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The Open University of Sri Lanka

IRC OUSL 2025

INTERNATIONAL RESEARCH CONFERENCE OF THE OPEN UNIVERSITY OF SRI LANKA 2025

"Inspiring Minds and Shaping the Future through Innovations"

PROCEEDINGS

THE OPEN UNIVERSITY

OF SRI LANKA

Book of Abstracts

International Research Conference of the Open University of Sri Lanka 2025

IRC-OUSL 2025

12th, 13th & 14th November 2025

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MESSAGE FROM THE VICE-CHANCELLOR

I am indeed happy to contribute this message to the International Research Conference of the Open University of Sri Lanka – 2025 *(IRC-OUSL 2025)* which is one of the flagship events in the university calendar. Research has a clear potential to make significant contributions to the quality of higher education. Therefore, universities have an obligation to make the research-teaching nexus as strong as possible. The annual OURS provides an opportunity for sharing of knowledge created through research across various disciplines.

The IRC-OUSL publishes the results of multidisciplinary research in the areas of Open and Distance Learning, Education, English Language Teaching, Natural Science, Engineering and Technology, Law, Humanities and Social Sciences, and Management Studies. It is open for the publication of research articles, reviews, and research communications in all disciplines. The IRC-OUSL provides an opportunity for OUSL academics as well as researchers at other state and Non-State Sector Higher Educational Institutions (NSHEIs) to publish high-quality research covering above all diverse disciplines.

The world around us is rapidly evolving and as an institution of higher learning and research, it is our duty to keep pace with these changes. IRC-OUSL is a testament to our commitment to stay at the forefront of cutting-edge research, academic exploration, and interdisciplinary collaboration. As global citizens we are living in era with plenty of pressing challenges. Climate change, healthcare disparities, technological advancements, and socioeconomic inequalities are just a few of the complex issues that demand our attention and needs rigorous investigation.

I am confident that the research presented here will not only contribute to our understanding of these challenges but also provide tangible solutions to address them. I want to express my deep gratitude to all the researchers, scholars, and students who have dedicated countless hours to developing their research papers. Your efforts exemplify the spirit of inquiry and discovery that lies at the heart of our institution's mission. You are the driving force behind our academic community, and your work continues to inspire us all.

To our distinguished guests and partners from other institutions, your presence is a testament to the collaborative spirit of academia. It is through partnerships and the exchange of ideas that we can achieve true progress. I encourage you to engage in meaningful dialogues with our researchers and explore opportunities for future collaborations. As we embark on this journey of knowledge dissemination and exploration, I encourage you all to embrace the diverse perspectives and ideas that will be shared over the course of this conference. Let us challenge our assumptions, ask difficult questions, and be open to new possibilities. In doing so, we can pave the way for a brighter, more sustainable future.

I look forward to the rich exchange of ideas, the insightful discussions, and the innovative solutions that will emerge from this research sessions. Together, we can make a significant impact on the world and work toward a better, more sustainable future. Thank you for your dedication to research, your commitment to excellence, and your passion for making a difference. Let us seize this opportunity to inspire, collaborate, and shape the future through our collective efforts.

I wish you all a productive and enlightening IRC-OUSL 2025.

Snr. Prof. P.M.C. Thilakarathne
Vice-Chancellor
The Open University of Sri Lanka

PREFACE

We are delighted to welcome you to The International Research Conference of the Open University of Sri Lanka 2025 (IRC-OUSL 2025), which will be held as a hybrid event on November 12th, 13th and 14th, 2025. This conference aims to unite local and international researchers on a single, stimulating platform for discourse and collaboration. The event will commence with an inaugural ceremony on November 12th, followed by two days of proceedings featuring six parallel technical sessions including a dynamic panel discussion.

Evolving from the annual Open University Research Sessions (OURS), IRC-OUSL has solidified its position as a premier research forum. Since its inception in 2003, OURS played a pivotal role in fostering a vibrant research culture among OUSL staff, inspiring their participation in both Open and Distance Learning (ODL) and discipline-specific research conferences. Organized by the OUSL Research Unit, the conference attracts a wide community of scholars from OUSL, other state universities, and non-state higher education institutions, creating a vital platform for the presentation and discussion of innovative findings.

The consistent, yearly increase in abstract and extended abstract submissions attests to the conference's dedication to advancing the frontiers of knowledge through rigorous scholarly exploration. For IRC-OUSL 2025, we received 275 submissions for review. Following a rigorous blind peer-review process, 202 were selected for presentations.

The accepted abstracts represent a diverse array of subthemes, reflecting the breadth of research at OUSL and beyond. These areas include, Open and Distance Learning (ODL), Quality Assurance for Higher Education, Education, English Language Teaching (ELT), Engineering and Technology, Health Sciences, Biological Sciences, Agriculture, Forestry, Physical Sciences, Humanities and Social Sciences, Management, and Law. This volume proudly compiles these accepted abstracts.

The IRC-OUSL 2025 program features several distinctive components;
Pre-Conference Events: Lectures and workshops are scheduled for November 10th and 11th, 2025, jointly organized by the OUSL Research Unit, the six faculties, and the Centre for Environmental Studies and Sustainable Development (CESSD).
Special Competitions: The conference includes a Three-Minute Thesis (3MT) Competition, a Doctoral Colloquium, and selection of the Best Paper Presenter in each sub-theme.
Panel Discussions: Six panel discussions will be organized by the faculties of Education, Engineering Technology, Health Sciences, Management Studies, Natural Sciences, and Humanities and Social Sciences.

The inaugural ceremony of IRC-OUSL 2025 will be graced by esteemed dignitaries; Senior Prof. P. M. C. Thilakarathne, the Vice-Chancellor of the Open University of Sri Lanka, as the Chief Guest. H. E. Dr. Purna Bahadur, The Ambassador of Nepal to Sri Lanka and Prof. Sanjeev Sonawane, The Vice-Chancellor, Yashwantrao Chavan Maharashtra Open University, India, will be the

Guests of Honor. The invited keynote speakers include Asst. Prof. Lonn Pichdara, Department. of Food, Agriculture and Natural Resources, AIT, Thailand and. Prof. Mohamad Mahees, Department of Sociology, University of Colombo, Sri Lanka. We extend our sincere gratitude to all these distinguished individuals for their valuable time and presence.

Organizing an event of this scale necessitates a tremendous collaborative and dedicated effort. We are deeply grateful to the Vice-Chancellor of OUSL, for his unwavering support and facilitation of this event's success.

Our sincere appreciation goes to all authors for submitting their insightful research, and to the dedicated reviewers for their invaluable intellectual contributions that enhanced the quality and rigor of the sessions. Gratitude is also extended to the language editors, theme conveners, Session Chairs, and Panel members. We thank the various Senate Sub-committees and Awards Committees, including 3MT and Doctoral Colloquium for their diligent work in selecting the deserving awardees.

A special note of thanks goes to our Academic Partner, Emerald Publishing, and to Prof. Nalin Abeysekera for coordinating this partnership. We acknowledge the contributions from the Centre for Educational Technology and Media (CETMe), specifically Prof. Shironika Karunanayake/Act. Director CETMe, and Ms. Nirmali Kaushalya, for graphics and CETMe staff for video and photography coverage, and Mr. J. P. P. Tharanga for maintaining the IRC-OUSL 2025 webpage.

Finally, we commend the exceptional team effort of the entire IRC-OUSL 2025 Working Group, including Dr. Dusantha Alwis and Dr. Jayani Hapugoda, who chaired the 3MT and Doctoral Colloquium committees, respectively, and the working group co-chairs, Prof. Saminda Fernando, and Dr. Uthpala Jayawardena. The contribution of Dr. K. A. Sriyani, Mr. Harsha Balasooriya, Ms Ms. Mayanthi Jayakody, Dr. Kokila Ranasinghe, Ms. Kalpani Bandaranayaka, Mr. W. D. Manoj, Mr. Malith Jayasinghe, Ms. K. H. Thushara Abeysekera, Ms. Vindya Angammana, Mr. Kanishka Tennakoon, Mr. Dammika Warigajeshta, and Mr. Chameera Chandrarathna is greatly acknowledged. Their tireless commitment, supported by the invaluable secretarial assistance of Ms. Dasuni Nawodya Perera and Ms. B. S. Kalpani Bhagya, embodied the true spirit of leadership and teamwork that brought this conference to fruition.

We are confident that IRC-OUSL 2025 will be a catalyst for further research and intellectual growth. We wish you all three days of productive engagement and stimulating discourse.

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Address of the Chief Guest

Towards the Digital Transformation in Higher Education

Traditional classrooms equipped with chalk and board. Teachers used to deliver subject matters to students using blackboard (white board) and overhead projectors. Students in the classroom were passive listeners. The performance of learners is assessed mainly through end of period written examinations. This nature of 20th century education system has undergone the paradigm shift and adapted many innovative methods in the 21st century classroom setup. Today, higher education is in the era of digital transformation (Dx). Learning technologies and digital platforms are no longer an afterthought; they are critical for teaching and learning. The pandemic situation served as a catalyst for Dx, compelling universities, teachers, and students to shift online mode rapidly. Academics and students were prepared for the shift; those who were unprepared compelled to catch up the technology adaption quickly.

Gregory Vial (2019) defined digital transformation as a process in which "digital technologies create disruptions triggering strategic responses from organizations that seek to alter their value creation paths while managing the structural changes and organizational barriers that affect the positive and negative outcomes of this process." Dx is grounded in digital technologies, which plays a crucial role in digital teaching and learning. The following methods are used in digital learning; Learning Management System (LMS), synchronous technologies, multimedia applications, collaborative applications, cloud-based technologies, Artificial Intelligence (AI), extended reality (XR), augmented reality (AR), virtual reality (VR), analytics, and other emerging technologies can enable more innovative and engaging teaching methods and learning experiences.

The growing prevalence of digital teaching and learning in various instructional modalities requires additional investments in support services and personnel at higher educational institutions. At the same time higher education leaders must engage in meticulous planning to embrace digital teaching and learning initiatives. Especially strategic planning is essential to achieve new horizons in digital education. Partnerships with universities, professional organizations, and outside industries strengthen digital teaching and learning initiatives by capitalizing on the knowledge of experts in space. Eventually, digital learning provides students with opportunities to learn in various modalities. This process prepares them for the future workforce, where most jobs will require digital knowledge and skills.

Digital transformation in education could improve the effectiveness and quality of education by personalizing education, be it teaching and learning or other education services, by making it more inclusive and possibly equitable and by improving cost efficiency. It is worth to note that Ministry of Education, Sri Lanka together with Information and Communication Technology Agency (ICTA) in Sri Lanka formulated the policy document for digital transformation in education. Implementation of policy in digital education eventually benefit to reach the unreached for higher educational opportunities and thereby increase the higher education participation in Sri Lanka.

Prof. P.M.C. Thilakarathne
Senior Professor in Finance
Vice-Chancellor
The Open University of Sri Lanka

Address of the Guest of Honour

MY OWN REFLECTIVE AND EXPERIENTIAL JOURNEY OF BEYOND ACADEMIA "KATHTMANDU UNIVERSITY-KU POLICY LAB"

Following theme of IRC-OUSL 2025 conference, "Inspiring Minds and Shaping the Future through Innovations." I would like to share my own reflective and experiential journey on beyond academia, particularly focusing on KU Policy Lab. Being an academician and policy researcher, I feel privileged and honored to share thoughts on "Envisioning the Policy Lab: From Ideas to Action".

This overall journey of the Policy Lab at Kathmandu University (KU)/ the Kathmandu University School of Management (KUSOM), highlights its reflections and motivations. The KU Policy Lab is a university-led policy think tank initiative in Nepal, established to enhance policy governance through evidence-based and informed policymaking and legislation. Operating in collaboration with selected think tanks, the Lab adheres to the principle of "University for State and Social Responsibility", demonstrating its commitment to driving state and societal transformation. Ultimately, the Lab aims to strengthen policy governance and lawmaking, thereby improving public service delivery and promoting greater happiness and satisfaction among the people.

Methodologically, the Policy Lab employs Human-centered Design Thinking and the Diffusion of Innovation Approach to foster policy innovation. It facilitates the exchange of ideas, builds trust, and acts as a catalyst for change at both regional and national levels. Design thinking is an iterative process that emphasizes understanding users, challenging assumptions, and redefining problems to identify alternative strategies and solutions. The Lab adopts solution-oriented approach through the DDE framework-Discover, Design, Evaluate-and further aims to scale successful interventions.

Based on its interventions, experiences, and lessons learned, the KUSOM Policy Lab has emerged as an innovative, problem-solving platform aimed at addressing public policy challenges and enhancing effective public service delivery. It has the potential to serve as a center of excellence and a credible policy think tank in Nepal, contributing to improved policy governance across the country. Through the systematic documentation of policy cases and the generation of policy-relevant knowledge, the Lab functions as a trusted knowledge hub and a national policy resource.

As it fosters public policy innovation, the Lab is designed to serve as a forum for open and honest conversations on key policy issues. It supports the creation of new

networks, partnerships, and collaborations between academics and policymakers. The Lab synthesizes policy evidence into accessible and actionable formats and ensures the timely provision of relevant insights when policy windows arise.

From these interventions, I would like to draw a few key reflections linking with eternal Eastern Wisdom particularly the teachings of Buddha which the renowned Scientist Albert Einstein also acknowledged as scientific.

1. Beyond Academia and the vision of the Policy Lab represent a unique initiative that reflects an intellectual and civic commitment to contribute to state and societal development beyond conventional teaching roles.

2. The Policy Lab creates opportunities for faculty and students to think, rethink, and reimagine ideas, cultivating a culture of innovation and continuous learning. It resonates with John Dewey's thoughts and understanding on public education and affairs.

3. Human Centric Design Thinking, as an iterative and prototype-driven process, resonates with the Buddhist inquiry into dukkha, the exploration of challenges, their underlying causes, and the pursuit of transformative understanding.

4. The Discover, Design and Evaluate (DDE) process and its scale-up phase symbolize a journey from discovery to transformation echoing the Buddha's path from understanding to enlightened action.

5. True education, as the Buddha teaches, is not about filling the mind but liberating it, an ideal mirrored in the Policy Lab's effort to move learning from theoretical knowledge to transformative understanding.

6. The Policy Lab's human centered approach where challenges are treated not as barriers but as opportunities for creative and transformative solutions, resonates with recognizing and transcending dukkha through awareness and right understanding

7. The Policy Lab's "Beyond Academia" vision encourages reflective practice that nurtures humility, empathy, and social responsibility beyond conventional academic success, resonates with the Buddhist learning which involves unlearning ego and illusion.

8. When educational policy aligns with the Dhamma, based on values of wisdom and compassion, it nurtures holistic human development. This is

reflected in the Policy Lab's mission to merge academic excellence with ethical and experiential learning for sustainable governance.

9. The synergy among youth, professionals, and elders embodies the Buddhist principle of interdependence and mirrors the Policy Lab's inclusive model of policy innovation through cross-generational dialogue and collaboration.

10. All innovation originates in the mind and Policy Lab redefines innovation as an ethical, mindful, and human-centered process of societal transformation which resonates with the Buddha's transformation of suffering into wisdom.

H. E. Dr. Purna Bahdur
The Ambassoder of Nepal to Sri Lanka

Address of the Guest of Honour

Transforming Open and Distance Learning Through AI

Abstract

Open and distance learning (ODL) has entered a new era in which artificial intelligence (AI) is reshaping every facet of the learning experience. This paper examines how AI is transforming ODL through personalization, adaptive systems, and immersive technologies, drawing on a recent presentation by Sonawane (2024) and supporting literature. Personalized and adaptive learning systems use AI algorithms to tailor content to individual students' needs and pace, substantially improving engagement and outcomes (Panwale & Vijayakumar, 2025; Gkintoni et al., 2025). For educators, AI tools automate administrative tasks (e.g. grading, analytics) and enable real-time progress tracking, freeing instructors to focus on meaningful student interactions (Sihag & Vibha, 2024; U.S. Department of Education, 2023). Generative AI (e.g. large language models) is rapidly streamlining content creation by producing quizzes, essays, multimedia, and localized materials on demand (U.S. Department of Education, 2023). Immersive technologies such as augmented and virtual reality (AR/VR), powered by AI, are providing realistic simulation-based training—bridging geographic divides and allowing virtual hands-on practice in fields like medicine (Lin et al., 2024; Walls et al., 2024). We also consider ethical challenges and equity issues: ensuring privacy, minimizing algorithmic bias, and extending AI access to underserved and disabled learners (Gonzales, 2024; Gibson, 2024). Evidence from India and globally shows real-world impact: universities deploying AI tutors report higher retention, and government programs are funding AI literacy (Sihag & Vibha, 2024). Despite significant promise, challenges remain, including digital infrastructure gaps and the need for robust AI pedagogy. We conclude that AI is a catalyst for democratizing quality education at scale, and recommend coordinated investments in educator training, connectivity, and inclusive policy.

Keywords: artificial intelligence; distance education; personalized learning; adaptive learning; educational technology; immersive learning; equity

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Keynote Address 1

Technologies in Biodiversity Conservation

Abstract

The world is facing natural resources degradation and resource depletion at an alarming rate. Biodiversity conservation is a global effort in resource improvement and livelihood sustainability. Technological innovation in monitoring, protecting, and restoring biodiversity to address the accelerating loss of ecosystems and species have been increasingly applied, including remote sensing, drones, LiDAR, and AI-powered platforms for forest monitoring and illegal activity detection. Tools like WildScan and Rainforest Connection utilize smartphone-based acoustic sensors and machine learning to detect chainsaw sounds in real time, enabling rapid law enforcement response. Technologies for timber species verification—such as DNA analysis, mass spectrometry, and blockchain protocols—offer transparency across the supply chain, reducing illegal trade. Drone-based reforestation, by Dendra Systems, demonstrates scalable restoration potential. The cost of biodiversity loss is trillions of dollars annually, but with the relatively modest investment required for technological interventions. By integrating data-driven conservation tools, innovation, collaboration, and strategic investment with policy and community engagement can significantly enhance biodiversity outcomes.

Keywords: biodiversity conservation, illegal logging detection, drone reforestation, conservation technology

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Keynote Address 2

The Contemporary Sri Lankan Consumer Culture and Inspiration for Eco-friendly Consumerism

Abstract

This paper attempts to explore social crisis of consumer culture and possibilities seeking future eco-friendly consumerism. People in premodern society were more concerned about social relationships. However, it is believed that in the contemporary era people give more priority to the interaction with materials. According to Karl Marx, people started making more relationships with objects or materials which is known as commodity fetishism. Jean Baudrillard explained the obsessive obsession of material life as hyper-reality based on sign values expanding the Maxian arguments use values and exchange values. The contemporary social world is determined by political economy of sign or hyper-reality. The new form of social order has been made by consumer culture instead of values system or mode of production. Even Sri Lankan society has no exception in this regard. The signs and images that are found in consumer society determine social stratification and poverty. Baudrillard is of the view that it is not the income that decides poverty but the consumption of signs and images. As explained by Jaques Lacan, even the language and symbols (semiotics) have become an unconscious situation in modern society. Consumer culture has made everything into brands and compartmentalized people into different symbolic groups. It is observed that people in the present Sri Lankan society tend to consume more signs and symbols instead of goods and services in their day today life. The day today consumer behavior has been seriously influenced by symbolic consumerism in Sri Lanka. Sri Lankans from remote areas to Colombo city are struggling make their choice between the real needs and artificially produced desires or wants. The practice of purchasing higher quality or popular brands is known as conspicuous consumption, which can also lead to leisure class. Sri Lankan spend unlimited resources for constructing luxury houses and decorate them with expensive domestic appliances. The vehicles used by middle class Sri Lankans indicate the importances of sign values. Shopping malls, supermarkets, restaurants and food stalls are real witness for McDonalization of Sri Lankan consumer life according to George Ritzer. Technological and communication devices such as computers and mobile phones. It is not only goods but also services such as education, health care, weddings and funerals are under the influence of consumer culture. For example, Sri Lankan spend more financial resources for weddings and funerals. People have become numbed to the negative impact of comsumerism due to credit cards, loan schemes and seasonal offers. The consumer culture has created unnecessary competition and stress among the people, and people who are unable to join this rat race feel defeated or lost. The changing consumer culture in Sri Lanka has produced a “throw away society” by generating

more solid waste. The symbolic consumption (smart phones, branded dress codes, fast food) has created many social inequalities and social discrimination. Environmentally unfriendly consumerism has led to many environmental problems such as food waste, plastic pollution, land degradation, floods and human wildlife conflicts. The eco-friendly consumer practice is part of ethical consumerism. The eco-friendly consumerism is based consumption of sustainable goods and services, renewable energy, limited waste generation, resource conservation and behavioral shift. The environmental education, eco-volunteerism, eco-therapy, aesthetic environmentalism and grassroots environmental actions are the best tools and platforms for the promotion of eco-friendly consumerism in Sri Lanka.

Keywords: consumer culture, sign value, leisure class and eco-friendly consumerism

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PROCEEDINGS

OPEN AND DISTANCE LEARNING (ODL)

AGRICULTURE AND FORESTRY

HUMANITIES AND SOCIAL SCIENCES

LAW

MANAGEMENT

OPEN AND DISTANCE LEARNING (ODL)

IMPACT OF DIRECT PROMOTION ON UNIVERSITY ENROLLMENT INTENTIONS: ASSESSING THE EFFECTIVENESS OF PROMOTIONAL METHODS IN SRI LANKA'S ODL SYSTEM

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This study investigates the effectiveness of direct-promotional strategies in shaping students' intentions to enroll in public universities, focusing on rural districts in Sri Lanka. In a context of growing competition and limited awareness of Open and Distance Learning (ODL) opportunities, institutions like the Open University of Sri Lanka (OUSL) face major outreach challenges. Using the Higher Education Choice Model, the study analyzes how social media, websites, advertisements, peer initiatives, and financial messaging influence university choice. A quantitative survey-based design was adopted. Data was collected from 239 respondents aged 19 to 24, selected through a random sampling method across four rural districts. A structured questionnaire captured demographic data and perceptions of seven key promotional constructs. Construct validity was confirmed through correlation analysis, while internal consistency was validated with a Cronbach's alpha of 0.747, indicating acceptable reliability. Hierarchical multiple regression was employed to assess the incremental impact of each promotional factor on students' enrollment intentions. The results indicate that "Awareness by University Students" was the most significant predictor of enrollment intention, followed by social media engagement, university websites, financial motivation, and institutional awareness campaigns. Together, these predictors accounted for 69.4% of the variance in students' enrollment intention ($F = 38.923$, $P < .001$). Assumption tests confirmed the absence of multicollinearity, heteroscedasticity, and autocorrelation, validating the robustness of the regression model. In contrast, traditional methods such as parental influence, mass media exposure, and cut-outs/banners did not show statistically significant effects. These findings offer valuable implications for higher education policymakers and administrators. Public sector universities, especially those offering ODL programs, can adopt more targeted and cost-effective promotional strategies, particularly leveraging peer advocacy and digital media, to better engage prospective students in underserved rural regions. The study contributes to the evolving discourse on equitable access to higher education, emphasising the need for evidence-based outreach frameworks tailored to the rural realities of developing countries.

Keywords: enrollment intention, promotional strategies, Open and Distance Learning (ODL), rural higher education, higher education choice model

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ENHANCING RETENTION: EXPLORING STUDENT DROPOUTS IN THE B.SC. DEGREE PROGRAMME OFFERED BY THE FACULTY OF NATURAL SCIENCES AT THE OPEN UNIVERSITY OF SRI LANKA, BATTICALOA REGIONAL CENTRE

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The Open University of Sri Lanka (OUSL), the country's leader in open and distance learning, is experiencing a decline in Bachelor of Science students from the Faculty of Natural Sciences at the Batticaloa Regional Centre. Student records indicate that dropout rates have increased from 2016/2017 to 2023/2024 academic years. This mixed-methods study aims to identify the academic, personal, economic, and technological stressors contributing to these withdrawals and to propose appropriate interventions. The research will focus on these factors to inform strategies such as curriculum modifications and enhanced learner support services, helping B.Sc. students of the Faculty of Natural Sciences at the Batticaloa Regional Centre who reside on the university campus succeed and strengthen OUSL's open and distance learning model. Studies investigated why 200+ B.Sc. students of Natural Sciences faculty dropped out over the past five years using a mixed-methods approach that included both qualitative and quantitative methods. Google Form questionnaires sent to past students were used to gather information. Focusing on the Batticaloa Regional Centre, the study gave a region-specific analysis that found similar trends, personal problems, and institutional flaws. This gives a full picture of the reasons why students drop out of university. The findings suggest that most students struggle with severe academic loads and stress, notably from Continuous Assessment tests (CAT). Online students lack peer contact and academic support, which increases isolation. Poor infrastructure and lack of dorms, study areas, and exam rooms delay growth. Lack of lab access and poor virtual tools are obstacles to practical's related syllabus components. Delayed or confusing course materials make exam preparation difficult. The results bring to light some of the biggest problems that full-time students who work and go to university experience, namely work stress tied to their employment and issues with their courses in terms of infrastructure and logistics, together with a greater need for emotional and cognitive learner support. To fix this problem, the study suggests adding more study rooms, hostels, and exam rooms to the infrastructure, switching from one CAT to an assignment, having multilingual discussion groups, and making sure that textbooks are delivered on time and are prepared in a way that is easy to understand**.**

Keywords: Open and Distance Learning (ODL), student dropout, Bachelor of Science (B.Sc.), educational interventions, Continuous Assessment Test (CAT)

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THE FINISH LINE IN SIGHT: UNDERSTANDING ON-TIME DEGREE COMPLETION AT THE OPEN UNIVERSITY OF SRI LANKA

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This study explored the critical factors influencing timely degree completion among students at the Open University of Sri Lanka (OUSL), an institution dedicated to individuals seeking flexible higher education. While OUSL provides robust institutional support and pedagogical approaches, a significant number of students exceed the specified degree completion timeframe. This study argues that beyond external factors, students' internal traits, especially determination, discipline, and work ethic, play a significant role in timely graduation within OUSL's self-directed learning environment. Employing a mixed-methods approach with a questionnaire and in-depth interviews, the study examined 70 former/current OUSL students, purposively divided into on-time completers (OTCs) and extended completers (ECs). Thematic analysis of the data revealed significant contrasts. On-time completers had consistently demonstrated steadfast determination with clear goals, maintained orderly and non-negotiable study routines, engaged proactively and deeply with course material, exhibited high resilience in the face of adversity, and strategically used OUSL and external support mechanisms. In contrast, ECs often displayed unstable motivation, inconsistent study habits characterised by procrastination, reactive and superficial engagement with course material, lower resilience when facing challenges, and reluctance in seeking support. The findings highlight that delays in degree completion at OUSL are largely due to struggles with self-regulation, persistence, and the ability to prioritise within the strains of self-directed learning. Conversely, timely completion is a powerful testament to unwavering commitment and rigorous self-discipline. This study concludes that while OUSL offers an invaluable and flexible platform, a student's intrinsic attributes of determination, hard work, and orderly self-management are paramount to achieving academic goals efficiently. Cultivating these intrinsic abilities, alongside institutional support, can meaningfully empower OUSL learners to complete their degrees on time, thereby contributing to national human capital development.

Keywords: Open and Distance Learning (ODL), Open University of Sri Lanka (OUSL), degree completion, student success

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EXPLORING THE EFFECTIVENESS OF BLACKBOARD IN ENGLISH LANGUAGE TEACHING: A CASE STUDY OF OPEN AND DISTANCE LEARNING AT THE AMERICAN COLLEGE OF HIGHER EDUCATION, SRI LANKA

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The integration of Learning Management Systems (LMS) in English Language Teaching (ELT) is becoming increasingly important in Open and Distance Learning (ODL) environments. This integration was especially vital during the pandemic and continues to be significant due to the growing demand for accessible and flexible education. This study examines how Keiser University's Blackboard (BB) LMS supports ELT for international students, such as those in Sri Lanka, through various technological tools designed to enhance language learning beyond the traditional classroom environment. Accordingly, the current study investigates the effectiveness of using Blackboard at this institution, which serves as an off-campus instructional site for Keiser University. The study involved a mixed-method approach. Questionnaires were administered to 45 students and four English lecturers at the American College of Higher Education who study and teach in the Keiser Degree programme. All 45 students are required to use BB to complete their English course assignments, quizzes, and discussions. Engagement with BB is mandatory, so all students must log in to access learning resources, submit quizzes, and participate in discussion activities. IBM SPSS 27.0 was used to analyse the data, and it revealed that BB enables access to English language resources, including multimedia content, reading materials, and grammar tutorials, which support students in developing comprehensive language skills. Moreover, interactive features such as discussion forums and video conferencing tools allow students to practice both written and spoken English, enhancing meaningful communication and peer collaboration. Additionally, the BB platform supports individualized learning through self-paced modules, quizzes, and downloadable exercises, thereby promoting learner autonomy. Continuous feedback through online assessments (SD = 0.447) and instructor comments (SD = 0.694) enables students to monitor their progress and make improvements. Furthermore, instructors' presence through announcements, feedback, and virtual office hours was highly rated by students, with a mean score of 1.33 (SD = 0.640), indicating strong agreement that these features support motivation and engagement. While technological barriers such as network connectivity and digital literacy may pose challenges for students in Sri Lanka, the support available within BB helps mitigate these issues and fosters a productive online learning environment. Overall, Keiser University's use of BB demonstrates how well-integrated digital platforms can facilitate effective and inclusive ELT in a global ODL setting.

Keywords: Blackboard (BB), English Language Teaching (ELT), Learning Management Systems (LMS), Open and Distance Learning (ODL).

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DETERMINANTS OF SERVICE QUALITY PERCEPTIONS AMONG SCHOOL LEAVERS IN SRI LANKAN OPEN AND DISTANCE LEARNING CENTRES

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The growing demand for Open and Distance Learning (ODL) in Sri Lanka has broadened access to higher education, yet research on students' perceptions of service quality in regional ODL settings remains limited. This study examines key factors influencing service quality perceptions among school leavers at ODL centres in four districts: Matale, Monaragala, Badulla, and Kegalle. A 21-item questionnaire, based on the HEdPERF model and refined through expert review, was administered using a five-point Likert scale. Sample adequacy was confirmed (KMO > 0.70, communalities), justifying factor analysis despite the modest sample size. The study extends the HEdPERF model by validating its applicability in regional ODL contexts, emphasizing institutional prestige as an emergent dimension, reflecting the contextual importance of reputation in Sri Lankan ODL settings. A cross-sectional design yielded 162 valid responses (from 200), following the exclusion of multivariate outliers. Participants (aged 18–25, 60% female) primarily represented rural school leavers from middle-income backgrounds. Exploratory Factor Analysis (EFA) identified five reliable dimensions explaining 70.67% of variance, retaining 16 items after removing low-loading variables. Confirmatory Factor Analysis (CFA) confirmed strong model fit: ($\chi^2(94) = 138.751$, $p = .002$; $\chi^2/df = 1.476$; CFI = 0.953; RMSEA = 0.055; GFI = 0.902, meeting recommended thresholds). Composite Reliability ranged from 0.741 to 0.891; AVE values exceeded 0.502, and discriminant validity was supported by the Fornell-Larcker criterion. The study validates a multidimensional model of service quality in regional ODL institutions, identifying five dimensions: Environmental and Academic Accessibility, Financial Accessibility, Institutional Staff Support, Institutional Prestige, and Student Support Services. Student Support was strongly linked to engagement and well-being; Financial Accessibility to inclusivity; and Institutional Prestige to trust and affiliation. Students assessed institutional quality through affordability, access, image, and support systems. These findings offer strategic insights for enhancing satisfaction, retention, and competitiveness. Limitations include a small, regionally confined sample and cross-sectional design limiting causal inference.

Keywords: Open and Distance Learning (ODL), service quality, student perception, factor analysis

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LIFE SCIENCES

I. AGRICULTURE AND FORESTRY

Abstract/ Extended Abstract ID- 68

INTEGRATIVE ANALYSIS OF UREA SUPPLEMENTATION ON RUMEN FERMENTATION AND DAIRY CATTLE PRODUCTION

is not presented at IRC-OUSL 2025

CORRELATION ANALYSIS OF GERMINATION PERCENTAGE AND EARLY GROWTH PARAMETERS OF TOMATO (*Solanum lycopersicum*) UNDER SEED NANO-PRIMING WITH GREEN-SYNTHESIZED CuO NANOPARTICLES

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This study explored the effects of seed nano-priming using green-synthesized copper oxide nanoparticles (CuO NPs), prepared from *Mimosa pigra* leaf extract, on tomato (*Solanum lycopersicum*) germination and early growth. CuO NPs were synthesized via plant-mediated bioreduction and characterized using UV-visible spectroscopy, SEM, XRD, and FTIR. UV-visible analysis showed a surface plasmon resonance peak at 224 nm, while SEM revealed nanoscale morphology averaging 108 nm. XRD confirmed a crystalline monoclinic structure with peaks at 32.59°, 35.6°, 36.49°, 38.73°, and others, indexed to (110), (002), (111), (202), (311), and (220) planes (JCPDS 45-0937). FTIR spectra showed Cu–O vibrational bands in the fingerprint region (560.42–595.45 cm^{-1}), supporting nanoparticle formation. Tomato seeds were treated with CuO NP suspensions (0–1000 ppm) and evaluated for germination percentage, root length, shoot length, and fresh weight. Higher concentrations generally reduced seedling vigour. Pearson correlation analysis revealed a strong positive correlation between fresh weight and root length ($r = 0.779$, $p < 0.05$), moderate with germination percentage ($r = 0.695$), and weak with shoot length ($r = 0.248$). These results suggest that biomass accumulation is more closely linked to root development than shoot elongation. The study highlights the potential of CuO NPs in seed priming and recommends optimizing concentrations for improved seedling performance and further field-level evaluation.

