflation. But in Sri Lanka, we observe the presence of both high debt burden and high inflation in recent years. It questions the productive use of borrowed money. This study aims to identify the long-term impact of domestic and external debt on inflation in Sri Lanka using quarterly data from the period from 2010Q1 to 2023Q1. The Auto Regressive Distributed Lag (ARDL) model is adopted to find out the impact. In this study, prices of goods and services have been given as a function of public debt and many other fundamental macroeconomic variables based on the Sargent and Wallace Hypothesis and Keynesian macroeconomics. The results of the study convey that both domestic and external debt significantly and positively impacts on inflation in the long run, and that the effect of external debt is higher than domestic debt. Therefore, the public debt accelerates inflation in Sri Lanka. At the same time, the other factors such as gross domestic product, money supply, oil prices and interest rates have a positive impact on inflation. Therefore, inflationary pressure associated with high public debt creates macroeconomic instability in Sri Lanka.

Keywords: Domestic debt, External debt, Inflation, Money supply, Monetary policy

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Business Resilience in Crisis

**Global Health Challenges and Opportunities
for Collaboration**

Innovations for Sustainable Cities and Societies

Scientific Frontiers and Overcoming Challenges for Sustainable Transitions

**Towards Sustainable Agricultural Systems:
Transforming Challenges into Opportunities**

**Managerial Turn in Higher Education:
The Issues and Challenges for Human Existence**

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