Keywords: copper oxide nanoparticles, green-synthesized nanoparticles, growth parameters, seed germination, seed nano-priming

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PREDICTIVE ANALYTICS FOR RICE CANOPY MICROCLIMATE USING WEATHER FORECAST DATA AND BG-358 MONITORING

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Rice (Oryza sativa) is a primary food source for over half the global population, yet its yield is increasingly threatened by climate-induced microclimatic variations, particularly during sensitive growth stages like flowering. This study presents the development of a Machine Learning (ML)-based Early Warning System (EWS) designed to predict adverse canopy microclimate conditions, specifically temperature, humidity, and wind that influence rice yield and spikelet sterility. Utilizing high-resolution microclimatic data from the BG-358 rice canopy monitoring system, a locally developed IoT-based platform for real-time monitoring of microclimate, data were collected at 2-minute intervals from 2019 to 2024, resulting in a dataset of approximately 200,000 data points for two flowering seasons (each nearly 1 month) per year at RRDI Bathalagoda. These data, combined with NASA global forecast inputs, were split into 70% for training and 30% for testing, ensuring robust evaluation and reliable predictions to support proactive agricultural decision-making. The study employed Random Forest, Support Vector Machines, and Neural Networks to predict canopy temperature, relative humidity (RH), and wind conditions. After data pre-processing, including normalization and temporal feature engineering, models were evaluated using MAE, RMSE, and R^2 metrics. The Random Forest model demonstrated superior performance with an MAE of 0.78 °C, RMSE of 1.15 °C, and R^2 of 0.91 for temperature prediction. RH and wind predictions also showed high accuracy, with RH remaining above the 60% critical threshold in most cases, though wind forecasts, especially above the 20 km/h threshold, exhibited greater variability due to localized microclimatic conditions. Integrating real-time canopy data with weather forecasts enhanced prediction robustness, enabling heat-induced spikelet sterility anticipation up to 48 hours in advance with 85% reliability. The developed EWS incorporates real-time dashboards and automated alerts, demonstrating strong potential in mitigating climate-related rice yield losses and supporting sustainable agriculture. Future work will expand datasets across varieties and regions and foster collaboration with agricultural stakeholders for wider adoption and broader-scale yield forecasting to strengthen food security planning.

Keywords: Rice canopy microclimate, machine learning prediction, predictive analytics, spikelet sterility forecasting, climate-smart agriculture

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AI-POWERED MOBILE ASSISTANT FOR PRECISION CINNAMON FARMING USING REAL-TIME WEATHER AND SOIL DATA IN THE SOUTHERN PART OF SRI LANKA

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Ceylon cinnamon (*Cinnamomum verum*) is a globally renowned agricultural product and a key contributor to Sri Lanka's economy, particularly in the Southern Province. However, cinnamon farmers face persistent challenges due to climate variability, declining soil health, and limited access to real-time, localized agricultural insights, leading to suboptimal decision-making. To address these issues, this study presents the design, development, and evaluation of an Artificial Intelligence (AI)-powered mobile assistant aimed at enhancing precision cinnamon farming through the integration of real-time weather forecasts and soil condition data. The system was developed using the Flutter framework with Firebase backend services, incorporating RESTful Application Programming Interface (API)s for weather and soil data integration, while TensorFlow Lite enables on-device AI inference to ensure low-latency recommendations. Random Forest is used for predictive analytics, providing personalized, location-specific recommendations on irrigation scheduling, fertilization, plantation planning, and pest management. The assistant also supports multilingual interactions in Sinhala and Tamil, improving accessibility for rural farmers. Data were sourced from the Sri Lankan Department of Agriculture, meteorological services, public weather APIs, and scientific literature, complemented by field surveys and controlled experiments across three cinnamon cultivation sites over 6 months. The evaluation involved 20 AI-assisted farmers and a control group of 20 farmers following traditional practices. Field trials showed significant improvements: crop yields increased by 8-12%, water usage decreased by 15%, fertilizer usage reduced by 10%, and pesticide use lowered by 7% without compromising productivity. Over 80% of participants reported high satisfaction, citing usability and multilingual support as key enablers. This solution addresses gaps in existing agricultural platforms by delivering real-time, localized decision support tailored to the cinnamon sector. Future enhancements will integrate pest detection, disease prediction, and broader regional deployment, contributing to climate-resilient, sustainable, and data-driven agriculture in Sri Lanka.

Keywords: mobile assistant, precision agriculture, Cinnamon, real-time data, sustainable farming practices

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Abstract/ Extended Abstract ID- 226

BIOPRESERVATION USING MICROBIAL CONSORTIA IN POSTHARVEST SYSTEMS: A COMPREHENSIVE REVIEW OF ECOLOGICAL INTERACTIONS, MECHANISTIC INSIGHTS, AND CHEMICAL-FREE PRESERVATION STRATEGIES

is not presented at IRC-OUSL 2025

COMPARISON OF ANALYTICAL METHODS FOR DETERMINING NON-EXCHANGEABLE STABLE HYDROGEN RATIOS IN TEA

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Determining the δ^2H value of organic compounds is challenging due to the presence of moisture traces from ambient humidity, hygroscopic compounds, and exchangeable non-bound hydrogen atoms. Several approaches have been developed to avoid the interference of exchangeable hydrogen. However, these approaches are comparatively difficult to use for the δ^2H analysis of tea samples due to a lack of suitable solid reference materials for two-point calibration and time-consuming procedures. This study adapts and scales the method for lignin analysis, targeting methoxy groups to measure non-exchangeable hydrogen for the analysis of tea samples using gas chromatography coupled with isotope ratio mass spectrometry (GC-IRMS). It aims to compare the mentioned method with bulk δ^2H analysis of tea samples using equilibration techniques that involve different isotopic compositions and laboratory moisture. A total of 45 orthodox black tea samples were collected from three different tea growing regions with varying elevations in Sri Lanka: Nuwara Eliya (n=15), Kandy (n=15), and Ruhuna (n=15), and δ^2H values were measured using three different methods: GC-IRMS analysis of methoxy group, water vapor equilibration (enriched δ^2H) and laboratory moisture equilibration. One-way analysis of variance (ANOVA) was performed, and the results indicated a statistically significant difference in the averages of δ^2H values between the three methods ($p < 0.01$). The GC-IRMS method for analysing δ^2H in the methoxy groups of tea samples was the most reliable and precise method for analysing δ^2H in tea, as it offered consistent δ^2H values with low variability. There was a slight variability due to natural variations in the δ^2H of the non-exchangeable hydrogen in different elevations. It provided a clear separation between regions with minimal overlap. The laboratory moisture equilibrium and water vapor equilibration methods demonstrated high variability and lower precision, which may be due to environmental factors such as temperature and humidity. In addition, these methods were time-consuming compared to the GC-IRMS method for analysing the δ^2H in methoxy groups. Therefore, GC-IRMS methoxy group analysis is a robust method for δ^2H determination in tea with precision and consistency.

Keywords: δ^2H analysis, methoxy group, non-exchangeable hydrogen, stable isotope ratio, tea authenticity

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INVESTIGATING THE PRESENCE OF CURCUMINOID IN CRUDE EXTRACTS OF *C. longa* AND *C. zedoria*

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Curcuma species of Zingiberaceae family is a widely cultivated spice in Asian countries. *C. longa* L. is a well-established commercial source of curcuminoids, whereas *C. zedoaria* Rosc. remains relatively underutilized despite its rich phytochemistry. Comparing their extract yields not only identifies the most efficient solvent systems but also highlights the potential of *C. zedoaria* Rosc. as an alternative or complementary source of curcuminoids. The study focused on the screening of crude extracts obtained using four different solvents: methanol, ethanol, petroleum ether, and distilled water. Curcuminoid were extracted as a crude-extract from Dry Rhizome of *C. longa* and *C. zedoaria using* Soxhlet evaporator for 6 hours. Concentration of 75%, 85% and 95% were used from all three solvents instead of distilled water. Results showed that 75% methanol is the best solvent to extract the curcuminoids from *C. longa* and distilled water is the best solvent for *C. zedoaria.* The absorbance of *C. longa* extracted with all three solvent percentages (75%, 85% and 95%) ethanol has shown a maximum absorbance at the wavelength of 423 nm while all three percentages of methanol show maximum absorbance at the wavelength of 419 nm. The absorbance of ethanol extracted *C. zedoaria* having absorbance range of 267 to 274 nm. The extracts of petroleum ether as well as methanol, with all three solvent percentages (75%, 85% and 95%) as well as distilled water shown a maximum absorbance between 194 nm to 274 nm. The distilled water had shown the lowest absorbance of 194 nm. Acccordingly, *Curcuma longa* extracted in ethanol has shown the presence of curcuminoids. However, *C. zedoaria* does not prove the presence of curcuminoids from the UV spectrophotometer by not showing the absorbance peaks on the referred range of wavelength. The findings suggest continuity research with high-performance liquid chromatography (HPLC) to identify chemicals present in *C. longa* and *C. zedoaria.*

Keywords: *C. longa*, *C. zedoaria*, curcuminoids, UV spectrophotometry analysis

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ASSESSMENT OF SOIL NUTRIENT VARIABILITY IN LOW-INPUT PROSO AND FOXTAIL MILLET CULTIVATIONS IN SRI LANKA

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Millets are gluten-free, nutrient-rich cereals, offering a sustainable solution to global hunger due to their climate resilience and low-input adaptability. In Sri Lanka, proso (*Panicum miliaceum*) and foxtail (*Setaria italica*) millets are mainly grown in chena cultivations in the Low Country Dry Zone, with potential expansion to marginal areas. As soil nutrient data in millet-growing regions remain limited, this study assessed the spatial variability of key soil nutrients across proso and foxtail millet chena cultivations. Soil samples were collected from chena cultivations, after land preparation, using a composite sampling by collecting five random sub-samples in each site, from Dabana, Siyabalanduwa, Thanamalwila, Ampara, Sooriyawewa, Angunakolawewa, Weheragala, Ethimale, and Jaffna. Available nitrogen (N), phosphorus (P), exchangeable potassium (K), organic matter content (OM), pH, and electrical conductivity (EC) were measured and analyzed using R Studio 4.2.1. Available N, P, and K ranged from 91-238 ppm, 5.3-25.7 ppm and 53.9-386.8 ppm, respectively. OM ranged from 0.84%-3.74%, showing a moderately positive correlation with available N (r=0.51). Soil pH (4.7-7.9) and EC (0.014-0.143 dS/m) were generally within the tolerance range for millet crops. High levels of N, P, K without fertilization, may be attributed to crop rotation in chena lands, intermittent cultivation of legumes such as groundnut, the incorporation of groundnut residues during land preparation and other traditional farming practices that collectively enhance soil fertility and soil health. However, 40% of sites exhibited suboptimal P levels (<12 ppm), potentially limiting yield in P-sensitive millets like foxtail millet. Principal component analysis revealed that the first two components explained 65.1% of the total variance in soil nutrient data, with OM and N showing strong alignment. Cluster analysis identified three distinct sites, highlighting significant spatial heterogeneity in Jaffna, Sooriyawewa and Dabana compared to other areas. This national soil assessment reveals fertility variation across millet-growing areas, supporting site-specific nutrient management. Replicated multi-season sampling is needed to capture temporal nutrient changes and validate results.

Keywords: low-input agriculture, millet, soil nutrients, spatial analysis, Sri Lanka

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IDENTIFICATION OF SUITABLE GROWTH MEDIA FOR TOMATO (*Solanum lycopersicum* L.) CULTIVATION IN PROTECTED AGRICULTURE

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A study was investigated to identify the most suitable growth media for growing '*Bathiya*' tomato variety under polytunnel conditions. Six different media combinations: Sand + soil + coir dust (T1), Sand + PBRH + soil (T2), Sand + PBRH + soil + coir dust (T3), Sand + PBRH + soil + coir dust + compost (T4), Sand only (T5- Control), Coir dust only (T6) were evaluated in a pot experiment using completely randomized design with four replicates. Data on key growth parameters such as plant height, number of leaves per plant, and number of branches per plant were measured biweekly while root length, shoot length, fresh shoot weight, and fresh root weight were recorded at harvest. The number of fruits per plant and total yield were recorded as yield parameters. Results revealed that there was no significant difference among T4, T3, and T2 in plant height ($p < 0.0047$) and the number of branches ($p < 0.0005$). T6 exhibited significantly lowest plant height of 79.1cm while significantly fewer branches of 14.2 and 3.5 were recorded in T5 and T6 respectively. In shoot length, except T6 (64.0 cm), all other treatments were not significantly different. Significantly higher fresh shoot and root weights were recorded in T3, T4, and T2. Conversely, T6 consistently produced the lowest values across all growth parameters. T4 exhibited the highest fruit production per plant (51.5) followed by T2 (39.5) and T3 (30.5) whereas, significantly lower fruit numbers were recorded in T6 ($p < 0.001$). When considering the total yield, except T6 (10.2 kg/plant), all other treatments were in a homogeneous group ($p < 0.036$). Treatment T4 followed by T3 and T2 showed promising growth and yield performances in this study. In contrast, single-component media sand and coir dust alone were performed poorly. Results suggest that incorporating organic components together with aeration-enhancing materials enhances growth and yield of tomato under protected environments.

Keywords: compost, PBRH, polytunnel, productivity, yield

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COMPARATIVE STUDY ON SHEAR VERSUS HAND PLUCKING OF UP-COUNTRY TEA

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A better-quality made tea relies on the plucking standard, and the aim of maintaining an optimum plucking standard is to obtain an economic yield, produce high-quality tea, and keep the tea bushes in good health. Currently, the Sri Lankan tea industry encounters low productivity, high production costs, and a declining workforce. The cost of harvesting bears a significant share of the total production cost. Therefore, the tea industry should be supported with cost-effective methods of harvesting. The purpose of this research was to investigate an alternative technique for tea harvesting that is suitable for use in the upcountry, rugged terrain. A comparative assessment was conducted in Fields 02 and 12B of Glentilt Estate, each covering 0.25 hectares and comprising approximately 3,125 KO145 tea bushes. Data collected over seven rounds of hand plucking and four rounds of shear plucking, focusing on plucking rate, plucking average, and leaf standard. An interviewer-administered survey was also conducted among pluckers, field officers, and manufacturing staff to capture perceptions of shear plucking. Results indicate no significant difference ($p<0.05$) in leaf standard between the two methods. However, shear plucking demonstrated a significantly higher plucking rate (6.4 ± 0.3 kg/h) and plucking average (31.9 ± 1.6 kg/day) compared to hand plucking (4.2 ± 0.2 kg/h and 21.1 ± 0.8 kg/day, respectively). According to the survey, field officers, manufacturing staff, and hand pluckers prefer shear plucking due to its high efficiency, reduce refuse and higher made tea. Based on the findings, shear plucking can be suggested as a suitable alternative to conventional methods. However, further studies are recommended to validate these results and establish a more definitive recommendation.

Keywords: tea industry, hand plucking, shear plucking, plucking standard, leaf standard, plucking average, plucking rate

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FROM FARM TO MARKET: BANANA SUPPLY CHAIN EFFICIENCY AND PROFITABILITY IN SRI LANKA

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Banana (*Musa* spp.) is a staple fruit cultivated on about 9 million hectares worldwide. In Sri Lanka, despite the substantial production, limited information is available comparing the efficiency and value distribution of local and export banana supply chains. Hence, this study analyzes the supply chain efficiency of bananas from the farmer to the consumer with a special focus on post-harvest losses (transporting, distributing), initial capital investment for cultivation, and profit distribution in both local and export markets. Interviews were conducted at the Manning Market in Peliyagoda and the Rajanganaya export processing unit. Collected data include transport volumes, buying and selling prices, quantities rejected and processed, and farmers' production costs and profits. The research revealed significant differences between local and export markets. Farmers invest approximately Rs. 360,000 per acre and Rs. 601,000 per acre for cultivation in local and export markets respectively. The local market loses up to 40% of its harvest due to inefficient storage, inappropriate transport modalities, and an intermediary-dominated disintegrated supply chain while the export market has hardly any post-harvest losses due to the use of high-tech cold-chain supply chains and centralized quality inspection. The study further indicated extreme gaps in profit realization between the two markets. The local market is affected by sharp seasonal price swings (Rs. 50-200/kg) while the export market benefits from fixed pricing (Rs. 165/kg). The most striking finding of this study is that local farmers receive only 20-30% of the final retail price in contrast to the guaranteed returns secured by export-oriented farmers, highlighting severe imbalances within the value chain. These findings highlight the critical need to modernize local banana supply chains through enhanced post-harvest management practices and stronger value chain integration, thereby reducing food wastage and improving farmer incomes. The pack house in Rajanganaya, where 50% of the produce meets export quality and the remaining is sold to local supermarkets or value-added, presents an implementable model of improvement throughout Sri Lanka. These findings indicate that strengthening post-harvest processes and fostering greater supply chain coordination hold significant potential for improving the economic sustainability of banana cultivation in Sri Lanka.

Keywords: banana farming, supply chain efficiency, post-harvest loss, Sri Lankan agriculture

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II. BIOLOGICAL SCIENCES

EXPLORING THE ANTICANCER POTENTIAL OF *Loranthus* SPECIES: A BIBLIOMETRIC ANALYSIS

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Loranthus species, known as mistletoes, are gaining unprecedented attention as anticancer species. This review aims to explore and evaluate the anticancer potential of *Loranthus* species by examining their traditional Ayurvedic uses, and phytochemical composition. The methodology involved a comprehensive literature review using academic databases such as Google Scholar (32 articles), Academia (24 articles), ResearchGate (18 articles), Web of Science (45 articles), and PubMed (34 articles), employing relevant search terms to collect data. VOS Viewer software was used to analyse the information, elaborate on the analysis, such as trend line, keywords, types of articles and phytochemicals. A structured questionnaire survey was conducted with ten Ayurvedic practitioners to gather insights on the clinical use of *Loranthus* species. The number of publications related to mistletoe cancer treatment has shown a marked increase since the early 1990s, peaking at 38 articles in 2023, indicating growing scientific interest in this field over the past three decades. The network visualisation highlights Mistletoe's role in cancer treatment, focusing on clinical applications, molecular mechanisms, and biochemical properties, while also emphasising its integration in Ayurvedic and traditional medicine. This review, supported by a survey of Ayurvedic practitioners in Sri Lanka, highlights the anticancer potential of *Loranthus* species. Traditional use confirms their value, particularly with host-specific variations noted for medicinal effectiveness. Phytochemical analysis reveals key bioactive compounds—flavonoids, polyphenols, terpenoids, and lectins with strong antioxidant and anticancer properties. Extracts of *L. micranthus*, *L. europaeus*, and *Dendrophthoe falcata* show cytotoxic effects against breast, lung, cervical, ovarian, and colon cancer cells through apoptosis induction and immune modulation involving NF-κB and JAK/STAT pathways. Survey feedback stresses the need for standardization due to host-related variability and a lack of clinical trials, despite strong preclinical evidence. These findings support further research into *Loranthus* as a natural anticancer agent within the Ayurvedic framework.

Keywords: *Loranthus*, mistletoe, anticancer, ayurvedic, literature, visualisation

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IMPACT OF NUTMEG (*Myristica fragrans*) DOMINANCE ON VEGETATION COMPOSITION AND DIVERSITY IN KANDYAN HOME GARDENS

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Kandyan home gardens are well-established land use systems found in the mid country wet zone especially in and around the Kandy District. Due to their unique vegetation characteristics, these ecosystems play an important role in enhancing food security and biodiversity. Among the cultivated species, nutmeg (*Myristica fragrans*) has become a popular crop due to its high economic value. This study aims to investigate the dominance of nutmeg in Kandyan home gardens and its impact on plant diversity by comparing the species diversity of home gardens with and without nutmeg trees. Vegetation data were collected using the Point-Centered Quarter Method (PCQM) at 10 sampling points along a 50 m transect, recording 40 trees in total. Light intensity at each point was measured and for each plant, the distance from the central point, diameter at breast height (DBH), and tree height were recorded. Species dominance, diversity, and structure were assessed using standard ecological indices. A species abundance matrix within study sites was analyzed using PCORD software. Cluster analysis and Detrended Correspondence Analysis (DCA) were used to determine species composition patterns across Kandyan home gardens. Biodiversity indices were computed using Biodiversity Pro software for comparative analysis between sampling sites. Nutmeg was found in 78% of the sites surveyed, contributing an average of 17% to total tree density and 19.75% to overall basal area, indicating its strong ecological presence. Home gardens with higher nutmeg density showed lower absolute tree density, reduced light intensity, and a strong negative correlation between nutmeg abundance and understory light levels. Species diversity was notably lower in nutmeg-dominated sites. Cluster and DCA analyses grouped home gardens into distinct clusters based on species assemblages, with nutmeg-dominated sites forming separate ecological outliers. DCA ordination confirmed that *Myristica fragrans* strongly influenced site distribution, highlighting its role as a key driver of species composition. These findings suggest that nutmeg dominance can substantially alter species diversity and ecosystem structure in Kandyan home gardens. Adaptive management strategies are recommended to maintain productivity, ecological resilience, and biodiversity conservation in these systems.

Keywords: nutmeg, dominance, home gardens, diversity, composition

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BALANCED MEAL AND DIETARY FIBRE CONSUMPTION IN THE INDUSTRIAL WORKFORCE IN GAMPAHA, SRI LANKA

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The dietary behaviour of young adults in Sri Lanka is a key determinant of long-term health outcomes in the country. This study aimed to evaluate the daily dietary fibre (DF) intake and balanced meal consumption patterns among young adults employed in a Sri Lankan export processing zone, Gampaha. A cross-sectional quantitative study was conducted among 327 participants using a validated, interviewer-administered questionnaire, including 128 males and 199 females. Data were analysed using ANOVA and Tukey's post-hoc test to compare means across demographic categories using IBM SPSS Statistics 29 software. The daily mean DF intake was 19.8 g (Male: 22.3 g; Female: 18.2 g; $p < 0.05$), which is lower than the recommended daily intake. The lowest DF intake was observed in the 18-23 age group (18.4 g), and intake significantly increased with age ($p < 0.05$). DF intake differed significantly across educational levels ($p < 0.05$), with graduates reporting the highest intake (21.6 g). Place of residence also influenced intake; those who were living at home had higher DF intake than those living in boarding places. Moreover, the consumption of balanced meals was critically poor with only 2% of subjects reporting a balanced diet across all main meals. The highest proportion of balanced meals was reported at lunch (55%), while none of the participants reported consuming a balanced breakfast. The findings of this study highlighted the necessity of educating the industrial workforce on their diet and health. Further, implementing policies and providing workplace facilities to promote healthier dietary practices among young adults should be prioritised and strengthened.

Keywords: balanced diet, dietary fibre intake, export processing zone, nutrition

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MORPHOLOGICAL AND MOLECULAR CHARACTERIZATION OF *Citrus* GERMPLASM IN SRI LANKA

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Sri Lanka has a rich variety of *Citrus* species, ranging from wild-growing limes in village backyards to cultivated hybrid mandarins and oranges in commercial plantations. Despite their economic and cultural importance, the true diversity of *Citrus* in Sri Lanka has not been fully explored or documented. The main objective of this project is to fill that gap by identifying and characterizing *Citrus* species across the island using both traditional morphological methods and modern molecular tools. Morphological characterization involved the documentation of traits such as fruit, leaf, tree and floral morphology. Quantitative data were scandalized using z- score normalization, while qualitative data were encoded numerically. Species distances were calculated using Gower distance in the R programming environment. A dendrogram was constructed using the word's method of hierarchical clustering in IBM SPSS. Based on the morphological characters, five main clusters were identified. Cluster I - Yak dehi, Key lime, Nas naran, and Kaffir lime. Cluster II - Lemon- round, Lemon – long, Cluster III - Sour orange, Sweet orange Cluster IV - Sidaran, Cluster V – Pumelo. Molecular characterization was carried out through DNA barcoding of chloroplast genes. Genomic DNA was extracted using a modified CTAB method, and PCR amplification was performed using *rbc*L and *mat*K gene markers. PCR products were sequenced at Macrogen, South Korea. The sequences were analyzed using BioEdit software and deposited in GenBank. Phylogenetic trees were constructed using MEGA software to infer genetic relationships among species. The phylogenetic tree based on *mat*K sequences revealed three major clusters: Cluster I - Sour orange, sweet orange, Nas naran, Yak dehi, and Pumelo. Cluster II - Long lemon, Round lemon, Key lime, and Kaffir lime. Cluster III - Sidaran. The phylogenetic tree based on *rbc*L sequences formed two primary clusters. Cluster I - Sour orange, Sweet orange, Nas naran, Yak dehi, Pumelo, and Sidaran. Cluster II - Long lemon, Round lemon, Key lime, and Kaffir lime. Phylogenetic analysis using both *rbc*L and *mat*K markers revealed consistent clustering patterns, with the only notable exception being the placement of Sidaran. These findings provide a foundational understanding of the morphological and genetic diversity of *Citrus* species in Sri Lanka and contribute to future conservation and breeding programs.

Keywords: *Citrus* diversity, Sri Lanka, molecular characterization, morphological characterization

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SYNTHESIS OF ALPHA-PINENE HYDROPEROXIDES AND TOXICITY ASSESSMENT VIA ZEBRAFISH EMBRYO

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Alpha-pinene is a naturally occurring monoterpene present in the essential oils of various plants. The oxidation of α-pinene with singlet oxygen [$^1O_2(^1\Delta_g)$] yields hydroperoxide and hydroxide derivatives that possess potential biological activities. Considering the known anxiolytic properties of α-pinene, these oxidized derivatives may exhibit comparable or enhanced effects, thereby justifying further investigation, prompting the present study. The photo-oxidation reaction was carried out by combining 1 cm^3 (0.858 g) of α-pinene with 0.001 g of methylene blue as the photosensitizer in 50 mL of chloroform. The mixture was exposed to continuous oxygen flow and irradiated for 6 hours using a 200 W tungsten halogen lamp as the light source. Reaction progress and purification were monitored via thin-layer and column chromatography, with structural characterization by NMR and FT-IR spectroscopy. Toxicity was evaluated by exposing Zebrafish (*Danio rerio*) embryos to α-pinene and its hydroperoxide at varying concentrations and observing developmental endpoints over a 96-hour period. α-pinene hydroperoxide formation was verified by the ^1H NMR peaks at 5.52 (-OOH), 4.49, 4.25, 1.27, 0.64 ppm, and FT-IR absorptions at 3340.2 (-OH stretching) and 844.09 cm^{-1} (O-O). α-pinene and its hydroperoxide exhibited dose-dependent toxicity, with 100% mortality at ≥300 mg/L, while lower concentrations (37.50 and 18.75 mg/L) showed reduced toxicity. The LC_{50} value of α-pinene hydroperoxide was 69 mg/L. Exposure to α-pinene hydroperoxide caused significant developmental malformations, including pericardial and yolk sac edema. Additionally, spinal curvature was frequently observed during the early stages of embryonic development. However, this malformation showed signs of gradual correction over time and was notably resolved by 96 hours post-exposure (hpe), suggesting a potential for developmental recovery under sublethal exposure conditions. However, further studies are required to confirm these observations. α-Pinene completely inhibited hatching (0%) at concentrations of 75-600 mg/L, whereas α-pinene hydroperoxide caused complete inhibition at 150-600 mg/L and improved hatching rates (40-80%) at lower concentrations (18.75-75 mg/L). In conclusion, spectral data confirms the hydroperoxide formation, and the Zebrafish Embryo Toxicity (ZET) assay highlights the dose-dependent toxicity of α-pinene hydroperoxide in zebrafish embryos.

Keywords: α-pinene hydroperoxide, monoterpenes, Zebrafish embryo toxicity, singlet oxygen

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DEVELOPMENT OF LARVAL STAGES OF *Aedes aegypti* IN POLLUTED WATER HABITATS IN COLOMBO DISTRICT AND THEIR SUSCEPTIBILITY TO TEMEPHOS INSECTICIDE

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Dengue fever, primarily transmitted by *Aedes aegypti* and *Aedes albopictus*, affects approximately 400 million people worldwide annually. In Sri Lanka, recurring outbreaks have occurred since the 1960s, with severe epidemics in Colombo, especially in 2017. Recent findings indicate that *Aedes aegypti* can breed in polluted water and develop resistance to insecticides such as temephos. This study investigated the developmental characteristics and temephos susceptibility of *Aedes aegypti* larvae reared in polluted water (PW) and freshwater (FW) under laboratory conditions to assess the role of polluted habitats in mosquito larval development. Field-collected eggs were reared to the fourth (F4) laboratory generation, with water quality (temperature, dissolved oxygen, pH, conductivity, total dissolved solids, salinity) assessed for both PW and FW. Morphometric analysis of all larval instars included head, thorax, antenna, siphon, anal papillae, abdominal features, and total body length using binocular microscopy. Temephos susceptibility was evaluated using five concentrations, ranging from 0.0125 mg/L to 0.625 mg/L, on third- and early fourth-instar larvae. Testing involved 20 larvae per concentration across four replicates, with mortality assessed after a 24-hour exposure period. Statistical analysis employed log-probit methods to determine lethal concentration values. Results revealed that both populations exhibited temephos resistance, with PW larvae showing significantly higher resistance levels. LC_{50} values were

0.019 mg/L (95% CI: 0.014-0.027) for FW versus 0.046 mg/L (95% CI: 0.00-

0.109) for PW populations. LC_{99} values reached 0.102 mg/L (95% CI: 0.055-

0.660) for FW and 0.602 mg/L (95% CI: 0.306-23.933) for PW populations.

Morphometric analysis revealed significant differences in PW larval siphon and anal papillae development, showing faster growth and distinct developmental patterns compared to the consistent progression of FW larvae. These results indicate that polluted habitats foster temephos resistance and morphological adaptations in *Aedes aegypti*, highlighting the need for revised vector control and integrated management strategies to prevent dengue transmission.

Keywords: *Aedes aegypti*, development, morphometry, polluted water, susceptibility, temephos, vectors

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EFFECTS OF SOUND FREQUENCY ON GERMINATION AND SEEDLING GROWTH OF CHILI (*Capsicum annuum)* SEEDS

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Optimization of crop productivity and sustainability should be achieved through optimization of seed germination and viability of seedlings. This study examined how certain sound frequencies affect the early development of Chili (*Capsicum annuum*) seeds to find eco-friendly, non-chemical methods for maximizing seedling vigour. In here, the effects of frequencies of sound such as 125 Hz, 250 Hz, and 500 Hz were used to check the germination and early growth of *Capsicum annuum* seeds as pertaining to identify the best frequency which encourage the seedling growth. The experiment was conducted under a controlled environment where seeds were exposed to single sound frequencies for four hours daily with constant environmental conditions along with two controls (ambient and no sound). Important growth characteristics like germination percentage, shoot and root length, seedling weight, and chlorophyll content were monitored on a 15-day regimen. Results indicated that at 250 Hz sound frequency, it showed the maximum germination percentage, shoot and root elongation, and seedling vigour, while 125 Hz caused an increase in the content of chlorophyll to the highest level. 500 Hz treatment caused variable effects and the control sound group never lived up to expectation. In addition to this, the development of fungi along with seedlings was affected due to treatments with sounds. According to this research, 250 Hz sound frequency was confirmed as the best sound frequency for promoting germination of *Capsicum annuum* seeds and development of seedlings. Seeds treated with this frequency showed more germination, shoot and root elongation, and chlorophyll content than controls involving no sound and ambient sound. These results show that the processing of sound frequency can be an environmentally friendly, chemical-free method for increasing crop yield.

Keywords: chili seeds, *Capsicum annuum*, seed germination, seedling growth, sound frequency, plant physiology, frequency-specific sound treatment

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INFLUENCE OF OPERATIONAL SEX RATIO, SIZE, AND BODY COLORATION OF MALES ON MATE SELECTION AND MALE-MALE COMPETITION IN *Poecilia reticulata* (GUPPIES)

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The operational sex ratio (OSR) in fishes fundamentally describes the intensity of sexual selection and potential reproductive success. It reflects the ratio of sexually active males to sexually receptive females, influencing the intensity of competition, including associate behaviours among males for mates. This research used wild guppies as the model organism to understand the influence of OSR in the behavioural display of both males and females, and to evaluate the relationship between male body colouration, body size of both sexes, and mating success. Methodology consisted of initial collection and acclimatisation of wild guppy populations from the canals around Colombo, like the Udahamulla Railway Station (6.8622720, 79.9086026), Pagiriwaththa Railway Station (6.8648125, 79.9024510), and Paramitha Dharmayathana Temple (6.8763484, 79.9083455), followed by subjecting them into three tests based on OSR, tail colouration of male guppies, and body size of both sexes. Different OSR levels were created, ranging from 1:5 (female-biased) to 5:1 (Male-biased). Under each level, mating tactics such as sigmoid displays (SG), sneak attempts (SA), mirror action (MA), and male-male interactions were recorded using videography tools. Measurement of tail colour and body size preference also consisted of the same behavioural recording protocol. Results indicated prominent SG display while male behaviour declined from 0.17 to 0.83 OSR treatments. The second test of tail colour preference indicated a higher preference for orange-tailed males by the females. In the last test of body size preference, both sexes preferred large-bodied counterparts with increased activity. Hence, the OSR influences the mate choice of both sexes and competition in the more biased sex, which ultimately affects the evolutionary trajectory of the species in the environment through secondary sexual traits.

Keywords: operational sex ratio, OSR, guppy, mating behaviour, sexual selection

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SUBMERGENCE TOLERANCE IN SELECTED RICE VARIETIES OF SRI LANKA: AN EVALUATION OF O*ryza sativa* L. ACROSS DIVERSE WATER SOURCES

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Submergence poses a major challenge to rice cultivation, significantly reducing harvest outcomes. Therefore, the adoption of rice varieties with enhanced tolerance to submergence is crucial. This study examines how water quality and environmental conditions influence the submergence tolerance of selected improved rice varieties (*Oryza sativa L.*) in Sri Lanka. After 24 hours pretreatment procedure, LD 376, LD 253, LD 368, and LD 408 selected rice varieties were submerged for 12 days with Well water, Canal water and Chlorinated tap water from 6 different locations. During the pretreatment, each sample was submerged in corresponding water of each location for 24 hours followed by the weight treatment for 24 hours. Then, cultivation was carried out using Well water obtained from Walasmulla (L1) and Udugama (L2) locations, Canal water from Embilipitiya (L3) and Hambantota (L4) locations and chlorinated tap water from Tangalle (L5) and Galle (L6) locations. SPAD readings were obtained from randomly selected rice plants after 12 days, while bud length was measured daily with respective water samples. According to analyzed data, LD 408 variety showed the highest bud growth rate in Canal water which has high conductivity values and also LD 408 rice sample which was submerged in Canal water in Location 3 & 4 has relatively high SPAD values. Thus, LD 408 rice variety exhibited resilience to Canal water with high conductivity, resulting from dissolved soil minerals such as NaCl and $CaSO_4$ as well as sewage, maintaining rapid bud growth and elevated SPAD values, which indicates strong tolerance to submergence and ionic stress. It implies its suitability for cultivation in flash-flood-prone areas and other marginal environments with saline or nutrient-rich water in Sri Lanka.

Keywords: submergence tolerance, improved rice varieties

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INVESTIGATION OF THE ANTIOXIDATIVE AND SUN-PROTECTIVE PROPERTIES OF *Aegle marmelos* AND *Cardiospermum halicacabum* HERBAL EXTRACTS

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Medicinal plants are rich natural sources of bioactive phytochemicals and are widely used in the cosmetic industry due to their compatibility in types, with fewer side effects. Therefore, it is essential to assess their phytochemical composition to determine the potential of these indigenous plants as valuable sources of medicinal and cosmetic applications. This study aims to evaluate the Sun Protection Factor (SPF) and the antioxidant activity of *Aegle mamelos* (Beli/Bael) and *Cardiospermum halicacabum* (Welpenela) through their leaf extract, as both plants are traditionally used in cosmetics and in the treatment of various human infections. Leaves from both plant species were subjected to hot water extraction, and a dilution series was prepared using ethanol as solvent to assess SPF. A UV-spectrophotometer was used to determine the absorbance values across the 290–320 nm wavelength range, and SPF values were calculated based on the Mansur equation. The experimental data were analysed using the paired sample *t*-test to compare the mean values between *Aegle marmelos* and *Cardiospermum halicacabum* extracts. Antioxidant activity was measured using the hydrogen peroxide scavenging assay. According to the Mansur equation, *Cardiospermum halicacabum* exhibited SPF values ranging from 0.315 to 1.296, while *Aegle marmelos* ranged from 0.324 to 1.194. Both extracts had a maximum SPF value at the highest concentrations and then steadily decreased with dilution. *Cardiospermum halicacabum* had a slightly higher average SPF (mean = 0.707) than *Aegle marmelos* (mean=0.698), but the difference was not statistically significant ($p > 0.05$), indicating comparable UV protection capacity. The hydrogen peroxide scavenging assay revealed that both leaf extracts possessed antioxidant properties. Comparatively, *A. marmelos* extract demonstrated stronger antioxidant activity, with up to 54.2% scavenging activity than 28.9% in *C. halicacabum*. Both leaf extracts showed UV-absorbing and antioxidant properties, with *Aegle marmelos* showing slightly higher activity in hydrogen peroxide scavenging and comparable sun protection potential, indicating its potential as a natural bioactive ingredient for skin-protective formulations. Despite phytochemical analyses, proper clinical cosmeceutical trials are needed to evaluate the appropriate efficacy of these natural products in addressing dermal needs.

Keywords: sun protection factor, antioxidant activity, hydrogen peroxide

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LOW-COST MULTI-SENSOR PLATFORM FOR MONITORING INSECT BEHAVIORAL RESPONSES TO ENVIRONMENTAL CHANGE: A CASE STUDY IN ANTS

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Insect foraging behaviour is influenced by various environmental factors; however, continuous monitoring under natural conditions remains technically and financially challenging. In this study, we present a cost-effective, autonomous multi-sensor monitoring system developed to investigate the foraging behaviour of a ground-dwelling ant species in relation to temperature, humidity, and light intensity. Leveraging a low-cost ESP32 microcontroller and a MATLAB-based optical flow computer vision algorithm, the system enables continuous monitoring and analysis of ant activity (ingress and egress). A comprehensive dataset was collected every 15 minutes from 23 to 29 August 2024, including environmental parameters (temperature, relative humidity, and light intensity) and corresponding ant ingress and egress counts. During the observation period, a 5-minute video feed for each time interval of 15 minutes was captured. This, paired with the environmental parameter logging system, captured data over a total duration of 168 hours (7 days), resulting in 672 discrete 15-minute intervals. Nearly 709 Carpenter ants (Family Formicidae) were observed moving either in or out of the monitored mound per 5 minutes of each interval. Distinct nocturnal patterns were observed, with peak foraging activity between 0000 and 0600 hours, and reduced activity during the daytime. The multivariate regression analysis revealed that ant activity was significantly associated with the tested parameters ($p = 0.009$; $R^2 = 0.216$), where temperature ($p = 0.07$) and humidity ($p < 0.001$) were found to be significantly influencing the ant activity; however, the adopted model only moderately supports these variables due to the limited number of data points. This case study reports baseline information on affordable automated systems, which can be used in behavioural ecology. Further, the findings enhance the understanding of the environmental factors influencing ant foraging and suggest a methodological framework applicable to other small-bodied terrestrial invertebrates.

Keywords: behavioural ecology, computer vision, insect tracking system, low-cost monitoring technology, multi-sensor integration, optical flow algorithm

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ECTOPARASITES OF CHIROPTERAN SPECIES IN THE MANNAR ISLAND AND POONERYN REGION OF SRI LANKA

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Bats are hosts to a variety of ectoparasites, which may impact their health and the transmission of zoonotic pathogens. However, studies on bat parasites in Sri Lanka are very limited and are mainly restricted to the bats in the wet zone. Therefore, the overall objective of this study was to examine the prevalence, diversity and distribution of ectoparasites associated with selected bat species from the Mannar Island and Pooneryn area of the Northern Province of Sri Lanka. A total of 246 bats were captured using mist nets at dawn and dusk. All captures and handling were permitted by the Department of Wildlife and Conservation, Sri Lanka (WL/3/2/30/2024). Ectoparasites were collected from the captured live bats and preserved in 70% ethanol. Morphological identification of parasites was carried out using published taxonomic keys and guides. Parameters such as parasite prevalence, abundance, mean intensity, Shannon-Weiner diversity index and average parasitic load per host species were calculated. Ectoparasites were found in all five species of bats surveyed. *Scotophilus kuhlii* had ectoparasites in 23 (21.9%) of them, while *Cynopterus sphinx* had ectoparasites only in 2 (3.85 %) of them. A single infection was observed in *C. sphinx, Scotophilus heathi* (0.09%), *Pipistrellus coromandra* (2.94%) and *Taphozous longimanus* (25%) bat species while, multiple infections were seen in *S. kuhlii.* Bat flies from family Nycteribiidae, a mite species from family Spinturnicidae and a hard tick from family Ixodidae were found among a total of 183 ectoparasites. The dominance of *Nycteribia* species, including three *Nycteribia* fly species and five other unidentified species from the family was noted. Although parasites in *S. kuhlii* showed the highest diversity (H'=1.77) and parasitic load (175), collectively parasitic loads did not show a significant difference (one way ANOVA, $p > 0.05$) within the five-host species from a single study region or between the two regions: Mannar Islands and Pooneryn. *S. kuhlii* harbor larger numbers of ectoparasites and experience higher frequency of infections as they live in colonies as opposed to other host species sampled. This study suggests that roosting behavior may contribute to differences in patterns of host-parasite associations, while regional factors (arid vs. dry regions) may not. The present study further contributes to bridge the knowledge gap on host parasite associations in bats of arid and dry zones in Sri Lanka, as the first such scientific attempt.

Keywords: Chiroptera, ectoparasites, Nycteribiidae, Mannar, Pooneryn

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INTRASPECIFIC VARIATION IN SCHNEIDER'S LEAF-NOSED BAT *(Hipposideros speoris)* ACROSS THREE ECOLOGICALLY DISTINCT ROOSTS IN SRI LANKA

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Hipposideros speoris occurring across all bioclimatic zones is one of the most widespread bat species in Sri Lanka. This study focused on ecological traits and body morphometrics of three colonies of *H. speoris* from ecologically diverse locations namely a cave in Yakkala (62.6 m asl), a mine in Kegalle (155.3 m asl) and an abandoned building in Thanamalvila (91.29 m asl). The sites were selected to capture variation in roost structure, light exposure, elevation and colony size. Observations were conducted from August 2024 to April 2025. Bats were captured using both active and passive methods to obtain morphometric measurements, while roost environmental conditions were assessed. Light penetration was measured using a lux meter, and roost structure documented via direct observation. Roosts differed in structure and illumination. The Yakkala cave, with four natural openings allowed minimal light penetration (0.2 lux) into deeper roosting sections. The Kegalla mine, shared with *R. rouxii*, had a single main opening, and bats inhabited interior areas with no light penetration. In Thanamalvila, the roost had one dark entrance, with bats clustered beneath the ceiling. Estimated colony sizes were 50, 100 and 500 in Yakkala, Thanamalvila and Kegalle respectively. To reduce potential variations arising from age, sex or reproductive status, data were normalized prior to analysis. Significant differences were noted in several morphometric measurements across the colonies (One Way Anova, $p<0.05$). Traits showing significant variation included tibia length ($p<0.0001$), length of hind foot and claws ($p<0.001$), length of the thumb ($p=0.038$), and several metacarpal dimensions. Body size differed significantly, with Yakkala bats ($P=0.022$) being larger, while the Kegalle bats exhibited disproportionately longer hind feet and claws. In contrast, characters linked to echolocation, such as ear and nose leaf dimensions remained stable among populations. This study highlights heterogeneity across a widespread bat species, suggesting phenotypic plasticity that may facilitate adaptation to local environments. The consistency of echolocation traits supports the hypothesis that acoustic structures might be evolutionary preserved due to functional constraints. Overall, the findings may provide insights into intra-specific variation and the ecological influences, contributing to the understanding of cryptic diversity among Sri Lankan micro chiropterans.

Keywords: bat colonies, roost structure, morphometric variation, light exposure, phenotypic plasticity

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COMMUNITY KNOWLEDGE, ATTITUDES, AND PRACTICES ON SEA TURTLE CONSERVATION IN MADIHA AND POLHENA, SRI LANKA

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The global sea turtle population is threatened due to anthropogenic activities. The coastline of Sri Lanka, including Madiha and Polhena beaches, provides critical habitats for five species of sea turtles. Their popularity as tourist destinations further highlights the need for effective conservation in these areas. This study aimed to assess the influence of demographic factors on knowledge, attitudes, and practices (KAP) of the local community of these areas towards sea turtle conservation. A mixed-methods survey was conducted among 100 locals from Madiha and Polhena, selected through random sampling and categorized into three age groups: 18-30 years (33%), 31-50 years (34%), and 51-70 years (33%). A structured questionnaire, validated through a pilot study (n=40), including 19 items assessing demographics (5), knowledge (7), attitudes (3), and practices (4) of locals regarding sea turtle conservation was used for data collection. Informed consent was obtained from all participants before data collection. Data were analysed using the software IBM SPSS Statistics Version 20, converting responses into numerical scores. KAP scores were calculated by summing the respective items. The data were analysed using descriptive statistics, Chi-squre, Mann-Whitney U, Kruskal-Wallis, Spearman's correlation, and regression analyses. $p < 0.05$ was set as the statistical significance. The structured questionnaire demonstrated strong validity and reliability (Internal validity, Cronbach's alpha=0.785; CVR=1.00; Face validity, Kappa=0.689, p=0.002; 73.8% of variance indicated by PCA). The older age group (51-70) had a significantly higher knowledge level (mean= 7.88 ± 2.10, p=0.006) compared to other groups. Gender-based assessment of knowledge and attitude scores showed that males possessed higher knowledge (mean 8.26 ± 2.29, p<0.0001) and more positive attitudes (p=0.007) than females. Both the old age group (p=0.026) and the long-term residents (p=0.001) showed greater knowledge about sea turtles at Madiha and Polhena. Moreover, both knowledge (β=0.45, p=0.004) and attitudes (β=0.39, p=0.007) significantly predicted conservation practices. Higher knowledge (OR=2.3, p=0.004) and positive attitudes (OR=1.9, p=0.007) contributed to the willingness to participate in sea turtle conservation. Knowledge and attitudes showed a greater influence on enhancing conservation practices among the local residents. Raising awareness among young individuals, females, and new residents may support community-based sea turtle conservation at Madiha and Polhena areas.

Keywords: sea turtle conservation, knowledge, attitudes, and practices (KAP), Sri Lanka, Madiha and Polhena, community-based conservation

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EFFECT OF CLIMATIC CHANGES ON REPORTED DENGUE CASES IN SRI LANKA: A RETROSPECTIVE STUDY FROM YEAR 2020 TO 2024

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Dengue fever remains a significant public health challenge in Sri Lanka, with rising incidence and expanding geographic distribution in recent years. This study investigates the spatial and temporal variations of dengue cases in relation to mortality patterns and their potential associations with climatic factors from 2020 to 2024. District-level data on dengue cases and deaths were obtained from national surveillance systems, alongside rainfall and temperature data from 21 districts. Statistical analyses, including Chi-square tests and linear-by-linear association models, were employed to assess relationships between dengue outcomes and climatic variables using SPSS version 25. The analysis also considered disruptions in disease surveillance during the COVID-19 pandemic. Colombo and Gampaha consistently reported the highest burdens, peaking in 2023 with 18,911 and 16,127 cases, respectively. Mortality reached its maximum in 2022 (72 deaths), followed by 62 in 2023 and 23 in 2024. A significant decline in cases was observed in 2020, with a 79% reduction in Colombo compared to 2019 ($p < 0.001$), which coincided with the implementation of COVID-19 restrictions. Dengue cases and deaths were strongly correlated in all years (2021: $r = 0.756$, $p < 0.01$; 2022: $r = 0.808$, $p < 0.01$; 2023: $r = 0.878$, $p < 0.01$; 2024: $r = 0.718$, $p < 0.01$). Rainfall was not significantly associated with dengue cases overall ($p = 0.236$), but in 2024 showed a significant positive trend with both cases ($p = 0.019$) and deaths ($p = 0.012$). Temperature showed no significant association with cases or deaths in any year (all $p > 0.05$). In conclusion, dengue transmission in Sri Lanka shows strong spatial variation, with urban districts most affected. Although rainfall had a significant impact in 2024, overall climate factors showed limited predictive value for 2020–2024. Integrating epidemiological and climate surveillance is advised to enhance climate-sensitive dengue preparedness.

Keywords: climate change, dengue fever, Sri Lanka, public health, vector-borne diseases.

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ASSESING DEGRADATION OF POLYCYCLIC AROMATIC HYDROCARBONS IN FRONT OF TIN (Sn) STRESS BY A SOIL BACTERIAL CONSORTIUM

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Polycyclic Aromatic Hydrocarbons (PAHs) are persistent in the environment and are toxic pollutants which have carcinogenic and mutagenic properties. They are composed of two or more fused benzene rings. Bacteria present in soil are capable of degrading these compounds via anaerobic and aerobic respiration. However, heavy metals such as tin have the ability to hinder the degradation capabilities of bacteria. The goal of this study is to isolate and identify soil bacteria capable of degrading Naphthalene and Phenanthrene in the presence of heavy metals. Soil samples were collected from 4 different locations in Sri Lanka: Colombo, Galle and Jaffna, as they are highly polluted areas according to previous literature and Meemure, as it had the lowest PAH pollution according to studies and were serially diluted and plated. Morphologically different strains were identified and starved on Bushnell-Haas Agar. Primary screening was performed using Naphthalene and phenanthrene spiked plates. Five bacterial strains: RUSHJ08, RUSHC09, RUSHMO6, RUSHG02, and RUSHG04, were able to degrade these PAHs were identified and were a subjected to second screening using methyl blue. UV-Spectrophotometric analysis revealed that these bacteria can degrade over 40% of the PAHs under optimum conditions. RJO8 (Accession number PV942241) and RJO2 (Accession number PV942264) were identified as best PAH degraders. Gram staining was performed to identify Gram-negative and Gram-positive bacteria, and antagonistic assay was performed to identify the capability of the strains to exist as a consortium. Atomic Absorption Spectroscopy was performed to evaluate the presence of heavy metals in the Colombo soil sample, and the concentration of tin was 2.22mg/kg. The results of this experiment support the development of a bioremediation technique in tin-stressed environments, which provides a solution to environmental pollution.

Keywords: Phenanthrene, Naphthalene, heavy metals, spectrophotometric, bioremediation.

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HABITAT PREFERENCE OF THE SRI LANKAN SLOTH BEAR (*Melursus ursinus inornatus*) IN RAINY SEASON USING OCCUPANCY MODELING IN WILPATTU NATIONAL PARK, SRI LANKA

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The study focused on the endangered Sri Lankan sloth bear (*Melursus ursinus inornatus*), assessing its habitat preferences through occupancy modeling to improve target conservation efforts in protected areas. The study was conducted in Wilpattu National Park from September 2024 to April 2025 during the wet season. Twelve passive infrared camera traps were installed using a systematic-random sampling method and relocated every 1.5 months. Data on sloth bear presence/absence and habitat variables, including vegetation, physical, and food abundance covariates, were collected. Occupancy was analyzed using a likelihood-based method, with detection histories recorded as binary values ('1' for presence, '0' for absence), assuming camera trap station independence and no animal movement between stations. Logistic regression identified significant covariates, and highly collinear ones ($r > 2$) were excluded to avoid overfitting. Data analysis was performed using the PRESENCE software, where detection histories were combined into single-species models. Multiple models incorporating various covariates were developed to assess their impact on occupancy. Model selection was based on delta AIC (dAIC), with model-averaged parameters used to estimate occupancy and detection probabilities. Occupancy probabilities for different habitat types were calculated and visualized using R Studio 4.5.0. The occupancy probability of sloth bears was highest in dry mixed evergreen forests (0.93) and tropical thorn forests (0.68), with grasslands showing the lowest probability (0.30). The best-fitting model for occupancy had an AIC weight of 0.11, with a model-averaged occupancy probability of 0.79, compared to a naïve estimate of 0.49. Main factors influencing sloth bear occupancy include stem density>10cm, litter depth, termite mound density, and fruiting tree density, all of which positively impact occupancy. The negative impact of distance to water bodies highlights the importance of key habitat features for conservation. Focusing on areas with essential resources, such as water and food, can improve habitat management and ensure the long-term survival of sloth bears.

Keywords: camera trapping, occupancy modeling, habitat preference, large carnivore, Wilpattu National Park

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COMPARATIVE ACTIVITY PATTERN ANALYSIS OF ENDEMIC CHEVROTAINS IN SRI LANKA

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Chevrotains are the most primitive ruminants, with few species surviving globally. Sri Lanka has two endemic species: *Moschiola meminna* in the dry zone and *Moschiola kathygre* in the wet zone. Data on their activity patterns are lacking due to their elusive nature. To address this knowledge gap, we conducted a comparative analysis of their activity patterns using camera trap surveys in Wilpattu National Park (WNP) for *M. meminna* and Sinharaja Forest Reserve (SFR) for *M. kathygre*. We placed camera traps covering >30% of each habitat type present in both study areas using a systematic random survey method. Camera trap timestamps were used to analyze the activity patterns. Time data were converted to radian time for cyclical time representation before analysis. Using the R package *'activity'*, species-specific activity levels and the proportion of the diel cycle during which each species was active were quantified. Activity level estimates were generated through 1,000 bootstrap iterations, with non-parametric von Mises kernel density estimators used to model the probability density functions of activity peaks. The analysis showed that the overall activity level of *M. meminna* in WNP was 0.50 (SE: 0.08). The activity pattern was recorded across multiple time intervals, with distinct peaks at 0400, 1100, and 1800 hrs. This suggests a cathemeral strategy, possibly to avoid midday heat while balancing foraging and predator avoidance. The lowest activity was recorded at 1500 hrs. The activity level of *M. kathygre* in Sinharaja was estimated at 0.39 (SE: 0.04). The activity pattern revealed distinct peaks of presence at 0400 and 2000 hrs, showing a nocturnal activity pattern. This behaviour is typical of forest ungulates that evade daytime predators and human activities. Their nocturnal habits may suggest competition with other herbivores or heightened sensitivity to disturbances in fragmented habitats. The higher overall activity level of *M. meminna* compared to *M. kathygre* suggests greater diurnal activity in open habitats (WNP) versus dense forests (SFR). These findings emphasize the importance of species-specific conservation strategies to protect Sri Lanka's endemic chevrotains. For *M. kathygre,* reducing human disturbance during nocturnal hours is crucial to maintain natural activity rhythms. For *M. meminna* in the dry zone, conservation should prioritize preserving thorn and dry mixed evergreen forests, along with habitat features such as litter cover that provide refuge and foraging resources.

Keywords: Chevrotains, activity, Sinharaja Forest Reserve, Wilpattu National Park, camera trap

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THE EFFECT OF SUGAR AND GINGER EXTRACTS AS FLORAL PRESERVATIVES TO INCREASE THE VASE LIFE OF CHRYSANTHEMUMS

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Cut flowers play an important role in the commercial floriculture industry and bring export earnings that highly contribute to the economy of the country. Their vase life and longevity depend on the flower variety and are influenced by pre-harvest, harvest, and post-harvest conditions. Among cut flowers, Chrysanthemums have a high commercial value and are widely cultivated across several regions, particularly to meet domestic and international demand. With the recent advancements in post-harvest senescence research, various techniques are used to extend the vase life of cut flowers. However, with the growing interest in natural alternatives rather than synthetic chemicals, this study investigated the use of sugar and ginger extract as natural preservatives to improve the postharvest quality and the vase life of Chrysanthemums cut flowers. Fifty flowers were harvested in the morning to ensure freshness, stems were cut under water to prevent gas embolisms and transported to the laboratory wrapped in moist newspaper. Ten treatments were used: distilled water (control), sugar solutions at 1,000 ppm, 10,000 ppm, and 100,000 ppm; ginger extract solutions at the same three concentrations; and sugar–ginger mix solutions at 1,000 ppm, 10,000 ppm, and 100,000 ppm. The observations of the experiment were carried out over 25 days. All treatments showed an initial increase in fresh weight during the first two days and a gradual decline with the time. Among them, the 10,000 ppm sugar–ginger mix solution yielded the best results, with a maximum relative fresh weight of 78.5% and an extended vase life of 25 days. In comparison, the control had a 66.3% relative weight and a vase life of 17 days. The 10,000 ppm ginger-only treatment also performed well, extending vase life to 19 days. Overall 10,000 ppm sugar–ginger combination is the most effective natural preservative tested, enhancing both the appearance and longevity of Chrysanthemums cut flowers. The sugar provides a respiratory substrate, while the ginger solution acts as the antimicrobial agent to control harmful bacteria and prevent plugging of the xylem and phloem. This investigation indicates that natural, eco-friendly preservatives may also serve as effective agents for extending the vase life and the longevity of Chrysanthemums.

Keywords: Chrysanthemums, cut flower, sugar solution, ginger solution, sugar ginger mix solution, distilled water, fresh weight

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BIODEGRADATION OF RHODAMINE: B TEXTILE DYE USING CYANOBACTERIA UNDER OLIGOTROPHIC CONDITIONS

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The persistence and resistance of Rhodamine-B and other analogous synthetic dyes in aquatic ecosystems are a cause of serious environmental and public health concern. Their persistence against degradation by conventional wastewater treatment methods urges the pursuit of new, environmentally friendly alternatives. The present study investigated the potential of a filamentous cyanobacterial strain, CB4, isolated from a freshwater body in Sri Lanka, to degrade Rhodamine-B under oligotrophic (nutrient-deprived) conditions. A 10 ppm of Rhodamine-B solution was inoculated with 6 mL of CB4 culture in the exponential phase and incubated at room temperature under light illumination of 2000–3000 lux for 28 days. The medium was not supplemented with any nutrients, simulating indigenous effluent conditions. Decolourization was quantified spectrophotometrically at 563 nm, while growth was measured at 680 nm. Although the dye received a lower decolourization efficiency (6.16%), CB4 exhibited a good adaptability to the dye medium with 89.81% growth efficiency and 10 mg/day biomass accumulation. High-Performance Liquid Chromatography (HPLC) analysis revealed a 10.26% reduction of peak area compared to the control, implicating partial degradation of Rhodamine-B. The phytotoxicity assay using green gram (*Vigna radiata)* seedlings revealed enhanced mean shoot and root lengths in the CB4-treated sample (9.65 cm and 9.92 cm, respectively), compared to the untreated control. These findings demonstrate that CB4 can tolerate and bring about partial biodegradation of Rhodamine-B under oligotrophic conditions. Despite incomplete decolourization, the reduction of phytotoxicity and detectable dye degradation highlighted CB4 as a promising candidate for low-cost, sustainable bioremediation of dye-contaminated textile wastewater.

Keywords: biodegradation, cyanobacteria, HPLC, oligotrophic, phytotoxicity, Rhodamine-B dye

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UNDERSTANDING STUDENTS' USAGE OF LIBRARY FACILITIES AND ACCESS TO DIGITAL RESOURCES AT THE OPEN UNIVERSITY OF SRI LANKA

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MICROPLASTIC CONTAMINATION IN SELECTED SHRIMP FARMS AND ADJACENT WATER BODIES IN PUTTALAM DISTRICT, SRI LANKA

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Microplastics (MPs) have emerged as a widespread environmental pollutant, posing significant threats to aquatic ecosystems and human health. This study investigated the prevalence, distribution, and characteristics of MPs in shrimp farms, and adjacent lagoons (Puttalam, Mundel, and Chilaw) in Puttalam District, focusing on water, sediment, and shrimp tissues of *Litopenaeus vannamei*. Samples were collected from six shrimp farms and their associated lagoons, with MPs isolated and analyzed using density separation, alkaline digestion, wet peroxide digestion, stereomicroscopy, and Fourier-transform infrared spectroscopy (FTIR). Results revealed significant spatial heterogeneity in MP concentrations. Chilaw Lagoon exhibited the highest MP levels in water (3294.7 ± 153.6 MPs/m³) and sediment (962.3 ± 58.9 MPs/kg), attributed to anthropogenic activities such as urbanization, fishing, and tourism, while Mundel Lagoon showed the lowest contamination (1637.3 ± 159.2 MPs/m³ in water; 521.0 ± 38.2 MPs/kg in sediment), likely due to lower human impact and efficient hydrodynamic dispersion. Shrimp farms mirrored these trends, with ponds exhibiting higher MP concentrations than water inlets, suggesting accumulation due to restricted water exchange and inputs from feed and plastic equipment. MPs predominantly were fragments (35–36%) and fibers (29–31%), with darker colors (e.g., blue, red, black) being more abundant. Smaller MPs (0.10–0.50 mm) dominated across all samples, particularly in shrimp tissues, where the gut showed the highest contamination (10.32 ± 1.80 MPs/g), followed by gills and muscles (0.67 ± 0.10 MPs/g). A strong positive correlation ($R^2 = 0.9025$) between shrimp muscle weight and MP abundance, indicated bioaccumulation over time. FTIR analysis identified common polymers, including polyethylene, polyvinyl chloride, and polyethylene terephthalate, originating from packaging, fishing gear, and industrial waste. Mainly MP pollutions have come to shrimp farms from water sources and plastic materials which are used for aquaculture practices. Microplastics can be minimized using ground water or purified water before aquaculture practices and substitute materials can be used instead of plastics. The study highlights the warning signs for the shrimp industry of Sri Lanka as farms showed considerable MP levels, with implications for food safety and export quality. The findings underscore the need for improved waste management, regulatory measures, and sustainable practices to mitigate MP pollution in aquaculture. Future research should prioritize long-term monitoring and the development of biodegradable alternatives to reduce environmental and health risks.

Keywords: microplastics, bioaccumulation, polymer analysis, food safety

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INFLUENCE OF DISTURBANCE REGIMES ON FIG-WASP RELATIONSHIPS AND SYCONIAL CHARACTERISTICS OF *Ficus tinctoria* (MORACEAE) IN SOME SELECTED SITES OF KANDY AND MATALE DISTRICTS

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The fig–fig wasp interaction is an obligate mutualistic relationship. *Ficus tinctoria* (Moraceae) is a hemi-epiphytic dioecious fig tree species. The present study investigated the influence of vegetation disturbance regimes on the fig–fig wasp relationship and syconial characteristics of *F. tinctoria* across two study sites and was conducted from October 2024 to February 2025. Study sites were selected based on the difference of disturbance level in their vegetation after calculating the percentage vegetation cover. The study sites were the less disturbed Nattarampotha area which belongs to the Kandy District (Site 1) and the more disturbed urban core within Matale city (Site 2). Mature syconia were collected, their diameter measured, cut into two halves and reared until the complete wasp emergence. The number of galls and florets per syconia, pollinator fig wasps (PFWs) and non-pollinator fig wasps (NPFWs) were counted and recorded according to their sex. Percentage contribution of galls in the syconium for fig wasp production was higher in Site 1 (89.00%) than Site 2 (79.85%). Mean values of syconial diameter (DS), volume (VS) and number of florets per syconium (Fl/S) were comparatively higher at Site 2 (DS = 9.46 ± 0.40 mm; VS = 473.23 ± 63.67 mm^3; Fl/S = 134.60 ± 21.6). The sex ratio of PFWs in Site 1 was 0.06 and in Site 2 was 0.30, indicating that Site 1 is more female-biased. The pollinator ratio of Site 1 (0.40) was significantly higher ($p=2.14 \times 10^{-8}$) than Site 2 (0.10). At site 1, there was a strong positive correlation between total non-pollinator fig wasps and pollinator male fig wasps (PMFWs) (r = 0.785) and between non-pollinator male fig wasps and PMFWs (r = 0.824), whereas there was no strong correlation found at Site 2. Overall, Site 1 showed higher pollinator ratio, proportion of female wasps and wasp abundance within the syconia, indicating a stable mutualistic relationship. This study reveals the significant effects of disturbance on the relationship between *F. tinctoria* and its associated fig wasp species. The findings support the conclusion that increased disturbance negatively impacts syconial characteristics and fig–fig wasp relationships.

Keywords: galls, pollinators, non-pollinators, florets

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PRELIMINARY GENETIC CHARACTERIZATION OF SELECTED MANGROVE SPECIES IN SRI LANKA

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Mangroves are woody plants that thrive at the interface of land and sea, inhabiting harsh environmental conditions such as high temperature, strong wind, high salinity, extreme tide, and anaerobic muddy conditions. They show specialized adaptations, morphologically as well as physiologically for survival in this environment. Mangroves do not form a single phylogenetic group; instead, they have evolved independently and exhibit convergent evolution rather than shared descent. Currently, there are 21 species of mangroves remaining genetically unclassified. Therefore, this study attempted to classify selected Sri Lankan mangrove species using *rbcL* and *matK* gene markers. Specimens from six species (*Rhizophora mucronata*, *Lumnitzera racemosa*, *Rhizophora apiculata*, *Avicennia officinalis*, *Lumnitzera littorea* and *Avicennia marina*) were collected from the West coast of the country covering wet, dry, and intermediate climatic zones. Dried specimens were submitted to the National Herbarium for further morphological identification while DNA was extracted from each leaf sample using modified CTAB method and Biospin genomic extraction kit. Although over 15 extractions were performed, most yielded low DNA concentrations and poor purity. However, Biospin kit extraction produced significantly better results with clear three genomic bands visualized of each six species through the Biospin method. PCR amplification using *rbcL* and *matK* primers confirmed higher efficiency with DNA extracted using the Biospin method. In this study, one species, *Avicennia officinalis* produced clear genomic bands with both extraction methods and both *rbcL* and *matK* amplification. However, other five species did not yield reliable bands with both methods. The secondary metabolites and high salt concentration of these species would have affected efficient DNA extraction. Sodium ions may bind to DNA complicating DNA extraction from mangrove plants. Interestingly, *Avicennia officinalis* which grows only in low-salinity environments showed better DNA yield, possibly due to reduced salt interference. This study pioneered research of its kind on mangroves in Sri Lanka and will be baseline research for optimizing DNA extraction protocols for mangroves and explore a variety of primers in future studies on genetic diversity of mangroves in Sri Lanka.

Keywords: genetic diversity, mangroves, molecular markers, Sri Lanka

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PREVALENCE OF MACROLIDE RESISTANCE AMONG METHICILLIN-RESISTANT *Staphylococcus aureus* : A META-ANALYTIC ASSESSMENT

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Methicillin-resistant *Staphylococcus aureus* (MRSA) is a globally significant pathogen characterized by high virulence and exceptional adaptability. It shows resistance to multiple antibiotics, particularly β-lactams due to the *mecA* gene. This meta-analysis examined the widespread transmission of MRSA, which evades host defenses and thrives in various environments, focusing on the prevalence of macrolide resistance. Macrolides, such as azithromycin, clarithromycin, and erythromycin, are antibiotics that inhibit bacterial growth by disrupting protein synthesis. Drawing from 101 studies identified through a comprehensive search including PubMed, the analysis adhered to PRISMA guidelines and included only cross-sectional studies reporting baseline resistance data in MRSA strains. Using a random-effects model, the pooled prevalence of macrolide resistance was calculated at 88.51% (95% CI: 84.76–91.43), revealing a high burden of resistance with significant heterogeneity ($I^2 = 98.23\%$, $\tau^2 = 2.9087$, $Q = 6483.68$, $p < 0.0001$). Subgroup analyses showed 90.22% resistance for erythromycin, 79.96% for azithromycin, and 61.47% for clarithromycin. Each showed varying heterogeneity, reflecting study variability from geographic, methodological, and temporal differences. Evidence of publication bias was detected through Begg's rank correlation and Egger's regression tests, with statistically significant results ($p<0.0001$), suggesting potential overrepresentation of studies with positive findings. These findings underscore the clinical challenge posed by macrolide-resistant MRSA, limiting the efficacy of a widely used class of antibiotics. This emphasises the need for regional surveillance, antimicrobial stewardship, and tailored therapeutic strategies guided by local susceptibility profiles. The extreme heterogeneity underscores the need for customized interventions and ongoing research into resistance mechanisms and epidemiology. This study offers vital insights into the extent and diversity of macrolide resistance in MRSA, supporting public health efforts to combat antibiotic resistance in community and healthcare settings.

Keywords: heterogeneity, macrolide resistance, Methicillin-resistant *Staphylococcus aureus* (MRSA), pooled prevalence, PRISMA

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HYDROGEN PEROXIDE-MEDIATED MODULATION OF GERMINATION RATE AND SEEDLING VIGOR IN *Psophocarpus tetragonolobus* (L.) DC.

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Winged bean (*Psophocarpus tetragonolobus* (L.) DC.), a tropical legume rich in protein, micronutrients, and antioxidants, holds significant potential for food security and sustainable agriculture due to its nutritional value and nitrogen-fixing ability. However, its cultivation is limited by low germination rates primarily caused by hard seed coats and dormancy. This study investigated the effect of Hydrogen peroxide (H_2O_2) as a pretreatment agent for modulating germination rate and enhancing seedling vigour in *P. tetragonolobus* (variety – SLS 44). Seeds were subjected to six concentrations of H_2O_2 (0.5%, 1%, 2%, 3%, 5%, and 7%), using a completely randomized design with a negative control treatment. Parameters assessed included mean germination percentage, mean lateral root count, mean root, and shoot lengths, measured at five and 10-days post-treatment, along with the cumulative growth rate. The results revealed that the 3% H_2O_2 treatment was the most effective, yielding the best outcomes for both seed germination and seedling development. After 10 days, seeds treated with 3% H_2O_2 exhibited the highest germination percentage (71.11%) and significantly enhanced root and shoot lengths (39.66±0.92 mm and 28.49±1.37 mm, respectively). Mean lateral root count (5 roots) and cumulative growth rate (7.13 mm/day) were also highest at this concentration. Statistical analysis via ANOVA confirmed significant effects of treatment day on all variables ($p < 0.05$), and of H_2O_2 concentration on mean germination percentage and mean root length. These findings suggest that hydrogen peroxide acts not only as a dormancy-breaking agent but also as a metabolic enhancer, likely modulating hormonal balances by increasing gibberellin and reducing abscisic acid levels. In conclusion, Hydrogen peroxide (H_2O_2) pretreatment at 3% concentration is a cost-effective way to break seed dormancy, boost germination, and enhance early growth in winged bean. Further studies are needed to confirm its reliability across various commercial H_2O_2 formulations, experimental designs, and varying agro-climatic conditions.

Keywords: cumulative growth rate, dormancy, germination rates, hard seed coat, Hydrogen peroxide, *Psophocarpus tetragonolobus* (L.) DC.

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EDUCATION

PERSPECTIVES OF BILINGUAL EDUCATORS ON CLIL CURRICULAR MATERIALS IN SRI LANKA: NECESSITY OF TEXT ADAPTATION

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This study examines the perceptions of bilingual educators regarding the use of Content and Language Integrated Learning (CLIL) curricular materials and the necessity of text adaptation in the bilingual education context in Sri Lanka. It is essential to understand how teachers engage with CLIL materials and whether current curricular materials meet the linguistic and cognitive needs of learners. With the expansion of bilingual education programs in Sri Lanka, there is a gap between learners' expectations and the quality of curricular material. Therefore, curricular materials should be modified to meet learners' expectations. One of the primary strategies for achieving this is through text adaptation. The research employed a survey design, utilizing a mixed-methods approach that incorporated both quantitative and qualitative methodologies. The population comprised all bilingual teachers and teacher educators. A sample of 250 bilingual teachers and five bilingual-related teacher educators were selected using stratified sampling and purposive sampling. Data collection instruments included questionnaires and a semi-structured interview schedule. Quantitative data were analyzed using pie charts and graphs, while qualitative data were examined through thematic analysis. The findings reveal that many teachers recognize the potential of quality CLIL materials to enhance both content and language learning. There are significant concerns about the linguistic complexity and cultural relevance of existing textbooks. The majority of participants indicated that adapting curricular materials is essential in the contemporary context. At the same time, bilingual teachers suggested the need for formal training or institutional support for text adaptation. If curricular material adaptation is not feasible at present, teachers can address this gap pedagogically. Even though teachers mentioned that applying text adaptation is currently challenging because it is a time-consuming process. These findings help curriculum planners, teacher educators, and policymakers aiming to improve bilingual education in Sri Lanka.

Keywords: text adaptation, CLIL, curricular material, bilingual education, teacher training

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THE ENDURING LEGACY OF MEDIEVAL EDUCATIONAL THOUGHT: THE INFLUENCE OF BOETHIUS, CASSIODORUS, ISIDORE, AND ALCUIN ON MODERN EDUCATIONAL SYSTEMS

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This study explores the enduring legacy of medieval educational thought by analyzing the contributions of four key figures: Boethius, Cassiodorus, Isidore of Seville, and Alcuin of York. Their works shaped medieval education and continue to influence present educational thought. Accordingly, this study is based on three objectives: (1) to analyze their educational philosophies, (2) to examine their role in preserving classical knowledge, integrating sacred and secular learning, and fostering literacy, critical thinking, and ethics, and (3) to evaluate the continuing relevance of their ideas to modern frameworks, including liberal arts curricula, interdisciplinary approaches, and digital systems. Using a qualitative historical-analytical method and thematic text analysis, this paper highlights how medieval strategies for preservation, integration, and moral education offer insights that help deal with twenty-first-century challenges. The findings suggest that these intellectuals not only preserved Europe's educational heritage but also laid foundations that resonate with modern values of accessibility, equity, and holistic learning. Their legacy underscores the timeless role of education in shaping societies, fostering growth, and sustaining cultural memory.

Keywords: education, Boethius, Cassiodorus, Isidore, Alcuin

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EXPLORING TEACHERS' PERCEPTIONS OF AUTHENTIC LEARNING IN GRADE SIX AGRICULTURE TECHNOLOGY MODULES IN SRI LANKA

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This research probes teachers' perceptions on the application of authentic learning in the Grade Six Agriculture Technology topic in the Western Province of Sri Lanka. The research problem that was addressed was the discrepancy between intended objectives of integrating agriculture technology into junior secondary education namely, enhancing practical skills, problem-solving, and real-life application and current teaching practices used in the classroom. Though genuine learning is acknowledged in general terms as an effective approach for vocational and technology subjects, the key to its successful implementation rests primarily on classroom practices and instructors' attitudes. The research objectives are to examine teachers' conception and implementation of authentic learning in agricultural technology courses, analyze the challenges teachers face, and explore the implications of authentic learning. A qualitative research approach was employed, making use of an interpretive research design for obtaining rich understanding of teachers' lived experiences. Systematic sampling method was used to select 140 agriculture teachers from IC, IAB, Type 1, and Type 2 schools, which offered different socio-educational contexts. Data were collected using focus group discussions, semi-structured interviews, and classroom observations. Thematic analysis was used in order to establish dominant patterns and draw conclusions. Three general themes were identified through the analysis: genuine teaching-learning processes, genuine learning settings, and genuine assessment strategies. The teachers emphasized bridging theory with practice agricultural activities such as gardening, composting, and crop experimentation. While 72% of the participants indicated positive attitudes towards authentic learning, underlining its capacity to engage students and develop practical and critical thinking skills, approximately 65% identified major barriers to implementation, including lack of resources, lack of professional development, rigid curriculum structures, and time constraints. The study argues that although teachers value the instructional potential of authentic learning, there are problems to be addressed in order for it to be successfully integrated into agriculture education. Policy and institutional strategies such as teacher capacity building, better infrastructure, and curriculum alignment are needed to expand authentic learning. The findings highlight the need to align classroom practice with Sri Lanka's 21st-century education vision.

Keywords: authentic learning, agriculture, technology education, teacher perceptions, grade six, general education

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IMPACT OF DIFFERENT SUBTITLED MODES ON VOCABULARY ACQUISITION IN L2 ENGLISH LEARNERS: AN EXPERIMENTAL STUDY

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Vocabulary acquisition is a key component of second language learning, and it directly affects learners' overall language competence. Many prior studies have revealed that technology-based language learning tools can be used in second language classroom to enhance the vocabulary knowledge of learners. The main objective of this experimental study was to examine the effect of bimodal and standard subtitles compared to a no subtitle mode, on L2 learners of English in developing their incidental vocabulary knowledge within a classroom context. The sample included 81 adult intermediate learners of English from a Sri Lankan university, selected based on their proficiency. The participants were divided into four groups randomly; three experimental groups and one control group. The first experimental group (A) watched the video with bimodal subtitles once, the second group (B) watched the video with standard subtitles once and the third group (C) watched the same video without subtitles. All groups watched the same video during the experimental session. Pre-tests and post-tests were conducted to assess participants' receptive and productive vocabulary knowledge of the five target words that occurred in the videos. The control group took only the pre-test and post-tests, without viewing the video. The results revealed that the participants in group A, who watched the video with bimodal subtitles, developed their receptive knowledge of the target vocabulary during the experiment, as indicated by the pretest to posttest results. The group B, which watched the video with standard subtitles and group C which watched the video without any subtitles demonstrated no significant gains in receptive and productive vocabulary knowledge, in contrast to the pre-test to post-test results. The control group did not show any significant difference between pre and posttest results. The findings indicate that video watching with bimodal subtitles can increase L2 learners' receptive vocabulary knowledge, and any other subtitled mode does not support enhancing the receptive and productive vocabulary knowledge of L2 learners. The study has several implications for effective use of technology in ESL classroom to facilitate vocabulary development.

Keywords: bimodal subtitles, L2 acquisition, subtitled videos, standard subtitles vocabulary learning

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THE EFFECT OF TEACHER COMPETENCE, AUTONOMY SUPPORT AND RELATEDNESS ON GRADE EIGHT STUDENTS' INNATE NEEDS IN SCIENCE LEARNING

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Science strengthens basic scientific concepts that are applied across all spheres of life and industry globally. Thus, improving students' understanding in science is crucial for establishing a solid foundation across all areas of development. Moreover, teaching science should inspire children's curiosity by shifting the emphasis from merely memorizing facts to fostering creativity and innovation through practical applications. Self-Determination Theory assumes that students have an inherent tendency to be curious about their environment and are naturally motivated to learn and expand their knowledge. Evidence suggests that when teachers support of students' basic psychological needs such as autonomy, competence and relatedness, it enhances their self-regulation, academic performance, and well-being. According to Self-Determination Theory, fulfilling these needs is essential for the internalization of academic motivation. Hence, this study conducted to assess the effect of teacher competence, autonomy support and relatedness (CAR) on their Grade eight students' competence, autonomy and relatedness in science. Quantitative approach was used in this study. Convenience sampling technique was used. Eighty science teachers and 2,475 Grade eight students selected from schools in Sabaragamuwa and Western Provinces in Sri Lanka were used in the study. Likert type multidimensional questionnaires were administrated teachers and students separately. Results revealed that there were very strong positive relationships between teacher competence, autonomy support and relatedness with their students' three innate needs autonomy, competence and relatedness [R^2 =.635 (2474), p <.0001, R^2 =.764 (2474), p <.001, R^2 =.745 (2474), p <.001], respectively. Thus, teachers who demonstrate competence, provide autonomy support, and foster relatedness are effective in promoting these same qualities in students, thereby enriching meaningful learning in science to meet 21st century education goals.

Keywords: autonomy support, competence, relatedness, Science, Self-determination theory

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PERCEPTIONS OF LECTURERS ON INCORPORATING TECHNOLOGY INTO EDUCATIONAL PRACTICES AT THE AMERICAN COLLEGE OF HIGHER EDUCATION, KANDY

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This survey was carried out to investigate the views and opinions on incorporating technology for effective education. Technology is merely a tool, but the teacher plays the most crucial role in inspiring students to foster collaboration and work effectively. Therefore, the main research questions of the study focused on the use of technology in traditional classrooms and the integration of technology in lectures: 1. What are the perceptions of lecturers regarding the use of technology in traditional classrooms? 2. How do lecturers at the American College of Higher Education, Kandy, enhance their knowledge through the use of digital technologies and digital literacy? 3. How has technology influenced the lecture room practices and curriculum development at the ACHE, Kandy? The target group for this survey consisted of 35 randomly selected full-time and part-time lecturers teaching various subjects at the ACHE, Sri Lanka, Kandy, branch. Due to the design of the survey and the nature of the data collected, a mixed data collection approach was adopted. A structured questionnaire was administered primarily to obtain data, with individual interviews and the study of prior work also providing data for the survey. In this survey, attention was paid to the following tools used in lecture rooms: Projectors, smartboards, presentation slides, online assessments or quizzes, educational videos or YouTube, video conferencing tools, AI tools, and content creation tools like Canva and Padlet; learning management systems, for example, the CloudSmartsSchool System, the learning management system used by the college for Diploma Programs, Higher National Diploma Programs, Foundation Programs, and Lincoln University College Malaysia Degree Programs; and the "Blackboard" platform, i.e., the learning management system provided by Keiser University USA for Keiser University associate degree programs, which represents a new experience for ACHE colleges. The survey concluded that lecturers prefer to use technology to deliver lectures. However, the survey revealed that the difficulties encountered when using technology tools can be addressed through workshops or similar training programs. The use of learning management systems such as CloudSmartsSchool systems, Blackboard, and other learning management systems can further facilitate the use of existing technology tools and methods for effective education.

Keywords: Blackboard, CloudSmartsSchool system, digital technology, digital literacy

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FROM EXPLANATION TO EXPRESSION: THE ROLE OF SKILL ACQUISITION THEORY IN EXPLICIT AND CONTEXTUAL GRAMMAR INSTRUCTION IN THE ENGLISH AS A SECOND LANGUAGE CONTEXT

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Grammar plays a vital role in English as a Second Language (ESL) education, serving as the foundation for learners to produce accurate and meaningful language. However, Sri Lankan ESL learners, particularly at the secondary level, often struggle to move beyond rule-based understanding towards fluent and spontaneous use of grammatical forms. Traditional explicit grammar instruction, while effective in building declarative knowledge, frequently fails to help learners proceduralize their knowledge in spoken and written communication. Conversely, contextual grammar instruction immerses learners in authentic tasks but may lack the clarity and structure needed for initial comprehension. Therefore, this study investigates the effectiveness of integrating explicit and contextual grammar instruction to enhance grammatical proficiency, drawing on Skill Acquisition Theory (SAT), which outlines three stages in learning: declarative (explicit rule learning), procedural (practice-based application), and automatic (fluent use), using past simple vs. present perfect tenses as the instructional focus. The study adopted a quasi-experimental mixed-methods approach with forty Grade 10 students from a Sri Lankan government school, divided into experimental and control groups. Both groups received explicit instruction on the rules of the target tenses, while the control group practised through repeated drills and the experimental group engaged in contextual grammar tasks. Data were collected through three pre-tests and post-tests, and the test scores were analyzed through descriptive statistics and a paired sample t-test using SPSS. Learners' perceptions were assessed using their reflective journals maintained throughout the treatment period, and relevant entries were thematically analyzed. Results indicated that the experimental group demonstrated greater fluency and accuracy in grammar, and the learners' reflections reported enhanced confidence and engagement in using the target language across academic and real-life discourse. The outcomes suggest that a balanced integration of explicit and contextual grammar instruction effectively supports the proceduralization of grammar use, aligning with SAT principles.

Keywords: English as a Second Language (ESL), explicit grammar instruction, contextual grammar instruction, Skill Acquisition Theory (SAT), balanced integration

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EXPLORING STUDENT ENGAGEMENT AND MOTIVATIONAL ORIENTATIONS IN THE G.C.E. (O/L) ENGLISH LITERATURE CURRICULUM IN GOVERNMENT SCHOOLS

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This study explores student perceptions of the prescribed literary texts in the G.C.E. (O/L) English Literature curriculum in Sri Lankan government schools, emphasizing their interests, preferences, and motivational orientations. A mixed-method study methodology was used to gain an in-depth understanding, including both quantitative and qualitative data collection and analysis. A stratified random sampling method was used to guarantee representation from various school types and student demographics, resulting in a quantitative sample of 120 students from Grades 10 and 11 across six government schools in the Central Province. Data were gathered using a standardized questionnaire to assess students' overall perceptions of the curriculum content. The results indicated an array of responses: some students appreciated the texts for their educational value, but many deemed them outdated, linguistically complex, or culturally irrelevant. To elucidate these tendencies and gain more insights, the research used a purposive sampling method in the qualitative phase, choosing 18 students and six English literature teachers for comprehensive semi-structured interviews and focus group discussions. The qualitative results indicated an apparent preference among students for modern, relevant texts and underscored the influence of cultural relevance, personal interest, and accessibility on student motivation. Educators highlighted similar concerns, highlighting limitations imposed by a rigid curriculum and the need for greater flexibility in selecting texts. The amalgamation of both data sets provided a comprehensive perspective on the challenges and opportunities in teaching literature within the existing curriculum. The research indicates that academic programs should use a more student-centered and culturally relevant methodology, connecting texts with students' life experiences and linguistic abilities. The results possess practical implications for syllabus reform, curriculum development, and classroom practices, with the objective of enhancing student engagement and learning outcomes in English literature across Sri Lanka's educational system.

Keywords: cultural relevance, English literature, mixed methods, student motivation, text selection

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INVESTIGATING THE PEDAGOGICAL COMPETENCIES AMONG INTERNATIONAL SCHOOL GEOGRAPHY TEACHERS

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This study investigates the pedagogical competencies of geography teachers working in international schools, with a specific focus on how these competencies relate to teaching experience and the Post Graduate Diploma in Education (PGDE) qualification. Grounded in Shulman's (1986) Pedagogical Content Knowledge (PCK) framework, the research explores the relationship between Subject Content Knowledge (SCK), pedagogical skills, and instructional adaptability in diverse learning environments. A survey-based research design was employed, and data were gathered by administering a questionnaire. Using a purposive sampling technique, 74 geography teachers were selected who teach years 7 to 13 at 25 international schools that are part of The International Schools of Sri Lanka (TISSL) for the study. The study employed one-way ANOVA to determine whether the pedagogical competencies of geography teachers varied significantly with their years of teaching experience and PGDE qualification. The results revealed that there is no significant difference in the mean of the geography teachers' pedagogical competencies versus their teaching experience levels ($F = 8.94$, $p = 0.450$). Additionally, the results revealed a significant difference in the mean values of geography teachers' pedagogical competencies compared to PGDE Qualification ($F = 94.555$, $P < 0.001$). The findings indicate that years of teaching experience do not significantly influence overall pedagogical competency. While experience tends to strengthen Subject Content Knowledge, it lacks a direct correlation with key pedagogical dimensions such as differentiated instruction, classroom management, and the ability to address diverse learner needs. In contrast, teachers who hold a PGDE demonstrate significantly higher pedagogical competencies. These educators exhibit greater effectiveness in managing multicultural classrooms and adapting instructional strategies to accommodate various learning styles, suggesting that formal pedagogical training enhances the integration of content and pedagogy in meaningful ways. The study highlights the crucial role of formal teacher education programmes, such as the PGDE, in developing pedagogical content knowledge and enhancing instructional quality. It recommends that international schools should place greater emphasis on pedagogical qualifications in their hiring and professional development practices. Additionally, ongoing training and reflective learning opportunities are essential for equipping teachers, regardless of their experience levels.

Keywords: Geography teachers, international schools, pedagogical competencies, PGDE qualification, teaching experience

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THE IMPACT OF ARTIFICIAL INTELLIGENCE TOOLS ON TEACHING AND LEARNING: A CASE STUDY OF A POSTGRADUATE PROGRAMME

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In the new normal, Artificial Intelligence (AI) has proven to be a tool with immense potential to transform the teaching and learning process. As a result, teachers and students use AI in the teaching and learning process in higher education institutes in Sri Lanka, too. The study aims to explore the impact of using Artificial Intelligence for teaching and learning in higher education. The specific objectives of the study were to identify the AI tools used for teaching and learning in the university, examine how AI tools are applied in the classroom, explore the students' and lecturers' views of using AI tools for teaching and learning, and suggest implications for policy and practice in the university. A case study approach was adopted, focusing on postgraduate students who study Information Technology at a state university. A sample of 100 students who follow this programme and 10 lecturers was selected using the purposive sampling method. Data were gathered through questionnaires, document analysis of 20 assignments, and semi-structured interviews with 20 students and 10 lecturers. Moreover, quantitative data were analyzed using descriptive methods, while qualitative data were analyzed using thematic analysis. The findings revealed that postgraduate students frequently used AI-assisted tools, primarily ChatGPT, as well as others such as Microsoft Copilot, Perplexity AI, Xmind AI, Canva, Grammarly, and QuillBot. These tools were employed in the preparation of various class activities, including written assignments, coding tasks, mind maps, PowerPoint presentations, and videos. When analyzing qualitative data, six themes emerged, such as efficiency in language fluency, efficiency in obtaining information and content development, redefinition of academic work and saving time, impact on academic integrity, poor acquisition of learning outcomes and skills, ethical and regulatory challenges. Therefore, while AI tools can significantly enhance teaching and learning efficiency, their improper use may hinder students' intellectual development. As a result, when designing classroom activities and assessments, lecturers should focus on evaluating higher-order thinking skills. It is recommended that the university make both students and lecturers aware of the proper use of AI-assisted tools in teaching and implement clear policies to regulate the use of AI-assisted tools in learning.

Keywords: artificial intelligence, AI-assisted tools, teaching and learning

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ASSESSING THE COMPETENCIES OF SECONDARY SCHOOL TEACHERS ON AI TOOLS FOR TEACHING: A STUDY IN KANDY DISTRICT, SRI LANKA

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The rapid advancement of Artificial Intelligence (AI) offers transformative opportunities for improving teaching and learning practices globally. However, teachers face considerable challenges in accessing and utilizing AI tools effectively in secondary school Kandy District in Sri Lanka. This study aimed to assess the knowledge, attitudes, and experiences of 75 secondary school teachers regarding the integration of AI in teaching. A quantitative descriptive survey design and convenience sampling method were used to collect quantitative data via an online questionnaire, which explored teachers' demographic profiles, awareness of AI, usage frequency, confidence levels, perceived barriers, and support needs. The findings revealed that although 57.3% of respondents were aware of AI tools in education, actual classroom usage was limited; only 10.7% used AI tools often or always, while 40% reported rarely or never using them. Confidence in using AI tools was generally low, with 65.3% indicating minimal or no confidence. Major challenges included a lack of training (60%), insufficient infrastructure (53.3%), limited institutional support (46.7%), heavy workloads (57%), and language barriers (40%). Teachers expressed strong interest in professional development, with 66.7% supporting training workshops, 60% requesting clear policies, 62.7% advocating for improved infrastructure, and over half emphasizing the need for peer mentoring and local-language resources. While 28% of teachers believed AI could enhance teaching and learning, nearly 49.3% remained neutral, indicating uncertainty or lack of exposure. Furthermore, 40% were undecided about participating in AI training programs. These results highlight an urgent need for strategic interventions at the institutional and policy levels to address knowledge gaps, strengthen teacher capacity, and ensure equitable access to AI resources. The study concludes that effective and ethical integration of AI tools into Sri Lankan secondary education requires ongoing teacher support, infrastructure development, and localized training initiatives tailored to the specific needs of schools in regions like Kandy.

Keywords: artificial intelligence, teacher training, secondary education, AI adoption, Sri Lanka

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PERSPECTIVES OF STUDENT TEACHERS ON ACADEMIC SUPPORT IN OPEN AND DISTANCE LEARNING PROGRAMMES

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Academic support services are critical to student success in Open and Distance Learning (ODL), especially in teacher education programmes where learners often handle multiple responsibilities. This study explores how students in the Bachelor of Education (B.Ed.) and Postgraduate Diploma in Education (PGDE) programs at the Open University of Sri Lanka (OUSL) perceive the academic support they receive. This study aimed to assess the effectiveness of current support services and identify areas requiring improvement. Using a survey approach, data were gathered from 474 student teachers representing both Sinhala and Tamil mediums through an online questionnaire. The instrument covered six key academic support areas: academic counselling, day school sessions, assessment feedback, self-learning materials, mentoring during teaching practice, and online learning support. Overall, the results reflect a generally positive student experience. Most participants appreciated the structure and consistency of day schools (85%) and valued the mentoring support during teaching practice (83%). Assessment feedback was seen as constructive by 73% of respondents. However, the findings also pointed to clear gaps. A notable portion of students (20%) felt they did not receive adequate counselling during registration. Additionally, 21% found the self-learning materials insufficient for independent learning, and 27% reported technical difficulties using the OUSL's online learning management system. A significant number of neutral responses (32%) on services like welfare counselling indicated a lack of awareness rather than indifference. The study recommends improving access to academic counselling, especially at the point of registration, ensuring consistent mentor training across programs, and upgrading the online platform to reduce technical issues. These targeted improvements can enhance the effective learning experience and support student retention in ODL settings, specially related to teacher education programmes.

Keywords: open and distance learning, academic support services, student perceptions, teacher education, Open University of Sri Lanka, learner engagement

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EXPLORING GENDER DIFFERENCES IN SUBJECT PREFERENCES AND EDUCATIONAL APPROACHES AMONG STEM UNDERGRADUATES AND GRADUATES OF THE OPEN UNIVERSITY OF SRI LANKA

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This study explores gender-based differences in subject preferences (students' inclination toward theoretical, analytical, or practical components of their academic disciplines) and educational influences (the external factors shaping students' academic choices) among STEM undergraduates and graduates at the Open University of Sri Lanka (OUSL). Grounded in 'Super's Life-Span, Life-Space Theory' and 'Eccles' Expectancy-Value Theory'; the study examines how these theoretical frameworks explain gender-based differences in academic preferences. While prior research has frequently focused on school-aged students, this study targets university students who have already made considerable academic choices, offering more informed perspectives. A well-structured, validated questionnaire was administered to 123 participants using a quantitative cross-sectional survey approach. Gender preferences across theoretical, analytical, and practical components (hands-on, applied tasks within STEM disciplines) as well as influencing factors such as personal interest, parental influence, and societal or institutional expectations were addressed. Reliability and validity were confirmed through pilot testing, with Cronbach's alpha at 0.60 and intraclass correlation at 0.742. Principal component analysis and discriminant analysis confirmed strong construct validity. Statistical analyses included Mann-Whitney U tests and Chi-square tests to examine gender associations. Results showed no statistically significant gender difference in how theoretical, analytical, or practical components were ranked. However, males tended to rate practical components slightly higher, though this was not significant. Most perceptions about gender and learning were consistent with Super's and Eccles' theoretical predictions, indicating limited influence of the respondents' own gender. Of all influencing factors, parental influence was the only one to show a statistically significant gender association ($p = 0.010$), with female participants reporting greater influence. Additionally, more male students (35.9%) than female students (16.7%) perceived that school curriculum and counseling services shaped their subject preferences; a statistically significant difference in perception ($p = 0.022$). Overall, the study suggests that while direct gender-based differences in subject preference were not prominent, differences do exist in how external influences are perceived. These findings underscore the need for tailored academic counseling and gender-sensitive career guidance that account for both familial and institutional factors influencing students' choice.

Keywords: gender differences, STEM education, subject preferences, parental influence, educational approaches, university students, Sri Lanka

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SCHOOL-LEVEL PLANNING: ROLE OF SCHOOL LEADERSHIP IN ENHANCING THE QUALITY OF EDUCATIONAL PLANNING

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In the context of Sri Lanka's shift toward decentralized education, school-level planning has become a cornerstone for improving school effectiveness and educational quality. School leadership plays a pivotal role in ensuring the success of such planning by aligning institutional goals with national educational priorities. School leaders must act not only as institutional managers but also as systemic change agents capable of implementing long-term educational reforms. The Short Course on School Management, introduced by the Department of Educational Leadership and Management at the Open University of Sri Lanka, aims to strengthen school principals' competencies in areas such as strategic planning, supervision, and evaluation. The primary purpose of this study was to examine how school leaders implement school-level planning, identify the challenges they face across various planning stages, and explore the strategies they adopt to overcome these obstacles. Employing a case study design, the research focused on 20 principals from the 5th batch of the short course. Data were collected through online questionnaires, focus group discussions, reflections, and document analysis. Quantitative data were analyzed using descriptive statistics, while qualitative data underwent thematic content analysis. Findings revealed that while all principals engaged in one-year and five-year planning based on national guidelines, their efforts were frequently obstructed by financial constraints, inadequate stakeholder involvement, limited teacher capacity, and insufficient data systems. Despite these challenges, most principals adopted strategic, collaborative, and contextually appropriate approaches to ensure the continuity and effectiveness of planning processes. The study recommends greater investment in professional development, improved data infrastructure, and stronger community engagement to enhance school-level planning outcomes. These findings have implications for both policymakers and educational leaders striving to achieve equitable and context-relevant education across Sri Lanka.

Keywords: school leadership, educational planning, strategic planning, school management

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THE IMPACT OF UNIVERSITY FACILITIES AND THEIR UTILIZATION ON UNDERGRADUATE ACADEMIC PERFORMANCE: EVIDENCE FROM THE FACULTY OF ARTS, UNIVERSITY OF COLOMBO

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ESL UNDERGRADUATES' PERCEPTIONS OF CHALLENGES IN TRANSITIONING FROM GENERAL ENGLISH TO ACADEMIC ENGLISH WITHIN THE FACULTY OF MANAGEMENT, SOCIAL SCIENCES AND HUMANITIES AT A DEFENCE UNIVERSITY IN SRI LANKA

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Students who enter university with limited English language proficiency often continue to face difficulties when transitioning from General English to the demands of Academic English. This study investigates the challenges faced by ESL undergraduates in the Faculty of Management, Social Sciences, and Humanities at a defence university in Sri Lanka, with particular attention to writing, listening, and speaking skills. Moreover, this study discusses the coping strategies used to overcome the challenges they face. A qualitative approach was adopted, and data were collected from 50 undergraduates representing different study years, with gender distribution (54% male, 46% female). The age distribution revealed that the majority of participants (70%) were between 23 and 26 years old, while 30% were within the 19–22 range, placing most of them in the midst of their undergraduate education, and most of them (54%) have followed General English courses before entering the university. The findings reveal that 52% of students lacked confidence in academic writing, while 66% reported difficulties with academic vocabulary. More than half (65%) indicated challenges in organizing ideas into paragraphs, and nearly half (46%) admitted limited understanding of citation and referencing practices. Furthermore, a strong majority (76%) perceived Academic writing as more difficult than General English writing. These results highlight that vocabulary development, writing organization, and referencing are key problem areas in the transition from General English to Academic English. Listening results show that half of the students found lectures harder to follow than General English conversations, with many citing the speed of lecturers' speech (50%) and the heavy listening demands of Academic English (64%) as key challenges. Moreover, 60% reported struggling with technical vocabulary, confirming that academic listening is a significant barrier in their transition from General English to Academic English. Over half of the students (56.0%,) reported feeling nervous during academic presentations and experiencing difficulty speaking spontaneously in class discussions. The results suggest that more structured opportunities for practice, feedback, and guidance are necessary. Therefore, targeted support and an updated Academic English program within the faculty are essential for helping ESL learners successfully navigate the transition from General English to Academic English.

Keywords: ESL learners, academic English, challenges, coping strategies,

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UNDERSTANDING WORKPLACE INCLUSION: EXPLORING EMPLOYEES' PERCEPTIONS, ATTITUDES AND EXPERIENCES REGARDING COLLEAGUES WITH SPECIAL NEEDS

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The unemployment rate of persons with disabilities in Sri Lanka continues to create a significant challenge not only for the individuals affected but also for the national economy, which misses the chance to benefit from the talents of capable people. The study explored perceptions, attitudes, and experiences of co-workers, staff, and heads regarding workplace inclusion for special needs colleagues. Using a qualitative research approach and following the case study design, the study involved two senior academics, five academic staff members of the departments, and 10 non-academic staff from the Department of Special Needs Education and the Learner Support Unit at the Open University of Sri Lanka (OUSL). Semi-structured interviews were conducted with the academics, while a focus group discussion was conducted to for non-academics. Thematic analysis was applied to identify common patterns and meaningful insights. Findings indicate that overall attitudes toward colleagues with disabilities are positive. Heads of departments emphasized the value and capability of these employees, and academic staff expressed willingness to foster a supportive work environment. Many non-academics expressed a desire for more awareness and orientation about the type of disability and how best to interact with and support such colleagues, preferably before recruitment. This reflects the need for preparatory training to enhance comfort and collaboration. Despite the goodwill expressed by staff, employment opportunities for individuals with disabilities remain limited. The study highlights that inclusion must go beyond policy and be supported through infrastructure, communication, and staff development. The study recommends increased disability awareness training for all employees, workplace adjustments based on individual needs, and active policy implementation to ensure a truly inclusive and supportive environment.

Keywords: workplace inclusion, Employees' perceptions and attitudes, experiences, special needs, inclusive employment.

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STUDENT TEACHERS' PERCEPTIONS ON THE INTERACTIVE LEARNING SESSIONS CONDUCTED VIA ZOOM

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This study investigated the perception of student teachers enrolled in the BEd Honours in Special Needs Education (SNE) Degree Program on Interactive Learning Sessions conducted via Zoom technology within the Open University of Sri Lanka. This study employed a survey design with a mixed-methods approach to gather insights from student teachers at Levels 5 and 6 of the BEd(Hons)SNE enrolled in the 2023/2024 academic year. Findings indicate that these Sessions are regularly conducted, often lasting 2-3 hours, and incorporate a mix of group work, lectures, and practical sessions, supported by various digital tools like PowerPoint and breakout rooms. Overall, the majority of student teachers reported a positive experience, highlighting convenience, reduced travel costs, and flexibility as key advantages. A high satisfaction with teacher-student interaction and perceived helpfulness in achieving learning objectives was also noted. However, a significant portion of student teachers faced challenges, primarily with connectivity issues, technical glitches, and continuously engaging with the sessions. Student teachers' suggestions for enhancing the quality of Zoom-based Interactive Learning Sessions include incorporating more interactive tools, providing dedicated technical support, sharing session recordings, implementing regular teacher training, encouraging camera use and active participation, and collecting continuous feedback. The study concludes that while the Zoom offers an effective and accessible learning modality for BEd(Hons) SNE student teachers, further improvements are necessary to address existing challenges and maximize its potential for all learners.

Keywords: BEd(Hons)SNE, student teacher, interactive learning sessions, Zoom technology

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ENGINEERING AND TECHNOLOGY

FORECASTING SOLAR ELECTRICITY GENERATION POTENTIAL ON 18 MAJOR RESERVOIR SURFACES IN SRI LANKA USING LONG SHORT-TERM MEMORY (LSTM) MODEL

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Sri Lanka's energy sector remains heavily reliant on fossil fuels, with coal and oil generating about 50% of total electricity as of 2023. Despite significant solar irradiance potential, solar energy contributes just 5% to the national grid. A major constraint to large-scale solar expansion is land-use conflict with agriculture, urban development, and ecological conservation. Floating Solar Photovoltaic (*FPV*) systems, deployed on reservoir surfaces, offer a sustainable alternative by utilizing underutilized water bodies without competing for land. This study focuses on forecasting the monthly solar energy potential across 18 major reservoirs in Sri Lanka, considering a 1 m² panel area for each site, using a Long Short-Term Memory (*LSTM*) model. The results of this study will help assess the feasibility of deploying FPV systems. Solar energy generation potential was derived by adjusting measured irradiance for environmental factors such as cloud cover, precipitation, atmospheric pressure, and surface reflectivity, combined with panel efficiency based on a 1 m² panel area. A separate *LSTM* model was trained for each site using a 12-month input sequence to predict the subsequent month's solar energy output. Data were standardized and split into training (80%) and testing (20%) subsets. Each model incorporated dropout and early stopping to mitigate overfitting, and performance was evaluated using Root Mean Squared Error (*RMSE)*, Mean Absolute Error (*MAE*), and Mean Absolute Percentage Error (*MAPE*). Historical data revealed strong seasonality, with average daily outputs ranging from 1–4 kWh/m², and peaks exceeding 5 kWh/m² in certain months. February to April were generally the most productive months. *RMSE* ranged from 0.64 to 0.89, with *MAPE* values below 0.57, indicating relatively accurate forecasts. Site-specific variability influenced model performance. Future studies could explore integrating climate change projections and reservoir-specific operational data to improve long-term forecasting accuracy and support strategic planning for FPV system deployment.

Keywords: floating solar photovoltaics, long short-term memory, solar energy, forecasting, reservoir

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FEASIBILITY STUDY OF MICRO-SCALE WIND POWER GENERATION FOR RURAL ELECTRIFICATION IN POLONNARUWA AREA

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Wind energy is one of the most promising alternative renewable energy technologies at present to sustain the increasing energy demand, whereas fossil fuels have negative effects on the environment. Moreover, the fossil is directly related to air pollution, land and water degradation. Despite significant progress made in power generation using large-scale wind turbines recently, domestic-scale wind turbines have received less attention, which have immense potential for standalone power generation. In this paper, micro-scale wind power generation in the Polonnaruwa area was investigated. The technical and economic feasibility of tower-mounted micro-scale standalone wind turbine installation was conducted. The potential of micro-scale wind power generation was statistically analyzed. The average wind speed data of a three-seasonal intervals of two years (2019 and 2020) was collected and analyzed to find the potential of wind power generation in the specified area. The Weibull probability distribution was applied to calculate the wind speed distribution at different heights. Therefore, the annual wind power potential of the area and the energy production of the selected wind turbine were estimated. Study results show that installation of the wind turbine at 10m hub height for this particular area gave better performance of annual energy production, capacity factor and, carbon savings. Therefore, a 500 W turbine with low cut- in wind speed of 2 m/s, was selected as the most appropriate micro scale wind turbine which can be installed at the site under study.

Keywords: annual energy production, capacity factor, wind turbine, weibull probability distribution, wind speed

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CRITICAL REVIEW OF GREEN RATING SYSTEMS IN BUILDING - INTEGRATED VEGETATION AND APPLICATION CHALLENGES IN SRI LANKA

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Today's world faces many burdensome issues, such as climate change, biodiversity loss, resource depletion, urbanization, and food insecurity. There is a growing attention to circularity and sustainable development. In this context, sustainable built environments that promote nature's regeneration play a vital role in leading to numerous benefits for overpopulated urban environments. Several studies have explored different types of Building Integrated Vegetation Systems (BIVSs) and their benefits, as well as the challenges/barriers to adopting them in both the global and Sri Lankan contexts. However, very few studies have focused on the role of vegetation in Green Rating Systems. This study categorizes the literature on different types of BIVSs, their role in Green Rating Systems (GRSs), common implementation and maintenance challenges, and the main barriers to adopting in the Sri Lankan context. The main objective of the study is to investigate the main reason why many green-certified buildings achieve the certification without integrating vegetation systems, specifically in the Sri Lankan scenario. This study is based on a critical review of 26 scholarly publications from relevant journals and online scientific databases. According to the findings, most Green Rating Systems do not offer direct points for incorporating vegetation systems into green buildings. Instead, points can be achieved through the benefits these systems offer. Those benefits can be achieved by other alternative sustainable practices. This has resulted in buildings obtaining the green certification without integrating any BIVSs. Furthermore, the study identifies the cost as the main barrier to adopting BIVSs in the Sri Lankan context, which is associated with their installation and maintenance.

Keywords: building integrated vegetation, circular built environments, cost, Green Rating Systems, Sri Lanka, sustainability

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EVALUATING THE EFFECTIVENESS OF USING DREDGING MATERIAL FROM OLIYAMULLA RETENTION POND AS A LANDFILLING MATERIAL IN COLOMBO, SRI LANKA

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The Sri Lanka Land Development Corporation (SLLDC) has developed the Oliyamulla Storm Water Drainage & Environment Improvement Project, aiming to control flooding in enhance the physical properties of dredged soil for landfilling. While the dredged soil is chemically acceptable, it lacks desirable natural physical properties for direct the Wattala, Peliyagoda, Kelaniya, Wanawasala, and Kiribathgoda areas by dredging the Oliyamulla retention pond. However, the project faces challenges in space, storage, and disposal. This study observes quarry dust as a cost-effective, eco-friendly substitute for stabilization of soil in landfilling, which is an answer to the prohibitive cost of cement in environmental operations. And assesses the environmental value of dredged material as a disposal site for wastes and demonstrates it to be pH neutral, of low electroconductivity, chlorides, organic matter, minimal heavy metals, and free from harmful toxins. Also, the use of quarry dust as a low-cost and environmentally friendly stabilizing agent for weak and soft soils. Laboratory tests for particle size distribution, Atterberg's limits, and proctor compaction on Oliyamulla retention pond dredged soil showed that mixing quarry dust with soil showed good soil improvement with acceptable landfilling limits. The cost breakdown also established that quarry dust usage is economical compared to other methods of disposal, thus making it an efficient and environmentally friendly method of ground improvement. And research evaluates the feasibility of using quarry dust to use without treatment. Experimental findings show that a 40% quarry dust and 60% dredged soil mixture enhances some significant physical properties like density, particle size distribution, and plasticity index significantly in favour of landfilling.

Keywords: weak soil improvement, landfilling, Oliyamulla retention pond

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ADOPTION OF GREEN BUILDING CONCEPT TO RESIDENTIAL BUILDING IN MONARAGALA MUNICIPAL AREA

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Green building is a sustainable development initiative that can be considered a solution. It enhances efficiency in electricity, water, soil, and materials, while minimizing environmental impacts and promoting human health throughout a building's life cycle. Many residential buildings in urban areas of Sri Lanka have adopted this concept, but non-urban areas are behind. This research evaluates the awareness, readiness, and practical use of green building technologies and strategies among homeowners, construction professionals, and experienced experts in green building projects. A mixed-methods approach was used, combining quantitative data from structured questionnaires with qualitative insights from stakeholder interviews and field observations. Key factors influencing the adoption of these practices include limited awareness among developers and homeowners, financial barriers, and inadequate facilities. Green building offers numerous benefits in terms of economics, environment, health and well-being, and quality of living. The research findings can be applied to develop a green residential building in the Monaragala area, featuring natural ventilation, daylighting, and optimal building orientation. This could incorporate locally sourced, sustainable materials, landscape design, rainwater collection, solar energy systems, and thermal insulation. Although some activities related to green practices are already in place, the adoption of green building practices in Monaragala is limited. However, the perceived benefits suggest a strong potential for future growth. By addressing the identified barriers with targeted strategies and policies, it's possible to significantly increase the adoption of green building concepts. This would not only contribute to sustainable development in the Monaragala municipal area but also set an example for broader regional and national efforts toward environmental stewardship.

Keywords: green building, residential building, sustainability, adoption

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EXPERIMENTAL STUDY ON THE ACCURACY OF CRACK DETECTION ON CONCRETE AND ASSESSMENT OF QUALITY OF REPAIRED CONCRETE WITH ULTRASONIC PULSE VELOCITY

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Concrete cracks are frequently discovered in structures made of concrete. They should be avoided because they may result in serious issues. Therefore, the prompt identification of cracks and the implementation of preventive measures are essential for ensuring structural durability. Cracks formed on the concrete cover pave the way for structural problems. The concrete cover varies according to the purpose of the structural member and the environment in which it is exposed. These cracks make the structural member less resistant to weathering, corrosion, and fire. To detect the extent of these visible cracks on plain concrete, it is better to start with a non-destructive test. This method is cost-effective and quick, making it preferable before using more advanced equipment that may be expensive and time-consuming. To detect the extent of these visible cracks that are on plain concrete, the Ultrasonic Pulse Velocity (UPV) Test can be used. The PUNDIT 7 apparatus of frequency of 54 kHz was used to detect the prefabricated cracks of 2cm, 4cm, and 6cm deep while keeping the width of the cracks fixed. Concrete beams of size 100 × 100 × 950mm were used. The accuracy of these crack detections was studied by varying the transducer distances from the crack. Identifying the most effective transducer distance would save time and cost in detecting the cracks by reducing the labour cost involved. For all three depth variations, the effective transducer distance range with high accuracy, higher than 85% was observed for 80 to 140 mm, and the most effective transducer distance was 100 mm with an accuracy of 97.04% for a 2 cm crack, 94.45% for a 4 cm crack, and 98.02% for a 6 cm crack. The identified cracks in any structure should be repaired. Otherwise, it may end in huge structural problems over time. In the market, many filling materials are available to fill cracks. Among various crack-filling materials, cement grout remains the most widely utilized due to its availability and compatibility with concrete. Therefore, in this study, cracks were filled with cement grout, and the efficiency, which is a measure of how much the filling comes closer to behaving as the original concrete, was checked. For cracks with depths of 2cm, 4cm, and 6cm, the percentages of efficiency were 94.39%, 90.90%, and 88.05%, respectively. These results show that cement grout is effective in reinstating the performance of cracked concrete, especially for shallower cracks. This study was focused on varying the depth of cracks while maintaining a constant crack width. For future research, it is recommended to investigate the influence of crack width variation at a fixed depth.

Keywords: UPV, concrete cover, visible crack, repaired crack

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ENHANCED COMMAND-LINE TOOLS USING LARGE LANGUAGE MODEL INTEGRATION AND SHELL ASSISTANCE

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EVALUATING TECHNOLOGICAL INTERRELATIONS USING THIO FRAMEWORK AND MICMAC ANALYSIS: DEPLOYING INDUSTRY 4.0 IN THE SRI LANKAN APPAREL INDUSTRY

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The apparel industry of Sri Lanka is undergoing a significant transformation through the integration of Industry 4.0 (I4.0) technologies, which encompass cyber-physical systems, Internet of Things (IoT), artificial intelligence, big data analytics, cloud computing, and additive manufacturing, due to the potential benefits of these advanced technologies. However, their successful implementation requires a comprehensive understanding of the complex interrelationships between key technological components. This research examines the interrelationship of technological components in implementing Industry 4.0 technologies within the Sri Lankan apparel industry, utilising the THIO Framework, which categorises these components into four groups: Technoware, Humanware, Inforware, and Orgware. The study employed a mixed-methods approach, combining qualitative semi-structured interviews with twelve industry experts and quantitative questionnaire surveys with seven respondents to gather comprehensive insights. Thematic analysis was conducted on interview responses to identify current applications and challenges of I4.0 technologies, while MICMAC (Cross-Impact Matrix Multiplication Applied to Classification) analysis was used to examine the driving and dependence power of thirty-six sub-components across the four technological categories. The research findings revealed that the Sri Lankan apparel industry has adopted various I4.0 technologies, including industrial robots, automation systems, IoT-RFID integration, smart manufacturing systems, computer vision, and business intelligence tools. However, implementation faces challenges due to high initial investment costs, a shortage of skilled workforce, integration difficulties with legacy systems, and employee resistance to change. MICMAC analysis identified four distinct clusters of components: autonomous components with minimal influence, dependent components with strong dependence but weak driving power, linkage components with both strong driving and dependence power, and independent components with strong driving power but minimal dependence. Technical and operational skills, leadership skills, teamwork, responsibility and discipline are found to be critical factors with high driving power, while IoT, AI, cloud computing, and cyber-physical systems show high dependence on other components. Further, it is found that successful I4.0 implementation within the industry requires coordinated management of all four technological components, with specific attention to developing human capabilities and organisational readiness along with technological infrastructure.

Keywords: industry 4.0, apparel industry, technological components, THIO framework, MICMAC analysis, digital transformation

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PREDICTIVE MODELLING OF KNIT FABRIC SHRINKAGE USING ARTIFICIAL NEURAL NETWORKS

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The dimensional shrinkage of knitted fabrics has been extensively investigated; however, existing predictive models remain limited in their ability to accurately estimate shrinkage solely from fabric properties. This study reports on the development of an Artificial Neural Network (ANN) model specifically designed to predict the dimensional shrinkage of single-jersey knitted fabrics composed of 100% cotton and polyester–elastane blends. The model integrates parameters from the knitting, pre-setting, and finishing stages, thereby providing a comprehensive framework for prediction. The training dataset was systematically compiled through controlled experimental trials on a range of knitted fabric samples, ensuring consistency and reliability of input variables.The model was trained using twenty-three input variables, including yarn count, loop shape factor, tightness factor, stitch density, course density, wale density, machine settings, and areal density. These inputs were chosen based on their known influence on shrinkage, as identified in previous literature and empirical observations. The ANN model was trained on experimental data and validated using samples not used for testing, demonstrating high prediction accuracy and a strong correlation between actual and predicted shrinkage values. The ANN was built using TensorFlow-Keras with a feed-forward backpropagation architecture, and its performance was evaluated using statistical measures, including correlation coefficients between the observed and predicted values, mean square error, mean absolute error, and mean absolute percentage error. This study demonstrates the superiority of ANN over conventional predictive models in both accuracy and scalability. Once trained, the ANN model can rapidly estimate fabric shrinkage using known input parameters, enabling proactive quality control at the production planning stage. This approach reduces reliance on physical sampling and post-compacting shrinkage testing, conserving time and material resources. The results establish ANN as a robust and practical solution to the persistent challenge of predicting shrinkage in knitted fabrics. By integrating machine learning with empirical textile knowledge, the textile industry can advance toward predictive manufacturing, improved productivity, and enhanced product performance. Furthermore, the proposed framework can be extended to incorporate parameters such as finishing and thermal treatments, and to forecast shrinkage in other knitted structures, including rib and interlock. Future research may also explore hybrid models combining ANN with fuzzy logic or genetic algorithms to strengthen predictive capability.

Keywords: fabric shrinkage, artificial neural networks, machine learning in textiles, knitted fabrics, dimensional stability

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A STUDY TO INVESTIGATE THE SUITABILITY OF SELECTED SUPERIMPOSED SEAMS AND LAPPED SEAMS FOR LONG SEAMS OF TROUSERS WITH RESPECT TO SEAM STRENGTH AND SEAM ABRASION

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Though different types of seams and stitches are used in an ad hoc manner in the construction of long seams (inseams and outer seams) of trousers, limited scientific studies are available to understand the effect of seam strength and seam abrasion on long seams of trousers. The main objective of this research study was to study the suitability of selected superimposed seams (SSa type) and lapped seams (LSc type) for the construction of long seams of trousers based on the test results of seam strength and seam abrasion. The fabric was selected by using a pilot survey. A suitable sewing thread, two (02) seam types, five (05) stitch types, and two (02) stitch densities were selected by using the knowledge gathered from the literature survey and the industrial practices for the experiments. The testing standards, machines, and equipment for seam strength and seam abrasion were also selected. Sixty (60) samples were prepared for the testing of seam strength, and another forty-eight (48) samples were prepared for the seam abrasion test as per the two testing standards. The constructed samples were tested for seam strength and seam abrasion to determine the suitability of seams prepared by using selected seam types and stitch types. A large number of relationships can be developed from this study between the selected seam types and seam strength as well as seam abrasion. The highest seam strength was shown by the LSc seam with stitch type 401 and with SPI 10. The lowest seam strength was shown by the SSa seam with stitch type 515 and with SPI 12. The seams made of LSc seam type showed higher seam strength than the seams made of SSa seams. The abrasion was determined by using the mass loss occurred during the abrasion. The highest mass loss was shown by samples that were constructed using SSa seam with stitch types 401 & 504 and with SPI 12 and the lowest mass loss was shown by the SSa seam with stitch types 301 & 504 and with SPI 10. Further studies should be carried out by increasing stitch densities, fabric and thread types to improve the findings.

Keywords: seams, stitches, stitch density, seam strength, seam abrasion, inseams, outer seams

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DEVELOPING A COMPOSITE WALL TILE USING TEXTILE WASTE

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The generation of textile waste has increased rapidly during the last few decades, and it has become a significant problem in the countries where apparel manufacturing is a major industry. The main objective of this research study was to develop a novel composite material for wall tile applications using textile waste. Textile waste, appropriate composite size was 12 inches x 12 inches, and the thickness was 8 mm. Four (04) composite samples were fabricated for each selected weight ratio of textile resin type, weight ratios of textile waste to resin, suitable composite manufacturing method and evaluation tests were selected to conduct the study. The selected sample waste to resin, amounting to a total of twelve (12) samples. The developed composite samples were evaluated for water absorption, modulus of rupture and impact resistance to determine the suitability for wall tile applications. According to the results, with the increase in the textile waste component, the water absorption of composite samples increased. Water absorption values show that the results are acceptable for using the developed samples as wall tiles. During the modulus of rupture testing, no failures were observed in any of the developed composite samples. As there were no failures, it can be suggested that the samples have a higher modulus of rupture. All the developed composite samples, regardless of their different material compositions, exhibited no visible cracks during the impact resistance tests. Therefore, all the developed composite samples showed a satisfactory level of impact resistance. The overall experimental results indicated that the developed composite samples showed encouraging results in water absorption, modulus of rupture and impact resistance, suggesting their potential for use in wall tile applications. As per the findings, all the test results were within the acceptable range for the tested parameters. Further studies should be carried out to determine the optimum range for the textile waste to resin weight ratio using an increased number of textile waste-to-resin weight ratios.

Keywords: textile waste, textile reinforced composites, wall tile, water absorption, modulus of rupture, impact resistance

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REDUCTION OF STIFFNESS IN 100% POLYESTER WOVEN FABRICS USING COCONUT OIL DERIVED BIO-SOFTENER: A SUSTAINABLE FINISHING APPROACH

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Polyester fabrics, though valued for their strength, dimensional stability, and low maintenance, are often criticised for their stiffness and poor comfort when used in apparel worn next to the skin. Conventional chemical softeners, typically petroleum-based, are non-biodegradable and raise environmental and health concerns. This study investigated the feasibility of using coconut oil–based BIO-softener as a sustainable alternative for 100% virgin polyester woven fabrics. Softener emulsions were prepared with food-grade coconut oil, Polysorbate 80 as a non-ionic emulsifier, and citric acid as a pH adjuster, at concentrations of 2%, 5%, and 10% (w/w). Fabric samples were treated using a dip-squeeze-air dry method and evaluated for drapability (ISO 9073), stiffness (ASTM D1388), tensile strength (ISO 13934-1), fabric weight (GSM), and surface pH, with wash durability tested according to ISO 105-C01. For each test, three readings per sample were taken, and mean values were used for analysis. Results indicated that increasing BIO-softener concentration reduced stiffness and improved flexibility, with the 10% treatment giving the highest and most balanced improvement. Drapability improved by lowering the drape coefficient by 14.77%, while flexural rigidity reduced by 22.86% in the warp and 23.08% in the weft directions. GSM increased proportionally with softener concentration due to surface film deposition, but remained above untreated values even after washing, confirming acceptable durability. All treated fabrics-maintained skin-safe surface pH (7.0–7.3). At the 95% significance level, tensile strength in the warp direction increased consistently and significantly ($p < 0.05$), while weft changes were minor and statistically insignificant ($p > 0.05$); the 10% treatment showed the greatest improvement in both directions. Concentrations above 10% led to undesirable oiliness and non-uniform appearance, limiting practical application. In conclusion, coconut oil–based BIO-softener proved effective in enhancing drapability and flexibility of polyester fabrics while maintaining mechanical integrity, wash durability, and wearer safety. Future studies should include thermal comfort and subjective hand-feel assessments for a more holistic evaluation of fabric performance. These findings confirm its potential as an eco-friendly alternative to petroleum-based softeners, supporting sustainable finishing practices for synthetic textiles.

Keywords: bio-softener, coconut oil, polyester, fabric stiffness, drapability, sustainable finishing

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A ROADMAP FOR ENABLING SMART MANUFACTURING IN SRI LANKAN SMES THROUGH INDUSTRIAL INTERNET OF THINGS (IOT) TECHNOLOGIES

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The Fourth Industrial Revolution (Industry 4.0) has transformed global manufacturing through the integration of digital technologies such as the Industrial Internet of Things (IoT), artificial intelligence, and data analytics. For Sri Lanka, where Small and Medium Enterprises (SMEs) contribute significantly to the economy, adopting IoT presents both an opportunity and a challenge. Despite accounting for over 50% of the national GDP and employing nearly half the workforce, Sri Lankan SMEs, particularly in sectors like textiles and food processing, face barriers to digital transformation, including limited technical skills, financial constraints, and inadequate infrastructure. This study proposes a structured, phased roadmap to enable IoT adoption among Sri Lankan SMEs, tailored to the country's unique socio-economic and industrial landscape. The research employs a qualitative approach, supported by literature reviews, case studies from developing economies, and expert insights. A pilot survey of 25 SME managers revealed low awareness but high interest in IoT technologies. Targeted awareness workshops and modular training programs significantly improved understanding and skills, with competency levels increasing by 55% post-training. Pilot installations of low-cost IoT sensors demonstrated tangible benefits, including a 20% reduction in machine downtime and 12% improvement in energy efficiency. The study underscores the importance of a National IoT Strategy aligned with Sri Lanka's digital policy, along with financial incentives, sector-specific IoT starter kits, and regional innovation hubs. Public-private partnerships and industry-academia collaboration are identified as key enablers for sustainable IoT integration. The roadmap emphasises inclusivity, recommending targeted efforts to involve women and marginalised communities in the digital workforce. With coordinated efforts and strategic interventions, Sri Lankan SMEs can transition to smart manufacturing, enhancing competitiveness and contributing to equitable economic growth. The proposed framework also offers a replicable model for other developing nations pursuing inclusive digital transformation.

Keywords: Industrial Internet of Things (IoT), smart manufacturing, small and medium enterprises (SMEs), digital transformation, inclusive growth

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"BEAUTY OF UNEVENNESS": CASUAL WEAR COLLECTION FOR SRI LANKAN YOUNG LADIES, INSPIRING GREEN STRIPED MUSHROOM CORAL

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This project investigates the impact of clothing on emotional well-being and self-confidence in young women with scoliosis in Sri Lanka. Through an online case study and survey, it explores how fashion can respond to both functional and emotional needs. Findings revealed that clothing plays a vital role in making individuals feel comfortable, unique, and confident. Inspired by the Green-striped mushroom coral, renowned for its asymmetry, vibrant colours, and rich textures, the collection embraces irregularity as a symbol of natural beauty. Just as the coral grows in unbalanced yet harmonious forms, scoliosis is reinterpreted as an organic structural variation rather than a flaw. The coral serves as a metaphor to challenge traditional beauty standards and celebrate asymmetry, individuality, and diversity. The resulting casual wear collection, Beauty of Unevenness, is designed specifically for young Sri Lankan women with scoliosis. It features asymmetrical silhouettes, innovative use of appliqué, frills, and pleating techniques, and vibrant colour combinations to distract from unevenness while highlighting uniqueness. Easy closures and adaptable fits ensure comfort and practicality without compromising style. This project aims to shift the narrative around scoliosis from concealment to confidence. By integrating both aesthetic and functional elements, the collection empowers wearers to express their individuality and feel confidently beautiful in their bodies. It positions fashion not only as a visual art but as a tool for self-expression, emotional support, and empowerment.

Keywords: empowering, ladies with scoliosis, casual wear, green-striped mushroom coral

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"GREEN GLAM": AN ECO-LUXURY ELEVATED CASUAL WEAR COLLECTION FOR MODERN SRI LANKAN WOMEN AGED 25–30, INSPIRED BY THE SPIRAL ALOE VERA

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This study investigates the integration of sustainable practices into luxury casual wear for Sri Lankan women aged 25–30, emphasising the balance between eco-consciousness and contemporary style. The research aimed to develop a functional and aesthetically appealing collection inspired by the spiral aloe vera (*Aloe polyphylla*), whose geometric structure and symbolic resilience informed both design motifs and conceptual philosophy. A mixed-methods research design was employed. Initially, trend analysis, fabric testing, and pattern development guided the design process. An online survey of 250 target consumers assessed willingness to invest in sustainable fashion and preferences for eco-luxury elements. Survey findings indicate that 89% of respondents prioritise sustainability without compromising elegance or individuality, confirming market demand for eco-luxury garments. The collection was realised using Taiwan linen, silk-cotton blends, and chiffon, selected for their breathability, aesthetic appeal, and environmental suitability for tropical climates. Design techniques included sublimation printing, fabric manipulation, and hand embroidery, reflecting the spiral motif while adhering to sustainable practices. Low-waste construction, grain optimisation, and zero-waste pattern drafting exemplify the 3R principles (Reduce, Reuse, Recycle). Results demonstrate that eco-luxury casual wear can meet functional, stylistic, and ethical expectations, offering a viable approach for sustainable fashion in the Sri Lankan context. This research contributes to the emerging discourse on conscious fashion, offering actionable insights for designers, manufacturers, and consumers who seek to integrate style, individuality and environmental responsibility.

Keywords: eco-luxury, sustainability, casual wear, spiral aloe vera, zero-waste designs

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TULSI EXTRACT MOSQUITO REPELLENCE FINISHES APPLIED ON COTTON FABRICS WITH PAD DRY CURE AND MICROENCAPSULATION

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Mosquito-borne diseases pose a major public health concern worldwide. There are some preventive measures, such as sprays, creams, roll-ons and coils, as traditional methods that have both synthetic chemicals and plant-based ingredients to reduce the transmission of mosquito-borne diseases. To improve prolonged mosquito repellent with minimal harmful chemicals, researchers have shifted towards mosquito repellent textiles such as bedsheets, curtains, clothing, etc., with natural plant-based extracts. The main objective of this research was to develop a mosquito repellent finish using Tulsi (*Ocimum tenuiflorum*) plant extract. Bleached 100% cotton fabric was dyed in black colour using reactive dye to attract more mosquitoes, and the dyed fabric was used as the control sample. Tulsi leaf extract and Tulsi powder extract were applied separately to dyed cotton fabrics using the Pad-Dry-Cure method. Samples treated with Tulsi leaf extract and Tulsi powder extract exhibited 60% and 90% repellence, respectively. Due to the greater repellence behaviour of Tulsi Powder, the sample treated with Tulsi powder was subjected to washing cycles, and repellence was dropped to 10% after ten washing cycles. To enhance the mosquito repellence behaviour, fabric samples were treated with microencapsulated Tulsi at 20ml and 30ml concentrations of Tulsi powder extracts. Fabric treated with microencapsulated 20ml of Tulsi extract showed 50% initial mosquito repellence, which reduced to 20% after ten washing cycles. In contrast, a fabric sample treated with microencapsulated 30ml of Tulsi extract exhibited 90% initial repellence, reducing to 40% after ten washing cycles. After ten washing cycles, the Pad-Dry-Cure-treated sample showed a gray scale rating of 1-2, and the microencapsulated sample that used 30ml Tulsi extract showed improved performance with a gray scale rating of 3-4 for colourfastness. Fourier Transform Infrared (FTIR) spectroscopy confirmed the presence of bioactive compounds of Tulsi on the fabric surface after being subjected to repeated washing cycles. Therefore, it is recommended that the microencapsulation method with 30ml Tulsi extract as a mosquito repellent finish for cotton fabrics, based on the results obtained in this research work. However, further investigations are to be carried out varying parameters such as the concentration of Tulsi, fabric types and application method to enhance the effectiveness of mosquito repellence.

Keywords: Tulsi, *Ocimum tenuiflorum*, mosquito repellent finishes, Fourier Transform Infrared (FTIR), microencapsulation

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REDEFINING NEONATAL MATERNITY WEAR: AN UPCYCLED SHIRTDRESS APPROACH IN SUSTAINABLE FASHION FOR BREASTFEEDING MOTHERS

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This study presents an upcycled shirtdress for breastfeeding mothers, integrating sustainable fashion principles, functional adaptability, and infant sensory engagement. Design decisions were guided by semi-structured interviews with ten mothers, revealing a demand for breathable fabrics, concealed nursing access, adjustable sizing, and chemical-free materials. Discarded men's cotton shirts were selected for their softness, durability, and hypoallergenic qualities, supported by literature on neonatal skin safety. Turmeric (*Curcuma longa*) and neem (*Azadirachta indica*) dyes were applied without synthetic fixatives, offering antimicrobial and anti-inflammatory benefits. Embroidery motifs, stitched with organic cotton thread, were placed near the chest and designed using bold primary colors and geometric shapes in line with infant visual development theory.

Unique pattern-making combined shirt and wrap-dress features, enabling zero-waste cutting and adaptive fit through adjustable waistlines. Market analysis indicated rising demand for sustainable, multifunctional postpartum wear, positioning this design within a commercially viable niche. In pilot testing, 90% of participants reported enhanced breastfeeding convenience, 100% observed positive infant visual engagement, and the garment achieved a 60% lower carbon footprint compared to new production. The resulting garment demonstrates how evidence-based textile choices, infant-centered aesthetics, and sustainable construction can deliver both ecological benefits and emotional value. This approach offers a model for expanding sustainable postpartum fashion into scalable, trend-aligned collections.

Keywords: breastfeeding fashion, neonatal mothers, upcycling, natural dyes, sustainable design, maternal comfort

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"HIGH FIVE TO COMFORT" – AN ECO-FRIENDLY CONVERTIBLE CASUALWEAR COLLECTION FOR UPPER-CLASS SINGLE WOMEN IN THE USA, INSPIRED BY PEARL OYSTERS

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This study presents the design and development of a convertible and comfortable casual wear collection tailored for upper-class single women aged 25–30 in the United States. Titled "*High Five to Comfort*", the collection addresses the distinct lifestyle demands and psychological needs of this demographic, situated within the context of contemporary American society, which often reflects relatively conservative attitudes toward sexual openness. The target consumers face a range of social and personal challenges, including experiences related to single parenthood, unhealthy relationships, substance abuse, and mental health issues. Many of these challenges stem from the pressures of a fast-paced, career-driven lifestyle, compounded by societal undervaluation and limited emotional support. These women frequently prioritize professional success, often working extended hours with minimal time allocated for leisure or personal well-being. Given these circumstances, there is a clear demand for practical, versatile, and comfortable garments that can seamlessly transition between various social and professional settings. This collection is specifically designed to meet these requirements by integrating functional and convertible design elements that support dynamic lifestyles. The conceptual framework for this collection draws inspiration from the film Miss Congeniality (2000), whose protagonist, Gracie Hart, embodies qualities that resonate strongly with the target demographic—independence, resilience, and adaptability. The fashion collection draws design inspiration from the pearl oyster, which symbolizes transformation by turning a small particle of dust into a valuable pearl. This natural process symbolizes understated beauty and resilience, reflecting the often-overlooked value and strength of the women for whom this collection is designed. The collection is developed under the Tommy Hilfiger brand, known for its innovative design solutions and youthful, contemporary aesthetic. Fabrics such as lightweight linen have been selected to enhance comfort, breathability, and suitability for the spring and summer seasons. The designs emphasize not only comfort and versatility but also incorporate elegant details, including decorative embroidery, that align with the refined tastes and high purchasing power of the target consumers. The convertible features enable wearers to effortlessly adapt their outfits for varying occasions, offering both functionality and aesthetic appeal.

Keywords: fast faced, life choices, convertible, comfortable

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BANDWIDTH ENHANCEMENT OF PIFA ANTENNAS FOR WIRELESS APPLICATIONS BY GROUND PLANE OPTIMIZATION

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Planar Inverted-F Antennas (PIFAs) are widely used in wireless applications because of their simple design, low profile, light weight, low cost, relatively low specific absorption rate (SAR), and good performance. However, they suffer from narrow bandwidth, which affects their performance in modern wireless applications. This research focuses on enhancing the bandwidth performance of PIFA antennas through ground plane optimization. The objective of the optimization was to maximize the bandwidth (S11 $\leq$ -6 dB) at 900 MHz, by modifying the geometry and dimensions of the ground plane. A basic PIFA antenna with dimensions of 100 mm x 40 mm x 1.6 mm was designed and simulated on an FR4 substrate (relative permittivity (ε_r) of 4.4 and loss tangent of 0.02) at 900 MHz, using High-Frequency Structure Simulator (HFSS) software. Then, as a bandwidth enhancement technique, slots were introduced on the ground plane. Initially, a single slot was created, and the position of the slot and its dimensions were optimized using parametric optimization. It was observed that the slot's position significantly affected the performance of bandwidth, with the highest bandwidth improvement achieved when a 30 mm x 5 mm horizontal slot was placed under the radiating patch. The bandwidth (S11 $\leq$ -6 dB) increased to 23.3% with a single slot, compared to 17.7% without any slot. Subsequently, a second slot with the same dimensions as the first was introduced, and its position was optimized through parametric optimization. The bandwidth was further improved up to 24.4% after inserting the second slot. The results confirm that ground plane optimization techniques, such as inserting slots, enhance the bandwidth of PIFAs.

Keywords: PIFAs, bandwidth enhancement, ground plane optimization

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"THE TEMPTRESS": A JOURNEY SEDUCTIVE SPLENDOUR - EVENINGWEAR COLLECTION FOR SRI LANKAN WOMEN, INSPIRED BY ZOANTHIDS CORAL

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This project presents "The Temptress", a distinctive eveningwear collection for Sri Lankan ladies aged 18 to 25 years, inspired by the captivating forms and textures of Zoanthid coral (Zoanthus sp.). Drawing upon the organic intricacies of these marine organisms, the collection embraces the seductive beauty of women and translates it into fashion through the artisanal techniques of crochet and knotting, crafts rarely represented in high-end evening wear. Targeting style-conscious, empowered women from elite social segments, the collection aims to offer innovative, emotionally resonant, and aesthetically bold fashion alternatives. Consumer preferences were gathered via a structured Google form survey to guide design development, with colour palettes, silhouettes, and detailing curated based on this research. The collection integrates tactile textures that reflect the radial and layered patterns of Zoanthids, using threads and locally sourced cotton yarns to ensure both visual richness and cost-efficiency. It further addresses the gap in Sri Lanka's fashion industry for original, high-quality eveningwear by encouraging a value chain that supports local craftsmanship and sustainable material sourcing. "The Temptress" explores a bold and sensual design narrative with the concept "A Journey into Seductive Splendour", positioning crochet as a powerful, expressive medium in contemporary fashion and redefining the possibilities of a luxury evening wear collection through a culturally rooted and environmentally conscious lens.

Keywords: eveningwear, crochet, knotting, craftsmanship, Zoanthids coral

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ADVANCING RESOURCE CIRCULARITY IN SUSTAINABLE BUILDING CONSTRUCTION INDUSTRY: A CASE STUDY ON VALUE-ADDED RICE STRAW-BASED COMPOSITE ECO-BRICK INNOVATION IN SRI LANKA

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The growing urbanisation of Sri Lanka's building sector has made it difficult to strike a balance between sustainable resource management. The huge volume of agricultural waste produced by present techniques leads to environmental, social, and economic sustainability challenges through direct open burning and landfill buildup. To improve resource circularity in Sri Lanka's sustainable building construction sector, this study investigated the feasibility of transforming waste rice straw into a value-added composite eco-brick with a lower production cost. The study employed an experimental research methodology that facilitates the discovery of material properties through testing and an understanding of material feasibility studies for sustainable construction. To improve the strength of rice straw material and increase its natural properties, selected additives were blended and tested for compressive strength, water absorption capacity, durability, and composite sample performance. According to the findings, rice straw-based composite bricks have comparable compressive strength (3.2-4.5 MPa) to ordinary clay bricks, notably lower thermal conductivity (0.28 W/mK), and reduced water absorption ability. When compared to traditional clay bricks, the economic analysis demonstrated a 20-25% cost reduction in material manufacturing. According to the study's findings, rice straw composite eco-bricks can assist Sri Lanka's construction industry in implementing circular economy principles, converting waste into value, and reducing carbon emissions, in addition to providing a sustainable alternative for building materials.

Keywords: sustainable construction, rice straw composite, eco-brick innovation, resource circularity, waste value addition

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DESIGNING A FUNCTIONAL AND COMFORTABLE SAFARI WEAR COLLECTION FOR YOUNG FEMALE TOURISTS IN SRI LANKA

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Sri Lanka is globally recognised for its wildlife, creating an increasing opportunity to engage young female tourists through fashion that respects both cultural and environmental aspects. As a result, a safari apparel line has been developed, drawing inspiration from the Sri Lankan leopard (Panthera pardus kotiya). This study examines the overlap of fashion and the safari tourism sector in Sri Lanka, concentrating on designing comfortable and modest travel garments for young women aged 25–30 from abroad who visit Sri Lanka as a safari location. The main goal of this project is to create a functional and visually appealing collection of safari clothing suitable for the spring and summer months in Sri Lanka while addressing the needs of fashion without compromising environmental concerns. A customer survey with 105 international female participants, including both past and potential visitors to Sri Lanka, revealed a demand for chic and practical safari clothing and highlighted the lack of a local safari apparel brand. These insights were instrumental in identifying the target demographic and guiding the design process. The theme was selected based on Sri Lanka's prominent position as a popular travel destination and current initiatives aimed at revitalising its tourism sector. By connecting this collection to one of the nation's most significant natural attractions—the safari experience—the project seeks to make a meaningful contribution to both the fashion industry and tourism. The Sri Lankan leopard, a native and endangered species, serves as the central influence, with its textures, rosette patterns, earthy hues, and agility shaping the design's visual and structural features. The collection incorporates breathable, skin-friendly materials like cotton twill to provide comfort in high UV conditions. Ayurvedic textiles are also included to reduce skin irritation and ensure sun protection. Moreover, methods such as screen printing, braiding with reeds, and separable garment components are utilised to enhance the wearer's experience and increase the versatility of the designs. Beyond just fashion, this project aims to foster environmentally friendly tourism and elevate awareness regarding wildlife conservation. By blending design innovation with cultural and ecological mindfulness, this collection not only fulfils the practical requirements of travellers but also honours Sri Lanka’s natural legacy.

Keywords: safari wear, Leopard, Ayurvedic textiles, tourism industry

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"EMBRACE INNER ESSENCE"– DESIGNING PLUS-SIZED BEACHWEAR CLOTHING LINE FOR THE SRI LANKAN MARKET

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The worldwide fashion sector has historically sidelined plus-sized women by focusing mainly on styles that fit slimmer figures. In Sri Lanka, this challenge is even more significant, with very few fashionable beachwear options available in larger sizes. Plus-size is generally defined as US size 14 and above, along with further categories like super-size (1X–6X) and extended size (7X and beyond). Although there is an increasing demand for stylish and confidence-boosting beachwear among plus-sized women, the market still presents limited variety in styles, colours, and fits. To fill this void, a plus-size beachwear line has been created under the Sri Lankan brand Lagoon Lab, inspired by bioluminescent jellyfish (*Aequorea Victoria*), aimed at young adults aged 25–30 in the Western Province for the Spring/Summer 2025 season. This collection aspires to empower plus-sized women by offering fashionable, trendy, and revealing pieces that honour body diversity and enhance self-esteem. Essential design strategies include the utilisation of comfortable, stretchy fabrics such as ITY four-way knit and power net, selected for their capacity to deliver both support and flexibility. Techniques such as optical illusion, sublimation printing, and well-placed frill detailing are used to flatter fuller body types and boost the overall aesthetic. By combining aesthetics with practicality, this collection not only caters to an overlooked market segment but also confronts traditional beauty standards in Sri Lankan fashion. Lagoon Lab's initiative represents a significant move towards inclusivity, allowing plus-sized women to fully enjoy leisure and beach activities without sacrificing style or comfort. This endeavour underscores the vital importance of inclusive design in modern fashion and serves as a rallying cry for both local and international brands to widen their size ranges and embrace diversity in their offerings.

Keywords: plus size, beach wear, Sri Lankan market, women empowerment

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A RULE-BASED SCORING METHOD FOR DRIVER BEHAVIOUR EVALUATION USING VEHICULAR PARAMETERS

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The analysis and evaluation of driver behaviour play a critical role in enhancing road safety, optimising fleet operations, and enabling fair usage-based insurance models. Traditional methods, such as manual observation, often lack objectivity and scalability, limiting their effectiveness in large-scale applications. This study introduces a transparent, rule-based scoring system designed to assess driver behaviour using real-time vehicular data collected via the OBD-II interface. The methodology involved selecting key driving parameters including speed, engine RPM, throttle position, engine load, application of brake, and steering speed based on Sri Lankan government regulations, expert mechanic input, and findings from the literature review. Data comprising approximately 4,000 records were collected from five vehicles driven by different drivers under typical urban and suburban conditions. The dataset was thoroughly pre-processed to remove noise and invalid data points, ensuring consistency and reliability across various car models. Each parameter was assigned thresholds to categorise observed values as good, acceptable, or poor, based on established regulatory standards, expert recommendations, and benchmarks identified through a comprehensive literature review. These scores were weighted according to their relative importance to safety and vehicle health. The total weighted score for each trip was computed by summing the weighted parameter scores and subsequently normalised to a 10-point scale for consistent interpretation. Trips were classified into four behavioural categories: excellent, safe, caution advised, and risky. Application of the scoring system to a dataset of 4,000 trip records demonstrated its capability to effectively differentiate driver behaviour classes. The distribution of results showed that 32.5% of trips were categorised as excellent, 41.0% as safe, 18.0% as caution advised, and 8.5% as risky, reflecting the overall driving behaviour captured across the dataset. To validate the accuracy of these classifications, an additional controlled test was conducted using a separate vehicle driven under deliberately risky conditions, such as high speed and high engine RPM. This test vehicle was correctly classified as Risky by the model, supporting the validity of the categorisation approach. This distribution confirms the system's ability to distinguish varying levels of driving quality and risk. The system's transparent and interpretable nature, combined with its independence from large labelled datasets, supports its practical deployment in real-world contexts. The results highlight the system's potential as a valuable tool for insurers, fleet managers, and road safety authorities.

Keywords: driver behaviour, rule-based scoring, OBD-II, driver evaluation, normalisation

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BLENDING CULTURES: A HANBOK-INSPIRED STREETWEAR LINE FOR SRI LANKAN YOUNG WOMEN

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This project presents a culturally infused streetwear collection for young Sri Lankan women, blending traditional and modern aesthetics. Showcasing the theme 'Traditional to Modern,' the collection transforms cultural heritage into contemporary fashion by integrating distinctive cultural elements into wearable designs. With the growing influence of the Korean Wave (Hallyu)—driven by K- dramas, K-pop, and Korean fashion—Sri Lankan youth, particularly Gen Z women, are increasingly drawn to Korean styles. However, limited local availability and high import costs make authentic Korean fashion difficult to access, creating a clear gap in the Sri Lankan market for culturally inspired yet affordable alternatives. The fashion collection is conceptually rooted in "acculturation", the process by which elements of one culture are adapted and blended with another while preserving local identity. Drawing primary inspiration from the traditional Korean hanbok, the collection reinterprets key design features such as voluminous silhouettes, wrap closures, curved lines, and soft layering into versatile, climate-appropriate streetwear tailored for Sri Lankan consumers. Fabrics, colours, and textures are carefully selected to align with tropical conditions while preserving the aesthetic sensibility of Korean-inspired fashion. This collection not only satisfies the fashion aspirations of Sri Lankan youth but also promotes cross-cultural appreciation, enabling wearers to connect with global trends without losing touch with their own cultural context. It fosters a sense of identity, confidence, and modernity, offering fashionable alternatives that bridge the gap between tradition and global fashion influences. Ultimately, the fashion collection exemplifies how fashion can serve as a medium for cultural dialogue, creativity, and innovation, illustrating the harmonious coexistence of globalization and local identity within contemporary apparel design.

Keywords: Korean fashion, hanbok style, acculturation, streetwear

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ENGLISH LANGUAGE TEACHING

UNRAVELING ZERO PERCENT ESL PASS RATES: A SOCIO-CULTURAL AND SYSTEMIC ANALYSIS OF UNDERPERFORMANCE IN SRI LANKAN SECONDARY SCHOOLS

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This study investigates the persistent phenomenon of zero percent pass rates in English as a Second Language (ESL) at the G.C.E. (O/L) examination in selected government schools within an Education Zone (EZ) in Sri Lanka. Despite nine years of formal English instruction through the national curriculum, certain schools consistently fail to produce a single passing candidate in ESL. This research seeks to understand the root causes behind this alarming trend and identify actionable strategies for educational reform. Guided by Collier's Conceptual Prism Model (CPM) of Second Language Acquisition (SLA), which emphasizes the interconnected roles of sociocultural, cognitive, academic, and linguistic processes, the study explores how factors at the individual, institutional, and systemic levels collectively influence ESL outcomes. A mixed method approach was employed using an Exploratory Sequential Mixed Methods Design. The qualitative phase included semi-structured interviews with educational administrators, focus group discussions with teachers, and school-based observations. These insights informed the development of structured questionnaires used in the quantitative phase, which involved students, parents, and teachers. Five major themes emerged: (1) Socio-economic disadvantage, where limited parental education and household instability restricted linguistic development; (2) Low student motivation, with many students unable to see the value of ESL due to immediate economic pressures; (3) Teacher competency gaps, including demotivated instructors with limited pedagogical innovation; (4) A lack of L2-rich environments in schools, where English exposure was confined to formal lessons; and (5) Systemic inefficiencies, including ineffective supervision, outdated training, and poor teacher deployment. A notable finding was the impact of localized subcultures that devalue formal education and ESL proficiency. The study concludes that these interlocking barriers severely restrict students' capacity to succeed in ESL. It recommends implementing ESL immersion programs tailored to low-socio-economic state learners, restructuring teacher training and deployment, revamping supervision mechanisms, and initiating community-based outreach to challenge limiting cultural narratives. These interventions aim to create equitable opportunities for English acquisition and broader academic success across marginalized school contexts.

Keywords: ESL, G.C.E. (O/L), Sri Lanka, second language acquisition, Collier's model, socio-economic disadvantage, student motivation, teacher competency, L2 exposure, educational reform

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AN ACTION RESEARCH INQUIRY INTO SECOND LANGUAGE ACQUISITION TO ENHANCE SPEAKING AND WRITING

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This action research study examines how targeted, acquisition-rich learning environments can enhance Grade Seven students' second language (L2) skills specifically speaking and writing of a 1C school of the Negombo Education Zone, Negombo. Analysis of ten years of G.C.E. (O/L) results in the Zone revealed the underperformance of the school in English despite having trained, fluent teachers. Preliminary interviews and observations suggested that limited exposure to meaningful L2 input and a predominant focus on form rather than authentic communication hampered students' fluency. Drawing on Second Language Acquisition (SLA) theory, which posits that meaningful interaction, rich comprehensible input, and a "silent period" precede effective L2 production, the study posited that systematic provision of listening, reading, and interactive speaking opportunities would boost learner engagement and output. The researcher adopted an adaptive Action Research model, conducting four iterative Plan–Act–Observe–Reflect cycles in one Grade Seven classroom (19 students). Data sources included: (1) pre- and post-intervention oral and written proficiency assessments; (2) classroom observations and teacher journals; (3) student self-reports and focus-group feedback; and (4) video recordings of speaking tasks. Interventions comprised curated short stories, songs, "word wall" displays, guided reading passages, and a simple English-language film all scaffolded to match learners' Zone of Proximal Development. Quantitative gains were evidenced by a 35% average increase in speaking fluency scores and a 40% reduction in basic writing errors. Students' mean word-count per writing task nearly doubled, and average pronunciation accuracy improved by two grades on a five-point scale. Learner confidence improvement was visible. Observation notes revealed more voluntary participation, peer scaffolding during group tasks, and creative use of vocabulary walls. Findings support Krashen's acquisition-learning distinction: when learners engaged with meaningful input and low-anxiety, output-focused tasks, natural L2 acquisition flourished. This study demonstrates that modest, low-cost interventions rooted in SLA theory and action research cycles can produce significant gains in L2 fluency and writing accuracy among under-exposed learners. Embedding regular "English immersion" sessions; (3) training teachers in scaffolded, student-centered facilitation.

Keywords: second language acquisition, zone of proximal development, scaffolding, speaking, writing

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A CRITICAL EVALUATION OF LEGAL ENGLISH COURSE BOOKS IN A BLENDED LEARNING SETTING: A CASE STUDY AT THE OPEN UNIVERSITY OF SRI LANKA

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The increase in global demand for legal professionals with advanced English proficiency has heightened the need for Legal English courses that are rich in content and contextually relevant. In response, this study aims to critically evaluate the English for Legal Studies course books: Part 1 - Intermediate Communication Skills and Part 2 - Advanced Communication Skills, used at the Department of English Language Teaching of the Open University of Sri Lanka (OUSL). Designed for a short-term blended learning course, the materials aim to support learners to enhance legal communication skills for academic and professional purposes. The study explores the alignment of course materials with the University Tests of English Language (UTEL) Benchmarks 2021 to identify the coverage of language skills in terms of the standard benchmarks. Initially, an impressionistic evaluation was done to get a general idea of the course books. This qualitative research employed UTEL (2021) descriptors (Bands 3-7), McGrath's (2002) evaluation checklists, and Kumar's (1996) standards for evaluation of course materials in ODL to critically evaluate the existing course books. A gap analysis was conducted to assess content, skill coverage, legal relevance, and pedagogical design, with specific focus on how the materials help students understand legal terminology, sentence structure, and practical expressions. Findings show that the course books present a logical progression from basic to advanced content and engage students through relevant and practical tasks. However, there is a need to further develop listening and speaking components, integration of skills, contextual grammar, and digital integration. Visual design, reflective tasks, and assessment tools were also identified as areas for improvement. The study recommends redesigning the materials using a blended methodology combining Task-Based Language Teaching (TBLT), Content-Based Instruction (CBI) and UTEL-aligned rubrics, while incorporating learner feedback and adapting to evolving ODL contexts. These refinements will help position the course as a benchmark model in Sri Lanka and beyond.

Keywords: legal English, UTEL benchmarks, ODL, blended learning, materials evaluation

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DEVELOPING AN ENGLISH LANGUAGE CURRICULUM FOR CHINESE NURSING STUDENTS IN SRI LANKA: BALANCING ACADEMIC AND EVERYDAY LANGUAGE NEEDS

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As global academic mobility increases, higher education institutions must design English language courses that cater to the specific and practical needs of international students. This study focuses on developing a tailor-made English curriculum for a group of Chinese students enrolled in the Masters in Nursing programme at the Open University of Sri Lanka (OUSL). Although these students were academically qualified, they struggled to use English effectively in their academic, professional, and everyday interactions. English, for them, had been learned as a classroom subject, not as a functional communication tool. The challenge, therefore, was to create a curriculum that was both practical and culturally responsive. A detailed needs analysis was conducted with input from both the Department of Nursing and the students. The analysis highlighted key areas where language support was urgently required: academic writing, speaking, listening comprehension, and everyday communication. Based on these findings, the Department of English Language Teaching (DELT) designed a short course titled *English for Healthcare Professionals*. The course consisted of 24 sessions delivered in a blended format, with online modules offered prior to the students' arrival in Sri Lanka and face-to-face classes conducted afterward. Lessons were built around real-life scenarios such as speaking to doctors, using public transport, and participating in class discussions. Materials were also developed to include healthcare vocabulary, role-play exercises, and simple grammar activities, supported by digital tools. The curriculum development process demonstrated that effective English teaching for international students requires more than academic content—it must also support students' day-to-day lives in a new environment. The course design was informed by stakeholder input and built on principles of English for Specific Purposes (ESP) and learner-centred pedagogy. This study emphasizes the importance of a needs-based, culturally aware approach to English curriculum development. It offers valuable insights for institutions aiming to support non-native English speakers in professional academic settings while ensuring they are equipped to navigate everyday life with confidence.

Keywords: English for Specific Purposes (ESP), curriculum development, needs analysis, international students, English for nursing

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ENVIRONMENTAL SCIENCES

FISH ASSEMBLAGES AS INDICATORS OF PEAT SWAMP HEALTH: EVALUATING FISH DIVERSITY IN THE SUNGAI KARANG FOREST RESERVE, SELANGOR, MALAYSIA

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Peat swamp forests are among the most distinctive and threatened freshwater ecosystems in Southeast Asia, providing critical habitats for endemic and endangered aquatic species. This study evaluated fish assemblages as indicators of peat swamp health in the Sungai Karang Forest Reserve, Selangor, Malaysia. Sampling was conducted over a month, from August 23, 2020, to September 24, 2020, across five habitat-diverse sites, utilizing two complementary capture methods, such as fish traps and scoop nets, to maximize species detection. A total of 423 individual fish representing 13 species, six families, and five orders were recorded. The Osphronemidae family was the most diverse, comprising over half of the total assemblage, with notable presence of *Betta livida* and *Betta hipposideros*, both classified as endangered by the IUCN. Catch per unit effort (CPUE) assessments revealed that *Betta livida* was the most captured species using fish traps and scoop nets combined, indicating its abundance. *Pristolepis fasciata* and *Betta bellica* also showed high capture rates, along with notable catches of *Helostoma temminckii*, *Trichopodus trichopterus*. Biodiversity was assessed using three ecological indices. The Shannon-Wiener diversity index yielded a value of 2.36, indicating moderate to high species diversity, while the Berger-Parker dominance index of 0.14 reflected low dominance by any single species. Notably, scoop nets proved more effective than fish traps in terms of capture volume and species range, accounting for 75.7% of the total individuals collected. Significant differences in catch composition between the two gear types were statistically supported ($F = 56.573$, $p < 0.05$), highlighting the influence of sampling methods on biodiversity assessments. The Sungai Karang Forest Reserve has a diverse freshwater fish community, highlighting its ecological importance. The presence of endangered species emphasizes the need to protect peat swamp habitats from threats like habitat alteration, runoff, and ecotourism. Ongoing biodiversity monitoring, habitat conservation, and community efforts are crucial to preserve Malaysia's peat swamp ecosystems.

Keywords: peat swamps, fish, diversity, indicator, diversity index, CPUE

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IMPACT OF IMPROPER SOLID WASTE DISPOSAL PRACTICES ON ENVIRONMENTAL AND PUBLIC HEALTH IN THE URBAN FRINGE OF JAFFNA

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Solid waste disposal poses a major threat to the environment and public health in developing countries, as most waste is directly dumped in open areas. In the urban fringe of Jaffna, Sri Lanka, rapid population growth and changing lifestyles have led to a sharp increase in domestic waste generation. This study investigates the impacts of improper solid waste disposal practices in the Nallur Pradeshiya Sabha area, located on Jaffna's urban–rural boundary. A descriptive statistical method was applied, with primary data collected through 50 household surveys using simple random sampling, field observations, photography, and interviews with local officials and public health inspectors. Improper disposal locations were identified using GPS technology and mapped with Google Earth Pro. Secondary data, including health records from the Medical Officer of Health (MOH), were also analyzed. Data analysis in MS Excel (2021) generated descriptive statistics, percentages, charts, and graphs, while qualitative findings were systematically coded and integrated with quantitative results. Results, presented through descriptive statistics, graphical illustrations, and GPS-based maps, indicate that common disposal practices dumping in public places, backyard burning, and discarding waste on streets or into inland water bodies persist despite regulations. Twenty-nine major improper disposal sites were identified, and most households generate considerable unmanaged waste. These practices have caused serious environmental consequences, including soil contamination, air pollution from burning plastics, and water pollution from blocked drains and seasonal pond dumping. Health impacts include increased cases of dengue, respiratory illnesses, and waterborne diseases. Institutional challenges, such as an overburdened composting facility, insufficient manpower, and transportation constraints, further hinder effective waste management. The study recommends improving collection services, promoting household-level segregation and composting, upgrading existing facilities, enhancing community awareness, enforcing stricter regulations, and strengthening inter-governmental coordination. By providing evidence-based insights, this research contributes to sustainable, community-driven waste management strategies for Jaffna's urban fringe and offers a model for other developing urban regions facing similar challenges.

Keywords: urban fringe, solid waste, household, impact, awareness, waste management

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EXPLORING THE POTENTIAL USE OF ENVIRONMENTAL LIFE CYCLE COSTING (ELCC) FOR SUSTAINABLE POULTRY PRODUCTION IN MALAYSIA

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The agriculture sector is essential for sustainable food production and maintaining socio-economic stability. Throughout the world, this sector continually faces the challenge of remaining profitable while addressing various environmental concerns. Currently, Malaysia is one of the countries that aspire to fulfil the global efforts towards sustainable agriculture. However, the challenge remains to assess the economic cost of environmental emissions generated from these activities. Given this, a study was carried out to evaluate the environmental cost associated with the agricultural sub-sector of poultry production. The study applied the method of life cycle assessment (LCA) to assess the overall environmental impacts. Following this, the approach of life cycle costing (LCC) and environmental life cycle costing (ELCC) was adopted, whereby the results for potential cost increase were assessed. The overall results indicated a potential cost increase of 25.12% if the environmental costs are included in future production costs. To avoid refusal among the producers, the best option is to encourage them to mitigate and reduce emissions before policymakers can implement new policies to impose the cost on the market. It is hoped that the findings in this study will serve as a reference for various methods to assess the environmental cost related to the agricultural sector in Malaysia.

Keywords: poultry production, environmental life cycle costing, emissions mitigation, sustainable production

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EVALUATION OF THE EFFICIENCY OF A BACTERIAL CONSORTIUM IN DEGRADING POLYCYCLIC AROMATIC HYDROCARBONS (PAH) UNDER THE INFLUENCE OF AND WITHOUT COPPER (CU) METAL STRESS

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Polycyclic aromatic hydrocarbons (PAHs) are persistent organic pollutants found extensively in petroleum-contaminated environments. They pose a severe risk due to their carcinogenic, mutagenic, and bio-accumulative properties. This study investigates the ability of a certain selected bacterial consortium to degrade PAHs, specifically naphthalene and phenanthrene, under nutrient-limited conditions and copper (Cu) stress as the heavy metal. Primary bacterial isolates obtained from environmental samples were screened on Bacto Bushnell-Haas agar infused with PAHs as the sole carbon source for primary screening. Effective colonies were then subjected to secondary screening using methylene blue as a redox indicator, and the absorbance was quantified through a spectrophotometric analysis at the absorbance level of 609nm. These methods include culturing bacterial colonies in Bushnell-Haas broth, with varying concentrations of PAHs and copper sulphate (20 ppm, 40 ppm, 60 ppm, 80 ppm, and 100 ppm). Absorbance reading indicated effective PAH degradation, particularly at 20 ppm, 40 ppm, and 80 ppm for phenanthrene and 20 ppm and 60 ppm for naphthalene. Triplicate experiments ensured statistical reliability. Initial confirmation of bacterial strains M11, C1, G13, M20, and J6 was carried out using Gram staining. The confirmed isolates were then subjected to antagonistic assays, which verified their mutual compatibility and diversity for effective consortium-based PAH degradation. Bacterial strains survived nutrient starvation and utilized naphthalene and phenanthrene as sole carbon sources. Primary screening identified efficient colonies, which were further evaluated through secondary screening using absorbance-based measurements. After 7 days, a phenanthrene-treated sample without copper showed a decrease in absorbance from 0.295 to 0.122, indicating 69.13% degradation. Under copper-induced stress, the consortium remained metabolically active, though with slightly reduced degradation.The isolates retained metabolic activity even under copper-induced stress, specifically at a concentration of 81.32 mg/kg of Cu, confirming their tolerance and resilience in heavy metal-contaminated environments, making them strong strains for an eco-friendly environment, contributing to advancing microbial bioremediation technologies and providing insights into PAH biodegradation under dual-stress conditions. This research highlights the potential applications of bacterial consortia in bioremediation targeting PAH contamination in metal-stressed environments.

Keywords: bioremediations, bacteria consortium, copper stress, naphthalene, phenanthrene

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ASSESSING WASTE GENERATION PATTERNS IN BOI INDUSTRIAL ZONES IN SRI LANKA USING A CORRELATION APPROACH

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Effective waste management is important to achieving the United Nations Sustainable Development Goals (SDGs), particularly in industrial settings where waste generation is significant. Various studies in Sri Lanka have identified environmental issues caused by industrial waste and emphasized the need for more understanding of industry-specific waste generation patterns for effective waste management. Therefore, the identification of a correlation between industrial concentration in selected areas and the types of waste generated across different industrial sectors should be vital. The objectives of this study were to analyze the correlation between the number of industrial establishments and the amount of waste generated under various categories in Board of Investment (BOI) industrial zones and to trace the trends of waste generation by industrial type and category. Data on the number of industrial operations and waste quantities categorized as solid waste, fabric waste, biodegradable waste, treatment plant sludge, in-house treatment plant sludge, hazardous waste, and other waste were collected from official BOI databases and analyzed using Spearman's correlation coefficient to assess the relationships. The analysis reported strong positive correlations between the number of industries and multiple waste categories, notably hazardous waste ($r = 0.87$), in-house treatment plant sludge ($r = 0.78$), and biodegradable waste ($r = 0.75$). These results indicate that, in the studied industrial zones, higher industrial concentration is closely associated with increased and more complex patterns of waste generation. A particularly strong correlation between in-house sludge and hazardous waste ($r = 0.90$) highlights the complex nature of industrial waste streams, which generally contain both hazardous and non-hazardous components due to diverse production and treatment processes. Also, solid waste reported a high correlation with biodegradable waste ($r = 0.91$), emphasizing the significant organic matter fraction within industrial solid waste. It also identified fabric waste as closely linked to hazardous and other waste types, suggesting that industries producing fabric waste tend to generate diverse and potentially harmful substances. Conversely, weaker correlations between treatment plant sludge and fabric or other waste categories suggest the need for distinct management pathways for sludge. The findings emphasize the interconnected nature of industrial waste categories and highlight the necessity of integrated waste management approaches.

Keywords: industrial waste, waste generation patterns, Spearman's correlation, BOI zones, Sri Lanka

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EVALUATION OF WATER QUALITY AND IRRIGATION SUITABILITY ACROSS CLIMATIC ZONES IN THE WALAWE RIVER BASIN, SRI LANKA

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The quality of surface water is vital for maintaining sustainable agriculture, particularly in regions that heavily depend on irrigation. The Walawe River Basin, an essential hydrological system in Sri Lanka, spans multiple climatic zones and supports extensive agricultural activities. However, there is a lack of research concerning the spatial variation in irrigation water quality across these zones. This study aims to examine surface water quality and its suitability for irrigation in the intermediate, dry, and arid zones of the Walawe River basin during the dry season. A total of 38 surface water samples were collected in March 2024. In situ measurements included pH, electrical conductivity (EC), and turbidity. At the same time, laboratory analyses determined the concentrations of anions and cations utilizing various spectrophotometric techniques and Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES). To assess the suitability of the water for irrigation, several established indices were calculated, including the Irrigation Water Quality Index (IWQI), Sodium Adsorption Ratio (SAR), Per cent Sodium (Na%), Kelly's Ratio (KR), Permeability Index (PI), and Magnesium Hazard (MH). Statistical differences across various climatic zones were evaluated using a General Linear Model. The results revealed significant spatial variability across several parameters, with the arid zone displaying higher pH values, electrical conductivity (EC), alkalinity, chloride, fluoride, and sulfate levels ($p < 0.05$). This variation is likely attributed to limited rainfall and increased evaporation. While most sampling sites fell within acceptable limits for irrigation use, the elevated sodium percentage (Na%) and lower permeability index (PI) values observed in the dry and arid zones indicate potential long-term risks to soil permeability and structure. The Irrigation Water Quality Index (IWQI) categorized all samples from the intermediate and dry zones as highly suitable. In contrast, 10% of the samples from the arid zone were downgraded to medium suitability. Overall, this study highlights the impact of climatic variability on irrigation water quality within the Walawe Basin. The findings advocate for implementing region-specific water management practices and ongoing monitoring programs to support sustainable agricultural development and mitigate potential future degradation of soil and water resources.

Keywords: salinity hazard, sodium adsorption ratio, sodium hazard

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A FIELD TRIAL ON THE PREVENTION OF COLOUR FORMATION IN TUBE WELL WATER OF CHAVAKCHCHERI AREA

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In Chavakachcheri (Jaffna district), an unpleasant odour, taste, and reddish-brown colour developed with time when clear water was drawn out from some tube wells. The coloured water has created problems in carrying out essential daily work. The previous research (paper 66, OURS 2020) findings reveled that brown colouration is due to $Fe(OH)_3$ and both coconut shell (CSC) and rice husk charcoal (RHC) of 212 µm (0.025 g in 25 mL of water) were effective in preventing colour formation by adsorbing iron (>78%) from tube well water within one minute of equilibration. The objective of the study was to apply these findings on a large scale in a user-friendly manner with respect to particle size, filtering medium and shaking to the community and get their views for further development. In this study, water samples were taken directly from the tube wells and total [Fe] was determined using the thiocyanate colourimetric method. Since RHC did not settle and could not be filtered using household filtering methods, a study was carried out with CSC only. In optimising studies of CSC, different weights of hand crushed (approximately 1 cm^2 area) and uncrushed charcoal were added to 500 mL and 5 L of water and were shaken 10 times every 5 minutes for 1 hr., filtered using a single cloth strainer and total [Fe] was determined before and after equilibration. The applicable least weight of biosorbent/volume of water ratio of crushed and uncrushed CSC was 0.3 – 4.0 g /500 mL and 20 g/5 L. The community trial for 6 houses was done in the rainy season with 20 g/5 L shaken 10 times /every 5 minutes for 1 hr., and nearly 50% of Fe could be removed. Treated water was used to wash a white pillowcase 3 times and allowed to sun-dry. Kept treated water in white porcelain cups for 6 hrs. Neither pillowcases nor porcelain cups were discoloured. The trial was repeated, and the results were the same. Face-to-face interviews with the householders showed that they were satisfied with the process and the outcomes, but wanted to simplify shaking and improve the filtering strainer type. The effect of shaking on Fe adsorption on CSC was determined with unshaken and shaken samples at different time intervals for different time durations. There was no effect of shaking. When applied to the community, Fe adsorption >50% resulted. To avoid filtering, a sack of different material (cotton, cotton + polyester) filled with CSC were applied but was unsuccessful since the sac materials used reduced the adsorption of Fe by CSC. The treated water was tested for drinking water quality chemical parameters, and the results showed that CSC can reduce the [Fe] to an acceptable level even in larger volumes of water without shaking. In addition, CSC can reduce the turbidity, Cl^-, TDS, SO_4^- and total hardness levels, but some only to the accepted level. This study shows that hand-crushed CSC can be used as a cost-effective, environmentally friendly biosorbent in a simple way to prevent colour development by Fe in water, with other additional advantages.

Keywords: coconut shell charcoal, Iron adsorption, coloured water, tube wells

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AQUAGUARDSL: EARLY-STAGE DEVELOPMENT OF A COMMUNITY-DRIVEN, MULTILINGUAL PLATFORM FOR REAL-TIME MARINE CONSERVATION IN SRI LANKA

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PLASTIC WASTE AND THE CIRCULAR ECONOMY: COMMUNITY-BASED EVIDENCE FROM MANNAR, SRI LANKA

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The intense use of plastics and linear waste systems has increased the accumulation of plastic in the environment. Such accumulation is a leading global issue, which suggests a shift to a circular economy focusing on recycling and waste reduction. This study examines the circular economy strategies for plastic waste management, recycling, upcycling, biodegradable alternatives, and eco-designs. The study was conducted as a case study from Mannar District in Sri Lanka on the collection and disposal of plastics among 147 respondents across six coastal fishery communities. The waste disposal sites were mapped to provide spatial patterns across the selected communities. The results showed that high levels of plastic waste originating from fisheries, households, and marine debris were due to poor disposal practices, limited infrastructure, and low public awareness. Among the identified disposal methods, illegal dumping (24.1%) and burning (17.9%) were the most prevalent. Additionally, 444 ± 17 kg Polyethene Terephthalate (PET) bottles were recovered from 24 fishery sites per month. The survey in Mannar District revealed widespread informal disposal practices and a considerable accumulation of marine plastics. However, this study highlighted strong community willingness to participate in structured waste management solutions. These findings reveal the importance of expanding similar assessments across Sri Lanka to develop effective strategies. Such efforts are essential for advancing a balanced and sustainable national plastic waste management framework grounded in circular economy principles.

Keywords: circular economy, plastic waste management, recycling, coastal communities, Mannar district, PET recovery

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VARIATION IN CINNAMON BARK CHEMICAL COMPOSITION AMONG VARIETIES IN RELATION TO PEELABILITY

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Ceylon cinnamon is valuable spice rich in volatile oils and bioactive compounds. However, harvesting is restricted to specific times of the year due to peeling difficulties in the bark during certain physiological stages and dry weather, creating a significant challenge in meeting the constant, year-round demand. This study investigated the interplay between chemical composition and peelability of the bark across three *Cinnamomum zeylanicum* varieties: Sri Gemunu, Sri Wijaya, and Common. Ten samples were collected from each variety, depending on the peelability of the bark. The bark oil was extracted using the Clevenger apparatus, which adapted the hydrodistillation method, to analyse its chemical composition using a Gas Chromatography (GC) instrument. Further, polyphenols, flavonoids, and tannins in powdered bark samples were determined using UV-VIS spectroscopy. The data obtained were analyzed using two-way ANOVA, considering variety and peelability. Gemunu and Wijaya varieties had shorter peeling times, while non-peelable samples took longer times than their peelable counterparts. Gemunu had the highest oil yield, and peelable samples showed slightly higher oil volume, indicating a marginal significance between peelability and oil yield ($p=0.0666$). Using GC reference data, α-pinene, Eucalyptus, β-caryophyllene, Linalool, Trans-cinnamaldehyde, Cinnamyl acetate, and Eugenol were identified among the constituents present in the bark oil. Trans-cinnamaldehyde represented the greatest concentration in all peelable and non-peelable bark samples (55% to 65%), with cinnamyl acetate as the next most prominent compound. The others were found in less than 10%. However, in Wijaya, cinnamyl acetate was found to be higher in non-peelable samples (23.48%) than the peelable ones (17.49%), and again, the opposite trend was observed for the common variety. There was no significant difference observed between the peelable and non-peelable samples, which indicates that both of these types can be used equally in their applications, even in less favorable conditions. Non-peelable bark of Wijaya variety had the highest flavonoid content, which was 2571 mg Quecertin Equivalents/g powder, and polyphenol content, which was 250 mg Gallic Acid Equivalants/g powder. Tannin was higher in non-peelable bark of the Gemunu variety (868 mg Tannic Acid Equivalents/g powder). Therefore, the less-peelable bark could also be a good source of bioactive compounds.

Keywords: bioactive compounds, cinnamon, chemical composition, peelability

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DRINKING WATER TREATMENT SLUDGE AS AN EFFECTIVE ADSORBENT FOR LINEAR ALKYLBENZENE SULFONATE FROM SYNTHETIC SOLUTIONS

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Drinking water treatment sludge, a byproduct of the coagulation process in water purification plants, offers potential for sustainable reuse in environmental remediation. This study investigates alum sludge as a cost-effective adsorbent for removing Linear Alkylbenzene Sulfonate (LAS), a common anionic surfactant in laundry wastewater. Due to its persistence and toxicity, improper discharge of LAS poses serious ecological risks. This study proposes an eco-friendly approach by repurposing waste sludge to eliminate such pollutants. Characterization studies of sludge showed a loamy sand texture with a pH of 7.42 ± 0.06, bulk density of 0.64 ± 0.1 g/cm³, particle density of 2.00 ± 0.4 g/cm³, porosity of 0.68 ± 0.1, and point of zero charge (PZC) of 6.60 ± 0.04. Batch adsorption studies were conducted using the Methylene Blue Active Substances (MBAS) method to evaluate LAS removal under varying particle sizes, sludge dosages, contact times, and pH levels. Fine particles (<0.5 mm) achieved the highest removal efficiency ($47.04 \pm 1.32\%$), while coarser particles (>3.2 mm) were less effective. Adsorption efficiency increased with higher sludge-to-solution ratios, peaking at 99.52% at a 1:2 ratio; beyond this, no significant improvement occurred. Contact time studies found optimal removal ($99.49 \pm 0.20\%$) at 60 minutes, after which equilibrium was reached. Lower pH (acidic pH) favored the adsorption process, and adsorption data fit the Langmuir isotherm model, suggesting monolayer surface coverage. These results highlight the potential of alum sludge in removing LAS from contaminated water, providing a low-cost, sustainable alternative to traditional adsorbents. The study supports waste valorization and lays the groundwork for eco-friendly surfactant removal methods using readily available industrial byproducts.

Keywords: Alum sludge, adsorption, laundry wastewater, wastewater treatment,

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SPATIAL VARIATION OF FORAGE MATTERS OF ASIAN ELEPHANTS IN HUMAN-DOMINATED AND NATURAL AREAS IN WASGAMUWA, SRI LANKA

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Understanding the dietary patterns of Asian elephants *(Elephas maximus*) in varying habitats is critical for effective conservation and Human elephant conflict mitigation. This study investigated the dietary preferences of elephants in natural and human-dominated areas of Wasgamuwa, Sri Lanka, from August 2024 to March 2025. The Wasgamuwa National Park was chosen as the natural area. The villages near the southern border of the park were chosen as the human-dominated area. A total of 100 dung samples were collected, with 50 from each area, and analyzed under the microscope to identify forage matters. Nine plant species were identified from the analysis, where two species were distinctively found in the samples collected from the human-dominated area, and one plant species was found to be distinctive to the natural area. The remaining seven plant species were found in samples from both areas. Monocot leaves were present in all samples, and wood particles were more abundant in elephant dung from human-dominated areas. These findings indicate that elephants primarily consume monocot plants, with *Panicum maximum* as the most consumed species across both habitats. To identify the forage consumed by elephants in relation to availability in both areas, 24 quadrats (10 m × 10 m) were established in each area. A total of 14 plant species were identified:two species were exclusive to the natural area, five species were found only in the human-dominated area, and the remaining seven species were common to both areas. *Tectona grandis* was the most consumed species in human-dominated areas, while *Cynodon dactylon* dominated in natural areas. These findings suggest elephants adapt their diet to forage availability, favouring grass in natural areas and tree species in human-dominated areas. Surveys with farmers were conducted to assess and identify the crop preferences of elephants. Ninety-seven crop-raiding incidents were recorded. Through these recorded incidents, 15 crops were identified that were consumed by the elephants. With paddy being the most raided crop. The peak of raids happens in December. Physical properties of dung, including moisture (24.59% in human-dominated areas vs. 26.51% in natural areas; p=0.101) and crude fibre content (47.27% vs. 40.47%; p=0.33), were analyzed using standard methods. Minor differences were observed in the physical condition of dung between the two areas. These findings provide a baseline for future research on foraging variations and inform habitat management strategies to reduce human-elephant conflict while supporting elephant conservation.

Keywords: Asian elephants, crops, human dominated area, natural area

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ASSESSING THE RELATIONSHIP BETWEEN TOURIST ARRIVALS AND PET PLASTIC WASTE COLLECTION IN SRI LANKA: AN ANALYSIS FROM 2019 TO 2024

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Plastic pollution remains a major global environmental concern, with post-consumer polyethene terephthalate (PET) waste forming a significant share of plastic debris. Sri Lanka, as a developing island nation and popular tourist destination, faces many challenges in managing plastic waste, particularly during periods of increased tourist arrivals. While previous studies have broadly examined plastic waste generation in tourism contexts, there are no proper studies related to PET plastics or to quantifying their relationship with tourism in Sri Lanka. This study addresses that gap by investigating the relationship between monthly international tourist arrivals and PET plastic waste collection volumes reported by a major private sector recycler from 2019 to 2024. The recycler collects PET from both formal and informal streams nationwide, and tourist arrival data obtained from the Tourism Development Authority. Descriptive analysis and Pearson correlation tests were applied to assess both direct and lagged relationships between two variables. Lagged analysis was conducted by shifting the PET waste data by one month to test for delayed impacts of tourism. Descriptive analysis revealed sharp declines in both tourist arrivals and PET collection in mid-2019 and early 2020, corresponding to Easter attacks and COVID-19 travel restrictions, respectively. PET collection gradually recovered from late 2021, and even as tourism recovery was more gradual, indicating that domestic consumption and improvements in collection infrastructure also influenced collection trends. Pearson correlation tests showed a statistically significant moderate positive correlation between tourist arrivals and PET collection ($r = 0.629$, $p<0.05$). The lagged analysis also revealed a moderate correlation ($r = 0.430$, $p<0.05$), suggesting that the effect of tourism on PET waste collection may not be immediate but may emerge in the following month due to delays in waste generation, collection, and transport processes. By linking the nationwide PET waste collection to tourism flows, this study provides new empirical evidence of tourism's contribution to plastic waste in Sri Lanka. The findings highlight the importance of seasonally responsive waste management strategies and can inform waste collectors, recyclers and local authorities in planning resource allocation during peak tourist seasons.

Keywords: PET plastic, tourism, waste collection, correlation analysis, lag effect

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NANO-INFUSED CELLULOSE- BEESWAX FILMS - SYNTHESIS, SOLUBILITY AND TOXICITY: REVOLUTIONIZING SUSTAINABLE PACKAGING

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Petroleum-derived plastic packaging is one of the major environmental pollutants, which persists for centuries and causes severe harm to wildlife. To address this challenge, a composite film was made entirely from renewable biopolymers, including cellulose and beeswax, via solution casting. For the preparation of biopolymer, Cellulose, which is dissolved or dispersed in a solvent, was mixed with molten beeswax, then cast and dried into thin films. The film's water dissolution time was recorded by adjusting the beeswax content, on the order of ~10 seconds up to ~1800 seconds (~30 minutes), reflecting the increased hydrophobic barrier provided by the wax phase. In Toxicity assays were conducted using *Artemia salina* larvae to assess the environmental safety of the developed films. Each test concentration (10, 100, 1000, 10,000, and 100,000 ppm) included 10 larvae per replicate and was performed in triplicate, using artificial seawater as the control (0% mortality observed). The highest tested concentration (100,000 ppm) resulted in a maximum mortality of 43.33% ± 5.77%, while lower concentrations showed ≤7% lethality in most cases. One-way ANOVA revealed that mortality rates at lower concentrations were not significantly different from the control ($p > 0.05$), indicating statistically negligible toxicity under standard conditions. The experimental setup involved exposing *A. salina* larvae to 300 µL of each test solution in sterile 96-well plates for 24 hours at room temperature, without aeration or feeding. These results align with the known behaviour of cellulose-based materials, which fully biodegrade under natural conditions and show no adverse effects on algae, daphnids or fish at high concentrations. Overall, nano-infused cellulose–beeswax films combine tunable functional performance (from water solubility to barrier properties) with confirmed biodegradability and low ecotoxicity. This synergy of designed functionality and environmental safety makes them promising materials for eco-friendly packaging applications.

Keywords: sustainable packaging, cellulose-beeswax-nanocomposite, water solubility, toxicity assay, biodegradability

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THE USE OF RAINWATER AS A RELIABLE ALTERNATIVE FOR DRINKING PURPOSE IN DRY ZONES IN SRI LANKA: A COMPARATIVE STUDY IN THE MEDAWACHCHIYA AND KEBITHIGOLLEWA AREA, ANURADHAPURA

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Access to safe drinking water remains a critical public health issue in the dry zone of Sri Lanka, particularly the North Central Province (NCP), where the prevalence of chronic kidney disease of unknown aetiology (CKDu) is high. This study investigates the safety and suitability of rainwater as an alternative drinking water source by comparing its quality with six commonly used water sources: well water (WLW), tube well water (TWW), tap water (TPW), tank water (TNW), reverse osmosis water (ROW), rainwater (RNW), and spring water (SPW) in Medawachchiya (MED) and Kebithigollewa (KEB) divisions. In this study, 53 families from the MED division and 72 families from the KEB division were randomly selected. A total of 213 water samples commonly consumed by these families were collected in triplicate from their respective l sources. The collected water samples were analyzed in for key chemical parameters, including pH, conductivity, total hardness, and alkalinity and were evaluated against the drinking water standards introduced by the World Health Organization (WHO) and Sri Lankan Standards Institution (SLSI). According to the results, the pH values of all the water samples were within the acceptable limits (6.5−8.5). The conductivity of the different water sources in both areas was increasing in the order of ROW (32.9±1.85 μS/cm) < RNW (33.7±16.3 μS/cm) < TNW (268.55±1.55 μS/cm) < TPW (559±128 μS/cm) < TWW (765±80 μS/cm) < WLW (860±526 μS/cm). The total hardness of most of the water sources in both regions fell within the acceptable range (250 – 600 ppm), while some WLW and TWW samples in both regions recorded higher values (>700 ppm). The alkalinity of TPW, WLW, and TNW demonstrated extreme values (>850 ppm) in both regions. RNW and ROW exhibited significantly lower conductivities (<50 μS/cm) while RNW showed lower hardness (<12 ppm) and alkalinity (<128.0 ppm) than ROW in both regions. The results highlight that there was no significant difference (Mann-Whitney test, $p>0.05$) between the ROW and RNW in terms of the water quality parameters tested. Therefore, rainwater can be promoted as a reliable source of drinking water in the dry zone of Sri Lanka following verification of its microbiological safety.

Keywords: CKDu, drinking water, ground water, North Central Province, rainwater harvesting, Sri Lanka

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THE ROLE OF ECOTOURISM IN PROTECTING SRI LANKA'S ENDEMIC SPECIES AND BIODIVERSITY HOTSPOTS: A COMPREHENSIVE REVIEW

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Sri Lanka harbours exceptional endemic species diversity within its 65,610 km² landmass and has been recognized as one of the world's 36 biodiversity hotspots. With over 3,200 endemic species, including flora and fauna, the island faces mounting conservation challenges from habitat fragmentation, human-wildlife conflict, and development pressures. The island's unique geographical position and varied climatic zones have created distinct ecosystems ranging from tropical rainforests to montane grasslands, each supporting specialised endemic communities. Ecotourism has emerged as a potential conservation strategy, generating revenue while promoting environmental protection and raising awareness about biodiversity conservation. However, the effectiveness of ecotourism in safeguarding Sri Lanka's endemic species and critical habitats requires systematic evaluation. This study aims to systematically evaluate the effectiveness of ecotourism as a conservation strategy for endemic species protection in Sri Lanka, examining conservation outcomes, community impacts, and implementation challenges across different protected areas and ecosystems. This systematic review synthesised peer-reviewed literature from 1995-2024 using databases including Web of Science, Scopus, and Google Scholar. Keywords used included "Ecotourism Sri Lanka," "Endemic species conservation," "Biodiversity hotspots," and "Sustainable tourism." Studies were included if they: (1) focused on Sri Lankan protected areas or endemic species, (2) examined ecotourism impacts on conservation outcomes, and (3) provided quantitative or qualitative data on tourism-conservation linkages. Exclusion criteria eliminated studies without empirical data, those focusing solely on mass tourism, and reports lacking peer review. Data extraction captured study design, geographic location, target species, conservation outcomes, and community impacts. A total of 87 studies were analyzed, focusing on protected areas, community-based conservation initiatives, and tourism impact assessments. Additional grey literature and government reports were reviewed to provide comprehensive coverage of ecotourism initiatives across different protected areas. Analysis revealed that ecotourism contributes significantly to endemic species protection through multiple mechanisms. Challenges persist, including limited local community participation in some regions due to inadequate benefit-sharing mechanisms, lack of technical skills and training opportunities, weak institutional support, and limited access to credit for tourism-related enterprises. Ecotourism demonstrates considerable potential for endemic species conservation in Sri Lanka when implemented with proper planning and community engagement.

Keywords: biodiversity hotspots, ecotourism, endemic species, Sri Lanka, wildlife conservation

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SPATIAL AND TEMPORAL DISTRIBUTION OF MICROPLASTICS IN SURFACE WATER OF BOLGODA LAKE, SRI LANKA

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Microplastic (MP) pollution is often referred to as the invisible threat of our era due to its minute size. Microplastics are defined as plastic particles less than 5 mm in size and can be transported across various ecosystems, including the atmosphere. They also have the potential for bioaccumulation and biomagnification within food chains. This study investigates microplastic pollution in Bolgoda Lake and examine the temporal variation of microplastics during the wet and dry seasons. Fifteen water samples were collected from randomly selected different locations across the lake during both seasons, with duplicates taken to ensure accuracy. A total of 25 liters of water were filtered using a 300 µm sieve, and the residue was collected for analysis. This residue underwent a digestion process followed by density separation. The extracted microplastics were then observed using a stereo microscope. The results indicated that the wet season exhibited a higher abundance of microplastics compared to the dry season. The concentration of microplastics in surface water was higher during the wet season (372 ± 143 MPs/m³) than in the dry season (252 ± 198 MPs/m³). In both seasons, microfibers were the predominant type of microplastic observed. Regarding color distribution, the microplastics observed during the wet season followed this order: Black > Red > Blue > Transparent > Green > Yellow > White. A similar pattern was found during the dry season, with the order being: Black > Red > Blue > Green > Transparent > Yellow > White. Results further indicated that areas near urban development recorded a higher abundance of microplastics compared to more isolated regions. This study highlights that Bolgoda Lake exhibits the highest concentration of microplastics in its surface waters. These findings provide crucial baseline data for understanding the sources, threats, and seasonal distribution of microplastic pollution in Bolgoda Lake and provide valuable insights for policymakers, researchers, and local communities.

Keywords: Bolgoda Lake, microplastics, surface water, plastic pollution

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HEALTH SCIENCES

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ASSESSMENT OF FOOD SECURITY AND FOOD ENVIRONMENT AMONG FIRST YEAR UNDERGRADUATES IN PUBLIC SRI LANKAN UNIVERSITIES

is not presented at IRC-OUSL 2025

EFFECT OF UNANI FORMULATIONS IN MENORRHAGIA : A CASE STUDY

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Menorrhagia or *Kasrat-e-Tams* is excessive or prolonged menstrual bleeding at regular intervals. It is a symptom and not in itself a disease, which significantly impacts women's quality of life. While multiple treatments exist, some cases remain unresponsive, necessitating alternative approaches. This case study evaluates the clinical effect of specific Unani formulations in managing chronic menorrhagia unresponsive to previous treatments. A 29-year-old nulliparous woman residing in Australia had experienced heavy menstrual bleeding for five years. She underwent both Ayurveda and allopathic treatments for nine months but no relief was obtained. Upon returning to Sri Lanka, she sought care at the National Ayurveda Teaching Hospital, Borella, where she was admitted from April 6 to April 28, 2025, for Unani treatment. Clinical examination revealed pallor; ultrasonography indicated an increased endometrial thickness of 20–21 mm without other pelvic pathologies. The patient received oral Unani formulations: *Qurs-e-Kehruba* one tablet morning and evening, *Qurse kustae faulad* two tablets morning and evening, *Safoof-e-Habis-ud-Dam* 5gm morning and evening, powder of *Haleela, baleela* and *Amla* 5gm morning and evening and *Majoon-e- Dabeed-ul-Ward* 5gm morning and evening. Additionally, daily sitz baths with *Post-e-Anar, Roasted Alum* and *Mazu Sabz* decoctions and powder of *Imly* paste on lower abdomen for one month were administered. After continued one-month treatment, pallor resolved, and the patient reported normal menstrual flow. This case highlights the potential of Unani formulations in managing chronic menorrhagia resistant to other treatments. As this is a single case report, findings cannot be generalized; further controlled studies are justified.

Keywords: menorrhagia, Unani medicine, *Qurs-e-Kehruba, Safoof-e-Habis-ud-Dam, Majoon-e-Dabeed-ul-Ward*

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DETECTION OF ANTIBIOTIC-RESISTANT BACTERIA IN DRINKING WATER SOURCES WITHIN THE COLOMBO DISTRICT OF SRI LANKA

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The rise of antibiotic-resistant bacteria in water distribution systems poses a significant risk to public health, particularly in regions such as Sri Lanka, where much of the infrastructure was built decades ago and may not meet present-day standards for bacterial control. This study aimed to detect the presence of antibiotic-resistant bacteria in drinking water sources within the Colombo District of Sri Lanka, focusing on two household sampling sites to which water is supplied by the National Water Supply and Drainage Board (NWSDB). Five biological replicates were analysed using various culturing methods: direct spread plating, direct quadrant streaking, and nutrient broth enrichment spread plating. This was followed by colony morphology observation, Gram staining, biochemical tests: catalase test, oxidase test, methyl-red, and Antibiotic susceptibility testing (ABST) via Kirby-Bauer disc diffusion method. The antibiotics tested were Gentamycin (10µg), Vancomycin (30µg), Ciprofloxacin (5µg), and Ampicillin (10µg). The results were analysed using Cowan and Steel's biochemical guidelines, WHO-listed waterborne pathogens, and CLSI guidelines. No fully resistant bacterial species were observed across all samples. However, potential intermediate resistance to Ciprofloxacin (5µg) by provisional *Campylobacter* spp. or *Pseudomonas* spp. was observed across an isolate from each sampling site, validating the importance of performing routine ABST to monitor bacterial resistance trends. Statistical analysis (ANOVA) confirmed no significant variation in antibiotic response across the samples. Future work should utilise molecular methods such as PCR for bacterial species confirmation and sample collection from multiple districts to assess bacterial resistance trends.

Keywords: antibiotic resistance, bacterial identification, culturing water samples, Kirby-Bauer disc diffusion, water distribution systems, waterborne pathogens, water quality monitoring.

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DIETARY INTAKE AND NUTRITIONAL STATUS AMONG ADOLESCENTS IN A SELECTED SCHOOL IN MONARAGALA DISTRICT, SRI LANKA

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This cross-sectional survey assessed dietary intake and nutritional status of 95 students, aged 15 to 16 years, from a selected national school in Monaragala district, Sri Lanka, at an academic stress period due to ordinary-level examination. The study's main objectives are to assess adolescents' dietary intake patterns using a seven-day food diary and determined to determine their anthropometric measures (BMI, weight and height). Participants were trained to complete a structured seven-day food diary. Nutrient information was calculated for Sri Lankan food-based dietary guidelines in order to approximate average daily servings for the most significant food groups. The anthropometric data showed that the corresponding values for mean BMI, weight, and height for girls and boys were 19.66 kg/m², 44.20 kg, 150.13 cm, 19.54 kg/m², 47.05 kg, and 154.99 cm. This expressed that both genders had healthy levels of BMI. Boys have consumed significantly higher numbers of servings of starch and cereals compared to girls ($P \leq 0.05$), with an average of 12.644 servings compared to 11.726 servings for girls. Although serving size is lower than the recommended level for fish, eggs, and lean meat, the serving size of boys (1.439) is significantly higher ($p \leq 0.05$) than that of girls (1.096). However, except for cereals and starches, the intake of the remaining food groups like pulses and legumes, fruits, vegetables, milk and dairy products, sugars and sweets, oily nuts, oils and fats was less than the daily minimum requirements for both genders. Notably, there was no significant correlation between gender, anthropometric measurements, and serving size in any food group. These findings indicate that while both boys and girls are healthy in terms of BMI, their dietary patterns are unhealthy, with suboptimal intake of several important food groups. Interventions and focused nutrition education are needed to overcome these nutritional deficits and promote a better adolescent diet.

Keywords: adolescent nutrition, dietary patterns, BMI, serving size

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ASSOCIATION OF WHITE BLOOD CELL AND PLATELET INDICES WITH BODY MASS INDEX AMONG FEMALE UNIVERSITY UNDERGRADUATES IN SRI LANKA

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Obesity is a significant health concern among young adults, yet its impact on haematological parameters in young individuals remains underexplored. The present study found that a higher body mass index (BMI) was linked to increased white blood cell (WBC) count and platelet indices, along with a decreased eosinophil percentage, suggesting obesity-related haematological alterations even in healthy undergraduates. This cross-sectional study was conducted among 91 healthy females aged 18-25 after obtaining ethical approval from the Ethics Review Committee of the Institute of Biology, Sri Lanka (ERC IOBSL 380/11/2024). Participants were required to complete a self-administered questionnaire to select healthy individuals without a diagnosed chronic illness. Participants were excluded if they smoked, consumed alcohol, were pregnant, recently ill, had haematological disorders, donated blood within the last six months, or used medications/supplements affecting haematological parameters. Anthropometric measurements were employed to calculate BMI. Height was recorded using a standard stadiometer, with participants standing upright, their heels, hips, and head aligned against the measuring surface. Body weight was assessed using a calibrated electronic scale. Participants were divided into four groups according to Asian BMI classification: underweight (BMI < 18.5kg/m2), normal weight (BMI=18.5-22.9 kg/m2), overweight (BMI=23.0-24.9 kg/m2) and obese (BMI $\geq$ 25.0 kg/m2). The full blood count analysis was performed using an automated haematology analyser (Mindray BC-20, Shenzhen, China). Correlation analysis was performed using Pearson or Spearman coefficients, with $p < 0.05$ considered statistically significant. Statistically significant positive correlations were observed between BMI and total WBC ($r = 0.434$, $p \leq 0.0001$), absolute granulocyte count ($r = 0.362$, $p = 0.0001$), platelet count (PLT) ($r = .326$, $p = 0.002$), and plateletcrit (PCT) ($r = 0.383$, $p = 0.000$), whereas eosinophil percentage showed a significantly negative association ($r = -0.272$, $p = 0.009$). Several WBC and platelet indices, including absolute lymphocyte count ($r = 0.032$, $p = 0.763$), monocyte percentage ($r = -0.187$, $p = 0.077$), mean platelet volume ($r = 0.002$, $p = 0.982$), and platelet distribution width ($r = 0.048$, $p = 0.653$), did not demonstrate statistical significance with the BMI. Future research should explore causal relationships between BMI and haematological alterations in more diverse populations. Therefore, the present study contributes to understanding obesity induced haematological alterations and provides a basis for future longitudinal investigations.

Keywords: body mass index, platelet count, white blood cell count

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"SMART NADI PARIKSHA": A CONCEPTUAL FRAMEWORK FOR PULSE DIAGNOSIS IN AYURVEDA AND HELA WEDAKAMA FOR HEALTH PREDICTION

is not presented at IRC-OUSL 2025

ABIOTIC STRESS EFFECTS ON PHYTOCHEMICALS AND ANTIOXIDANTS OF *C. speciosus*, AND BIOACTIVITY PROFILING (ANTIDIABETIC AND ANTIBIOTIC) IN HEALTHY PLANTS

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Abiotic stress refers to unfavourable environmental conditions that affect plant growth and survival by disrupting physiological processes, causing oxidative damage and cellular dysfunction. Plants respond to abiotic stress via adaptive mechanisms, such as altering metabolic pathways and producing stress-related proteins. This study explores the morphological changes and quantitative and qualitative evaluation of phytochemical composition of *C. speciosus* under abiotic stress conditions, including drought, high salinity, flood and nutrient deficiency, to investigate its adaptive mechanisms, while also investigating the antibacterial and anti-diabetic properties of *C. speciosus* to evaluate its potential medicinal applications. The stress-induced plants exhibited stress-specific symptoms such as leaf senescence, yellowing, and curling, resulting from oxidative stress and disrupted metabolic pathways. The qualitative analysis of the aqueous extract of *C. speciosus* revealed changes in phytochemicals such as alkaloids, phenols, flavonoids, coumarins, saponins, cardiac glycosides, tannins, terpenoids and steroids under varying stress conditions compared to the control plants. In the quantitative analysis, the moisture content was high in control plants (92.80%), whereas plants subjected to high salinity stress showed the lowest moisture content (58.99%). Flooding stress (29.58 $mgGAEg^{-1}$) significantly increased the total phenolic content compared to control plants and other stress conditions. Flooding (5.119 $mgQEg^{-1}$), high salinity (7.335 $mgQEg^{-1}$) and nutrient deficiency (9.73 $mgQEg^{-1}$) conditions elevated total flavonoid content compared to the control plant. Total antioxidant capacity increased under flooding and drought (3.233 $mgAAEg^{-1}$) but decreased with nutrient deficiency compared to the control plant. Flooding, high salinity and nutrient deficiency caused a decrease in total protein content. The change in the phytochemical composition highlights the plant's strategies to combat oxidative stress and maintain homeostasis. The methanolic extract of *C. speciosus* exhibited selective antibacterial activity, forming 10 mm inhibition zones, inhibiting the growth of *Escherichia coli*, but it was found to be ineffective against *Staphylococcus aureus*. Additionally, the extract (3.62 mg/mL) showed promising antidiabetic potential (60.674 %), with α-amylase inhibition comparable to that of standard acarbose (62.068%), suggesting its effectiveness in managing hyperglycaemia. The outcomes provide a foundation for exploring *C. speciosus* as a source of bioactive compounds for pharmaceutical and agricultural applications.

Keywords: abiotic stress, *Costus speciosus*, phytochemicals, antiglycemic, antibiotic

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GREEN SYNTHESIS OF SILVER NANOPARTICLES (AGNPS) FROM FIVE SPECIES OF *Cyperus* GENUS AND CHARACTERIZATION OF THEIR BIO-FUNCTIONAL AND CATALYTIC PROPERTIES

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Nanotechnology offers a sustainable approach for synthesising materials at the nanoscale, enhancing their physicochemical and biological properties. This study investigated the green synthesis of silver nanoparticles (AgNPs) using aqueous root extracts (AEs) of five *Cyperus* species, namely *C. mindorensis*, *C. esculentus*, *C. alternifolius*, *C. rotundus*, and *C. eragrostis*. Phytochemical screening revealed the presence of carbohydrates, saponins, proteins, and quinones in all AEs, while tannins and carboxylic acids were absent. SEM analysis confirmed spherical AgNPs of 20–50 nm. Compared to AEs, AgNPs showed significantly higher total flavonoid content (TFC), total phenolic content (TPC), and total antioxidant capacity (TAC). *C. esculentus* AEs showed 746.09 g/QE/100g for TFC, 543.34 g/GAE/100g for TPC, 52.988 g/AAE/100g for TAC, and AgNPs exhibited the highest TFC level (4.2 g/QE/100g), the highest TAC levels (319 g/AAE/100g), and the highest TPC levels (2158 g/GAE/100g). The antibacterial potential of the synthesised AgNPs was evaluated using the well diffusion method with gentamycin serving as positive control, revealing significant inhibitory activity against *E. coli* and *S. aureus*. Notable zones of inhibition were observed: *C. esculentus* – 11 mm, *C. alternifolius* – 11 mm, *C. rotundus* – 10 mm, and *C. eragrostis* – 11 mm. But *C. mindorensis*-AgNPs did not exhibit antibacterial properties. Cytotoxicity tests using *Artemia salina* indicated 100% viability across all AgNP concentrations, confirming biocompatibility. In catalysis studies, AgNPs facilitated the reduction of para-nitrophenol (PNP) to para-aminophenol (PAP), with *C. esculentus*-AgNPs showing the highest rate constant (0.1351 min^{-1}). Degradation of PNP was observed within 20 min at 420 nm, and formation of PAP was observed at 320 nm. Photocatalytic degradation experiments were performed with both methylene blue (MB) and methyl orange (MO). Photocatalytic degradation of MB and MO was faster with 4000ppm AgNPs, while 267ppm AgNPs showed enhanced degradation when combined with $NaBH_4$. 4000ppm showed higher degradation with AgNPs and AgNPs with $NaBH_4$. Bioinformatic docking analysis revealed silver ion binding with key residues (Ser127, Asn124) of the TRAF1 (1KZN) protein (pbd_00001kzn), suggesting potential anticancer applications. These results demonstrate that *Cyperus*-derived AgNPs possess multifunctional properties, highlighting their potential use in biomedical and environmental fields.

Keywords: AgNPs, *Cyperus*, green synthesis, antioxidant, photocatalysis, molecular docking

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SYNTHESIS, CHARACTERISATION, AND ANTIBACTERIAL POTENTIAL OF A Pt(II) COMPLEX WITH A NOVEL LINEAR SULFONAMIDE LIGAND TERMINATED BY BENZIMIDAZOLYL MOIETIES

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Platinum complexes have been extensively studied for their antibacterial and anticancer properties, primarily due to their ability to bind to DNA and proteins. In recent years, there has been growing interest in the development of novel N-donor ligands to enhance these biological activities. This study aimed to synthesise and characterise a novel *N,N′,N″*-donor linear sulfonamide ligand terminated with benzimidazolyl rings, along with its corresponding platinum (II) complex, to investigate their potential biological applications. The compounds were characterised using ^{1}H and ^{1}H–^{1}H ROESY NMR, FTIR, UV–Visible, and fluorescence spectroscopy. The ^{1}H and ROESY NMR spectra reveal that the methylene protons, which appear as singlets in the free ligand (L), split into two doublets in the platinum complex, indicating bidentate coordination to the Pt(II) centre, forming a symmetrical complex. This coordination restricts the free rotation of the methylene group, leading to the observed spectral changes. Tridentate binding is considered unlikely, as literature evidence suggests that similar *N,N′,N″*-donor linear sulfonamide ligands do not coordinate to Pt(II) in a tridentate fashion due to electronic and steric restrictions. The resulting yellow solid of the platinum complex is soluble in chloroform but insoluble in polar solvents such as water. Spectroscopic and literature data collectively support the formation of a $Pt(L)Cl_2$ -type complex, featuring an eight-membered chelate ring. Notably, complexation results in significant fluorescence quenching compared to the free ligand. The potential antibacterial activity of both the ligand (L) and the complex (C) was evaluated against gram-positive, *Staphylococcus aureus* ATCC25923, and gram-negative, *Escherichia coli* ATCC25922, using the agar well diffusion method. Both compounds exhibited minimal to no antibacterial activity even at 4000 ppm, suggesting limited interaction with bacterial cellular components. Nevertheless, further cytotoxicity studies on mammalian cell lines are warranted to assess their potential as anticancer agents.

Keywords: N-donor sulfonamide ligands, Benzimidazole, antibacterial.

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ANTIBIOFILM POTENTIAL OF SILVER, ZINC OXIDE AND TITANIUM DIOXIDE NANOPARTICLES AND THEIR APPLICATION IN WATER PIPELINES

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Biofilms are complex microbial structures that adhere to surfaces and are enclosed within self-produced extracellular polymeric substances (EPS), enabling them to resist disinfectants and antibiotics. Biofilm formation in water plumbing systems presents a serious risk to water hygiene and public health. The biofilm structures significantly reduce the efficacy of conventional disinfection methods and contribute to chronic contamination of water distribution and drainage lines. This study investigates the synthesis and evaluation of silver (Ag), zinc oxide (ZnO), and titanium dioxide (TiO_2) nanoparticles (NPs) with respect to their antibiofilm properties and potential applications in water pipeline systems. Biofilm-producing bacteria isolated from both water and scraping samples collected from kitchen and washroom pipelines were used to evaluate the antibiofilm efficacy of the nanoparticles. Ag, ZnO, and TiO_2 nanoparticles were synthesized by chemical reduction, microwave-assisted and sol-gel/hydrothermal methods respectively. The antibiofilm efficacy of the nanoparticles was assessed individually and in combination using the Tissue Culture Plate (TCP) method. To assess practical applicability, PVC pipe segments were coated with combination of ZnO–TiO_2 nanoparticles and compared with painted and uncoated controls. Biofilm formation was monitored over a three-month period using optical density (OD) measurements. The percentage of biofilm inhibition was calculated by the differences of the OD values of untreated and treated bacteria. All nanoparticles showed concentration-dependent inhibition. Especially, ZnO–TiO_2 combination showed the highest level of inhibition across different biofilm bacteria, suggesting a synergistic effect. During the first month, the nanocoated pipes showed biofilm formation (OD ≈ 0.57) that was almost similar to the uncoated controls (OD ≈ 0.58). However, a notable decrease in OD values (to approximately 0.51–0.53) was observed during the second and third months, indicating the effectiveness of the nanoparticles in inhibiting biofilm formation. These values were comparable to those of painted pipes and significantly lower than those of the uncoated controls (~0.58–0.68). Overall, the findings confirm that ZnO–TiO_2 nanocoatings effectively reduce biofilm accumulation over time and could serve as a promising alternative to chemical paints.

Keywords: antibiotic resistance, biofilm, nanoparticles, nanocoating, water plumbing system

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ASSOCIATION OF DIFFERENT FOOD LABEL FORMATS WITH HEALTHINESS EVALUATION AND CONSUMER FOOD CHOICES: A STUDY IN KESBEWA, SRI LANKA

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Food labels play an essential role in enabling consumers to make informed food choices and ensuring fair trade in the food industry. In Sri Lanka, numerous studies have explored the Traffic Light System, creating a notable gap in understanding the associations of different food label formats with healthiness evaluation and consumer choices. This study explored the variations in consumer awareness, knowledge, attitudes and food label utilization across different demographic factors. Further, determined how consumer awareness, knowledge, attitudes, and label utilization relate to their evaluation of foods and their food choices. Finally, the associations of different food label formats with consumers' healthiness evaluation and their food choices during purchasing were evaluated. The study involved 383 participants from the Kesbewa area using an interviewer administered questionnaire in the Sinhala language, and a consumer study comprising a choice task and a rank task comparing four label formats, including the Traffic Light System, Nutrition Fact Panel, Nutrition Fact Panel with Daily Values and Simple Statements. Statistical analysis was conducted using R Studio. Results indicated that consumer awareness, knowledge, attitudes and label utilization varied with gender, education level, income level, and health conditions. Both healthiness perception and consumer food choices were strongly and positively correlated with consumer knowledge, attitudes, and food label utilization. The Traffic Light System and Nutrition Fact Panel with Daily Values showed potential positive associations with improved nutritional choices, but lacked statistical significance. The Traffic Light System and Simple Statements were more effective than the Nutrition Fact Panel in enhancing the correct nutritional ranking of food. Educational and intervention strategies addressing the above demographic differences could promote better understanding and food label utilization for healthier choices. Descriptive front of pack food labels are more effective than numerical back of pack food labels in assisting consumers' healthier purchasing. Therefore, the government, relevant authorities, together with the food industry, should prioritize introducing and implementing descriptive food labels to enable consumers to make healthier food choices.

Keywords: consumer food choices, food label formats, food label utilization, healthiness evaluation, nutritional quality

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NURSES' EXPERIENCES OF REHABILITATION CARE FOR OLDER PEOPLE WITH STROKE AT A SELECTED REHABILITATION HOSPITAL, SRI LANKA

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Stroke is a leading cause of long-term disability among older adults, often requiring comprehensive rehabilitation to restore functional independence. Nurses play a key role in the multidisciplinary care team, particularly in rehabilitation settings where continuous support, encouragement, and skilled care are needed. Understanding nurses' experiences in delivering such care is essential for enhancing patient outcomes and improving nursing practice. The primary objective of this study was to explore the experiences of nurses in providing rehabilitation care to older adults recovering from stroke at the Rehabilitation Hospital, Sri Lanka. The study also aimed to discuss the specific needs of older stroke patients, describe patients' future expectations as identified by nurses, and perceived challenges and enablers in their caregiving role. A qualitative approach and descriptive design were employed. Data were collected through semi-structured interviews with purposively selected registered nurses working in the stroke rehabilitation wards at the selected Rehabilitation Hospital. The interviews were audio-recorded, transcribed verbatim, and analyzed thematically using Braun and Clarke's method to extract key themes and patterns related to their experiences. Ethics approval was sought from the Ethics Review Committee of the Colombo National Hospital, Sri Lanka. Thematic analysis revealed four main themes: (1) Family support and empathy – nurses highlighted the significance of patients' strong ties with family and the role of empathetic support by family in meeting their physical and emotional needs; (2) Hope for recovery and independence – Many patients hoped to regain their independence and return to their normal life. (3) Emotional and Physical Burden – perceived challenges in care giver role included emotional stress, heavy workloads, and limited resources; (4) Collaboration and Communication – inter-professional teamwork and effective communication were identified as crucial enablers for successful rehabilitation outcomes.Nurses' experiences in the rehabilitation of older stroke patients reflect notable challenges in their role. Addressing staffing shortages, improving resource availability, and encouraging family visits and enhancing family awareness of patients' conditions are essential steps toward optimizing rehabilitation care delivery and gaining better patient outcomes.

Keywords: rehabilitation, stroke patients, nurses' experiences

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EVALUATION OF MODIFIABLE BEHAVIORAL AND DIETARY RISK FACTORS FOR DIABETES MELLITUS

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Diabetes Mellitus (DM) is a metabolic condition associated with hyperglycaemia. DM is a non-communicable disease and results from insulin resistance or when the pancreas fails to generate enough insulin. DM has two subtypes, including DM type 1 and DM type 2. Modifiable risk factors are overweight, hypertension, hyperlipidaemia, physical inactivity, smoking, and alcohol intake. Non-modifiable factors are family history, ethnicity, age, and gender. The objective of this study is to evaluate the dietary and behavioural risk factors for DM by selecting a sample from the Gampaha District. It was a cross-sectional study and used self-reported questionnaire. A random sample of 106 individuals over 40 was selected and using a structured Google form, their dietary and behavioural characteristics were assessed, including smoking, alcohol consumption, body mass index (BMI), sleep duration, occupation, diet quality, and physical activity. It was distributed online. The study shows that 54.7% had DM. The study also reveals that 70.8% had a low diet quality, characterized by consuming high amounts of junk foods, which are low in essential nutrients like vitamins, minerals and fibre but high in calories, fat, sugar, and sodium. 48.1% had a habit of alcohol consumption and 17.9% individuals showed smoking as a habit. According to the study, 97.2% of individuals did not engage in any physical exercise. According to their BMI, 37.5% of them were overweight or obese. (overweight: 25.0 to 29.9 kg/m²; obesity: 30.0 kg/m² or higher). The study also revealed that the older population is likely to be physically inactive by watching television, using mobile phones, and sleeping during the day. Through the study, it can be concluded that the unhealthy and dietary and behavioral habits of individuals have contributed to DM. It can be suggested that if individuals have any family history of DM, the constant awareness of the risk factors of DM and regular testing aid in preventing DM, which helps to increase the quality of life of individuals.

Keywords: BMI, diabetes, dietary factors, risk factors

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INVESTIGATION OF THE PREVALENCE OF PHYSICAL, COGNITIVE, AND PSYCHOLOGICAL CHANGES ASSOCIATED WITH MENOPAUSE AMONG WOMEN IN THE GAMPAHA DISTRICT

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Menopause is a significant stage in a woman's life, marking the end of her reproductive years and the cessation of monthly menstrual cycles. It generally occurs between the ages of 45 and 55, with natural menopause defined as 12 consecutive months without menstruation. Hormonal changes associated with menopause can affect physical, emotional, mental, and social well-being. The objective of this study was to investigate the prevalence of physical, emotional, and cognitive changes associated with the onset of menopause by recruiting a sample from the Gampaha District. Data were collected using a cross-sectional, self-reported, closed-ended questionnaire. One hundred and five postmenopausal individuals were randomly recruited, and their physical, emotional, and cognitive health parameters were assessed. Physical health parameters included high blood pressure, heart disease, osteoporosis, constipation, urinary tract infections, and vasomotor symptoms such as hot flushes and night sweats. Psychological and cognitive parameters were evaluated based on sleep disturbances, anger levels, mood states, feelings of sadness, and difficulty concentrating. The results show that 67.6% developed high blood pressure, 40% developed heart disease, and 72.4% developed these changes after menopause. In terms of body composition, 56.2% gained weight and 54.3% gained abdominal fat. Among 61 individuals diagnosed with osteoporosis, 65.6% developed the condition after menopause. Regarding vasomotor symptoms, 60.6% of 104 individuals experienced hot flushes and night sweats, 60.6% developed constipation, and 51.9% experienced urinary tract infections after menopause. Significant prevalence of physical, psychological, and cognitive health changes was observed among individuals after menopause, indicating that hormonal changes significantly impact women's overall health. Specifically, 83.6% experienced sleep disturbances, 87.6% became easily angered, 76.2% experienced a low mood in previously enjoyed activities, 76.1% frequently felt sadness, and 86.6% reported difficulty concentrating. This study concludes that hormonal changes during menopause lead to a high prevalence of physical, psychological, and cognitive changes in most women. Awareness of these changes, along with maintaining healthy dietary, physical, and mental behaviours, may help women adapt more effectively.

Keywords: high blood pressure, hormonal changes, menopause, osteoporosis

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IN VITRO INVESTIGATION OF ANTIOXIDANT AND ANTICOAGULANT PROPERTIES OF *Calocybe indica* (MILKY MUSHROOM)

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The growing demand for natural therapeutic compounds has intensified the search for bioactive molecules with diverse therapeutic properties, including antioxidant and anticoagulant activities. *Calocybe indica* (milky mushroom), an edible mushroom widely cultivated on a large scale in South Asia, is known for its richness in phytochemicals. However, research on *C. indica* is relatively less, particularly regarding its bioactivity and the majority of the studies were carried out on its nutrient content. Therefore, this study was conducted to evaluate and compare the antioxidant and anticoagulant activities of aqueous, methanol, dichloromethane (DCM), and hexane extracts of *C. indica* fruiting bodies. Authenticated fruiting bodies of *C. indica* were freeze-dried, cold macerated, and concentrated. Total phenolic content (TPC) was determined using the Folin–Ciocalteu method, while antioxidant activity was measured using the 2,2-diphenyl-1 picrylhydrazyl (DPPH) radical scavenging assay. Among the extracts, the methanol and aqueous extracts exhibited the highest antioxidant activity, with the lowest IC_{50} values of 561.7 mg/mL and 549.8 mg/mL, respectively, indicating strong free radical scavenging potential. These were followed by the hexane (788.3 mg/mL) and DCM (961.6 mg/mL) extracts. A similar trend was observed in TPC values, further confirming these activities, with the aqueous extract showing the highest TPC (176.96 mg GAE/g), demonstrating a strong correlation between phenolic content and antioxidant activity. Anticoagulant activity was evaluated by measuring the prolongation of prothrombin time (PT). IBM-SPSS version 26 was used for statistical analysis. The bar chart analysis indicated that all four extracts, at varying concentrations, caused a significant increase in PT values compared to the control, confirming anticoagulant potential. All extracts contributed to prolonged coagulation time, highlighting the potential of *C. indica* as a natural anticoagulant. This study highlights the promising antioxidant and anticoagulant potential of *C. indica*, supported by its high phenolic content and ability to prolong prothrombin time. These findings are consistent with previous studies that report the therapeutic effects of mushroom-derived compounds such as polysaccharides and phenolics. Further research is needed to isolate the active constituents and confirm their efficacy and safety through in vivo studies. *C. indica* shows strong potential for development as a natural therapeutic agent against oxidative stress and thrombotic disorders.

Keywords: *Calocybe indica*, milky mushroom, antioxidant, anticoagulant activity

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THE IMPACT OF POLYPHARMACY ON THE QUALITY OF LIFE IN OLDER ADULTS: A NARRATIVE REVIEW

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Polypharmacy refers to the use of several medications prevalent among people aged 60 and above due to the presence of chronic diseases. This increases the risk of adverse drug effects, issues with medication adherence, drug interactions, falls, delirium, and toxicity. These complications can result in poor health outcomes, increased hospital admissions, and elevated healthcare expenses. Furthermore, previous research in Sri Lanka has shown polypharmacy in older adults, but few studies have assessed the impact of polypharmacy on the quality of life in older adults. This study aims to explore the impact of polypharmacy on the quality of life in older adults. Existing articles and recent studies from 2020-2025 on the impact of polypharmacy on the quality of life in older adults aged 60 and above were analyzed. According to the SANRA guidelines, eligible peer-reviewed studies were identified through databases like PubMed, Scopus, and Google Scholar. Data were extracted using a standardized form. Results were synthesized narratively and presented in a tabular format to summarize intervention approaches. The findings show a strong association between polypharmacy and decreased health-related quality of life (HRQoL) in older adults. Both physical and mental aspects were impaired, with a greater impact in chronic or cancer-related conditions. Multiple medications were key contributors to poor HRQoL, especially post-discharge. Tools like STOPP/START and the Medication Appropriateness Index indicated limited effectiveness without integration into computerized decision support systems. Moreover, prescribing errors, hyperpolypharmacy, and increased drug burden were linked to lower HRQoL and higher frailty levels, especially among people aged 65 and older living independently. Through the analysis of multiple studies, this review identified a consistent link between polypharmacy and a reduced quality of life in older adults, specifically related to treatment burden, frailty, and physical health. The studies emphasize the immediate need to apply effective medication management strategies, like clinical assessment tools and deprescribing protocols, to mitigate these risks. This underscores the need for actions that facilitate rational prescribing practices to improve health outcomes and promote a holistic approach to geriatric care.

Keywords: polypharmacy, older adults, quality of life

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PREVALENCE AND RISK FACTORS OF VENTILATOR–ASSOCIATED PNEUMONIA IN ICU SETTINGS: A NARRATIVE REVIEW

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Ventilator-associated pneumonia (VAP), a major hospital-acquired infection, affects 5% to 40% of patients on mechanical ventilators worldwide, with rates varying by region, intensive care unit (ICU) type, and diagnostic criteria. Its mortality rate can range from 10% to over 30%, particularly in cases involving multidrug-resistant organisms (MRO). Ventilator-associated pneumonia increases ICU stays and duration of mechanical ventilation (MV), driving up healthcare costs. This review aims to synthesize recent evidence on the prevalence of VAP in ICUs and reported risk factors across different settings. Articles published between January 2020 and June 2025 that included adult ICU patients were selected. The literature search was conducted following SANRA guidelines and using databases including PubMed, Scopus, Google Scholar with key words such as 'ventilator-associated pneumonia,' 'prevalence,' 'risk factors,' 'ICU,' and 'mechanical ventilation'. Only peer-reviewed original research was included. Systematic and narrative reviews were considered only to provide contextual background but were not included as primary evidence. Results were presented in tables highlighting the author and year, title of the study, study design, and key findings of each study. Prevalence of VAP ranged from 9% to 50% depending on region, patient condition, and ICU protocols. Multicenter studies indicate a prevalence of 20-35%. Patients with traumatic brain injuries (TBI) and those with COVID-19 indicated VAP prevalence rates exceeding 45%. Risk factors included prolonged MV, reintubation, TBI, use of sedatives, biofilm formation on endotracheal tubes, and infection by MRO. COVID-19 ICU patients were found to have higher rates of VAP, often involving MRO. VAP is still a considerable healthcare concern in ICU settings, with prevalence and risk factors strongly influenced by patients' clinical conditions, regional healthcare practices, and individual patient characteristics. This review highlights the need for risk-specific prevention strategies, particularly in high-risk populations. Continued surveillance, adherence to evidence-based protocols, and antimicrobial stewardship are critical to reducing VAP occurrence and improving patient outcomes.

Keywords: ventilator-associated pneumonia, prevalence, risk factors, ICU

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ASSOCIATION OF SERUM FRUCTOSAMINE WITH SERUM ALBUMIN AND AVERAGE PLASMA GLUCOSE CONCENTRATION AMONG DIABETES MELLITUS PATIENTS

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Diabetes mellitus is a chronic metabolic disorder characterized by persistent hyperglycemia; monitoring glycemic status is crucial for effective diabetes management, with fasting plasma glucose (FPG), postprandial plasma glucose (PPPG), and glycated hemoglobin (HbA1c) being commonly used biomarkers. Fructosamine, which is a glycated protein (GP), is an alternative marker that can overcome the limitations of HbA1c associated with red cell abnormalities that reflect intermediate-term glycemic control over 2–3 weeks. Since albumin accounts for 60%to 70% of all extracellular plasma proteins, fructosamine levels primarily reflect glycated albumin (GA) levels. However, the Fructosamine test is not routinely used in developing countries due to its high cost and a lack of awareness of well-established reference ranges. Therefore, this study aims to investigate the correlation between GP and average glucose and total serum albumin concentrations. Patients over 18 years old diagnosed with DM, who met the inclusion criteria were selected for the study (n=202). The laboratory results, including FPG, PPPG, serum albumin, and serum fructosamine, were obtained from Colorimetric assays. Mainly, descriptive statistics and bivariate correlation analysis were conducted to establish associations between serum albumin, FPG, PPPG, and fructosamine. Fructosamine exhibited a strong positive correlation with the average FPG and PPPG ($r = 0.825$, $p < 0.01$) and a moderate correlation with serum albumin ($r = 0.258$, $p < 0.01$). Also, a higher association was observed with lower albumin levels [<3.5 mg/dl], while a weak correlation was found at normal albumin levels [>3.5 mg/dl], indicating that glucose exposure time and albumin half-life are directly influencing glycated protein levels. This study establishes a strong association between Average plasma glucose levels and albumin, emerging as the most reliable predictor for fructosamine. Even though, due to the bromocresol purple assay limitations, the study couldn't obtain the non-glycated albumin portion separately, the study found that glycation of proteins is primarily influenced by the duration of glycemic exposure and the half-life of albumin.

Keywords: diabetes mellitus, average plasma glucose, total serum albumin, fructosamine, glycated albumin, advanced glycation end products

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RELATIONSHIP BETWEEN UNSUPERVISED DIET PLANNING AND DIETARY-RELATED RISK FACTORS FOR GASTRIC CANCER AMONG YOUNG ADULTS IN WESTERN PROVINCE

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Gastric cancer remains a global health burden, with diet, lifestyle, and other modifiable factors as key contributors. Despite advances, the incidence in younger adults is rising. Emerging trends in unsupervised diet regimens among young adults may significantly heighten the risk. This study investigates dietary behaviours and diet-related risk factors for gastric cancer in young adults from Sri Lanka's Western Province. A case-control study was conducted on 151 participants (35 gastric cancer patients and 116 controls) using a validated Food Frequency Questionnaire (FFQ) and structured survey instruments. Statistical analyses included binary logistic regression, analysis of variance (ANOVA), and Chi-square tests to examine associations between unsupervised dietary practices, cooking methods, meal patterns, alcohol use, and gastrointestinal symptoms indicative of gastric cancer risk. Awareness of gastric cancer risk factors was also assessed. Participants following unsupervised diet plans exhibited a statistically significant association with gastrointestinal complaints ($p = 0.014$). High consumption of spicy foods conferred an estimated 8.8-fold increase in gastric cancer risk (OR = 8.827; $p = 0.057$), while frequent alcohol intake was associated with a 20.6-fold elevation in risk (OR = 20.588; $p = 0.056$). Cooking methods characterised by high-temperature baking and frying demonstrated strong correlations with gastrointestinal morbidity ($p < 0.05$). Additionally, meal frequency significantly influenced the prevalence of gastrointestinal symptoms ($p = 0.028$). Conversely, levels of awareness regarding gastric cancer risk factors did not differ significantly among participants ($p = 0.599$). These findings underscore the need for targeted public health strategies to regulate dietary practices, improve awareness of gastric cancer risks, and restrict unsupervised access to gastric medication. Educational campaigns and youth-focused interventions are essential for reducing the future disease burden.

Keywords: gastric cancer, unsupervised diet plans, young adults, risk factors, Sri Lanka

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DEVELOPMENT AND EVALUATION OF A SMART HEALTH MONITORING SMARTWATCH FOR MULTI PARAMETER PHYSIOLOGICAL TRACKING, PHYSICAL ACTIVITY MONITORING, AND STRESS MONITORING

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This project presents a smart health monitoring smartwatch designed to support individuals particularly those with chronic health conditions or elderly populations in managing their health more effectively. The device continuously records essential physiological parameters and transmits the data directly to hospital information systems, enabling healthcare professionals to access patient health information at any time without requiring hospital visits.The smartwatch incorporates integrated miniature sensors to monitor eight key parameters: blood glucose level, body temperature, movement (including tremors), blood pressure, heart rate, respiratory rate, daily physical activity, and stress level. These indicators are highly relevant for the management of medical conditions such as diabetes, cardiovascular disease, and respiratory disorders. The system also evaluates physical activity levels and detects stress, contributing to overall health maintenance.One of the most notable features of the system is its ability to transmit health data to hospitals in real time. Each smartwatch is linked to the user's personal medical record, allowing physicians to review current data, compare it with historical records, and identify potential health concerns before symptoms manifest. When abnormal or potentially dangerous conditions are detected such as a rapid heart rate or low blood glucose levels, the device immediately issues an alert to both the user and the nearest hospital. This capability can be lifesaving in emergency situations, particularly when the individual is alone or unable to seek help.In addition to emergency alerts, the smartwatch provides continuous health monitoring, allowing healthcare professionals to observe gradual changes in a patient's condition over time. By using the patient's own medical history, the system delivers personalised health insights rather than generalised warnings. All data transmissions are secured through encrypted communication to ensure patient privacy and confidentiality. The smartwatch is lightweight, ergonomically designed, and easy to operate, making it suitable for daily use. It is intended to integrate seamlessly into everyday life while promoting better health outcomes and enabling healthcare providers to deliver more effective patient care.

Keywords: smartwatch, health monitoring, real time tracking, stress detection, wearable health device, patient safety

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ASSESSMENT OF AWARENESS AND PREVENTIVE PRACTICES ON ZOONOTIC DISEASES AMONG UNIVERSITY STUDENTS IN WESTERN PROVINCE

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Zoonotic diseases (those transmitted between animals and humans) are recognised as an important public health concern in the Western province of Sri Lanka, especially in regions where close human-animal interactions are common. As future professionals and knowledge disseminators, university students represent a critical group for understanding current awareness levels and behaviours related to zoonotic disease prevention. This study aimed to assess awareness, knowledge, and preventive practices regarding zoonotic diseases among university undergraduates across the Western province. A descriptive, cross-sectional survey was administered via a structured Google Form to 104 students representing both biological and non-biological academic streams, randomly selected from state and private universities. The questionnaire collected data on demographic characteristics, familiarity with zoonotic diseases, disease identification, modes of transmission, and self-reported preventive habits. Among the participants, the majority (60%) were from biological science disciplines, with 56.7% reporting pet ownership. A significant proportion (81.7%) indicated prior awareness of zoonotic diseases, and 78.8% correctly identified them as diseases transmissible from animals to humans. Rabies (91.3%), Dengue (82.7%), and Toxoplasmosis (76.9%) were among the most recognised zoonoses. Most students identified key transmission modes accurately, such as bites from infected animals and contact with contaminated animal waste. Encouragingly, 83.6% reported washing hands after animal contact, and 77.8% avoided raw or undercooked animal products. Among pet owners, 72% ensured regular vaccination of their animals. However, some gaps were noted, particularly in identifying less familiar zoonotic diseases and the consistent application of all preventive measures, such as avoiding direct contact with stray or wild animals. The findings revealed that there is a generally good level of awareness and favourable preventive practices among undergraduates, particularly those from science backgrounds. Nonetheless, there remains a need to strengthen education on lesser-known zoonotic threats and their transmission. Integrating zoonotic disease awareness into university curricula and promoting health communication through campus-based programmes could further enhance preparedness and responsible behaviour in future professionals.

Keywords: awareness, preventive practices, rabies, university students, zoonotic diseases

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PHARMACOLOGICAL SCREENING OF *TABERNAEMONTANA DIVARICATA*: A PROMISING NATURAL SOURCE FOR CYTOTOXIC AND ANTIOXIDANT AGENTS

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Tabernaemontana divaricata is a medicinal plant belonging to the Apocynaceae family. Native to South and Southeast Asia, it is widely cultivated as an ornamental shrub due to its attractive white, pinwheel-like flowers. In Sinhalese, it is called "Wathusudda". The leaves of this plant have traditionally been used for medicinal purposes, particularly in the treatment of inflammation and pain. Recently, a few studies have investigated the antioxidant, anti-inflammatory, and anticancer properties of related species within the same family. Therefore, this study aimed to evaluate the bioactivity of *T. divaricata*, with a particular focus on its potential cytotoxic effects. The leaves of *T. divaricata* were subjected to ethanol extraction before analysis. Total phenolic content (TPC) was determined using the Folin-Ciocalteu method, while antioxidant activity was evaluated via DPPH (1,1-diphenyl-1-picrylhydrazyl) and ABTS (2,2′-azinobis-3-ethylbenzothiazoline-6-sulfonic acid) free radical scavenging assays *in vitro*. Anti-inflammatory activity was assessed through the human red blood cell (HRBC) membrane stabilization assay and the protein denaturation assay. Cytotoxicity was analyzed using the MTT [3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyl tetrazolium bromide] assay against the HeLa (cervical cancer) cell line. The extract exhibited a TPC of 114.32 ± 5.76 mg GAE/g, while the flavonoid content was 21.66 ± 1.68 mg QE/g. The leaf extract demonstrated high antioxidant activity, with an IC_{50} = 0.01 mg/mL in the DPPH assay (standard ascorbic acid IC_{50} < 0.06 mg/mL). However, in the ABTS assay, the extract showed a higher IC_{50} value of 0.7 mg/mL (standard ascorbic acid IC_{50} = 0.06 mg/mL). In anti-inflammatory assays, the leaf extract exhibited better activity in the HRBC assay (IC_{50} = 0.1 mg/mL) (standard ibuprofen IC_{50} < 0.06 mg/mL) compared to the protein denaturation assay (IC_{50} > 1 mg/mL) (standard ibuprofen IC_{50} < 0.06 mg/mL). Cytotoxicity evaluation revealed that the leaf extract inhibited 98.82% of HeLa cell viability at a concentration of 1 mg/mL, with an IC_{50} value of 0.1 mg/mL. *T. divaricata* possesses considerable therapeutic potential, particularly as a natural source of antioxidant and anticancer agents, warranting further mechanistic and *in vivo* investigations.

Keywords: *Tabernaemontana divaricata*, medicinal plant, antioxidant activity, anti-inflammatory activity, cytotoxicity

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HUMANITIES AND SOCIAL SCIENCES

TEACHERS AS AGENTS OF LINGUISTIC INNOVATION: TEACHERS' VIEWS AND UNDERSTANDING OF VOCABULARY OF BRITISH, AMERICAN, AND SRI LANKAN ENGLISH

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One of the challenging issues that has sparked much debate, as a result of the emergence of World Englishes, is the dilemma: "Which English norms are appropriate for English language teaching and testing?". This issue becomes increasingly critical in the context in which a growing number of Sri Lankans seek international education and employment; thus, the pressure of being successful in standardised English tests such as IELTS and TOEFL is increasingly important. In accounting for the way teachers respond to this dilemma, this study aimed to examine teachers' attitudes towards and awareness of the vocabulary of British English, American English, and Sri Lankan English. This study employed a participant selection variant design which involves a questionnaire and individual interviews for a more focused and in-depth investigation of five Sri Lankan ESL teachers' attitudes towards and awareness of vocabulary of British English, American English, and Sri Lankan English. The results revealed that the teachers hold a middle ground that mediates the attitudes of "orthodox linguists" who uphold linguistic uniformity, and the attitudes of "liberal linguists" who promote the linguistic diversity and creativity of new norms. Particularly, the research findings positioned teachers as potential agents of linguistic innovation, as they yield the ability to either reinforce traditional norms or encourage innovative and inclusive approaches to English language teaching and testing. Moreover, the study revealed the complexity and the changing nature of the teachers' attitudes due to the influence of personal, interpersonal, sociopolitical, and institutional factors. Moreover, the teachers demonstrated limited awareness regarding the correct recognition of vocabulary of the three varieties. However, they demonstrated some awareness of the plurality of English in the context of globalization and localization. The findings of the study suggest the importance of promoting ways to raise teachers' awareness to prompt an attitudinal objectivity towards the differences between varieties of English while making learners prepared to navigate both international standards and the evolving landscape of English usage for greater mobility. This study provides insights into future research agendas on evaluating teachers' acceptability judgements towards not only vocabulary but also phonological and syntactic differences between varieties of English.

Keywords: World Englishes, attitudes, awareness, standardised English tests

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THE INFLUENCE OF CULTURAL HEGEMONIC IDEOLOGY BUILDS THROUGH PORNOGRAPHY ON YOUNG PEOPLE'S PARTNER PREFERENCES: A STUDY IN THE WESTERN PROVINCE OF SRI LANKA

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Pornography is influenced by both positive and negative societal discourses, illustrating multiple perspectives on its cultural, ethical, and psychological consequences. Numerous studies have demonstrated that internet pornography has several kinds of sociopsychological consequences. Sri Lanka has been ranked first in terms of searches for the word 'sex' on Google. There have also been studies on the influence of cultural hegemony on social behavior through various media messages. In this context, it is more important to examine the impact of internet pornography on young people when selecting their partner. Studying how ideological and cultural hegemonic ideas constructed through pornography affect youth relationships is an important research gap in the present, and this study has attempted to fill that research gap. The main research problem of this research is whether young people are using internet pornography to build an ideological cultural hegemony when selecting their partner. The main objective of this study is to examine whether young people are using internet pornography to build an ideological cultural hegemony when selecting their partner. The study was conducted with a special focus on the Western Province of Sri Lanka. This study utilized a mixed method, integrating quantitative and qualitative research methods. The online survey method was used to collect data through questionnaires analyzing the responses from 374 participants aged 18 to 29 in the Western Province. SPSS was used for data analysis. The findings of the research indicate that a significant number of young people expect the physical characteristics shown through internet pornography when selecting their partner. Also, the percentage of those who expect sexual activities shown through internet pornography from their sexual partner is high. Based on this data, the research indicates that young people are in a cultural hegemonic ideology built through internet pornography when selecting their partner.

Keywords: pornography, ideological hegemony, cultural hegemony, youth partner preferences

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IMPACT OF DEMOGRAPHIC FACTORS AFFECTING THE WORK LIFE BALANCE AMONG THE FEMALE NON-ACADEMIC STAFF IN A UNIVERSITY IN SRI LANKA

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A person's control over the amount of time spent at work and the amount of time spent outside of work is referred to as work life balance (WLB). Work is just one aspect of life. It should not interfere with personal time. When someone works willingly, attains satisfaction, and is bound to succeed not only at work but also in family life, there is WLB. There are various factors of WLB that influence an individual's personal and work life. The purpose of this study was to examine demographic factors and how they affect the WLB of female non-academic staff in the University of Jaffna. The study adopted a non-parametric approach and a cross-sectional survey design was used. A primary data collection, using modified questionnaires was distributed among a sample of 73 management assistants using the simple random sampling technique from a total population of 150. The measuring tool was a modified WLB questionnaire of Hayman (2005) consisting of 15 questions. The questionnaire was pre-tested. Cronbach's alpha was calculated, which is greater than 0.7, meaning the instrument is reliable. Statistical analysis of Spearman correlation was done using SPSS. The study aims to investigate the relationship between demographic factors such as income, age, experience, number of children, marital status, type of family, and level of education with WLB. The findings showed that there is a significant relationship between WLB and demographic factors. Higher income can provide more financial freedom and options whereas lower income challenges females to meet family needs. More children can complicate WLB due to increased responsibilities and financial strain. Unmarried females have a WLB greater than married women. The type of family structure can significantly influence WLB, in terms of the support received from family members. Nuclear families often experience more stress whereas extended families can provide support to working females. The relationship of age, experience, and level of education is not statistically significant, having p-values greater than 0.05, which are 0.61, 0.82, and 0.64, respectively.

Keywords: work life balance, demographic factors, female, university

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UNEQUAL MEDIA EXPOSURE IN SRI LANKA: PUBLIC SUSPECTS VS. POLITICAL FIGURES

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THE EMPLOYMENT OF ARTIFICIAL INTELLIGNECE (AI) POWERED CHATBOTS AND VOICE ASSISTANTS TO IMPROVE ENGLISH SPEAKING PROFICIENCY: IMPACT ON UNDERGRADUATES IN SRI LANKA

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Consequences of globalization and the rapid digital transformation of the world have elevated the necessity of second language learners to excel in English speaking skills to compete in academic and professional settings. The major objective of this study was to investigate the effectiveness of Artificial Intelligence (AI) powered tools in enhancing students' fluency in English speaking. The incorporation of AI powered chatbots and voice assistants represents a new approach that caters to this knowledge gap. Furthermore, this study explored the efficacy of these tools in improving oral competence through interactive and constructive opportunities to interact with the English language. The research sample consisted of 120 undergraduates in disciplines of Business and Information Technology from the University of Kelaniya, Sabaragamuwa University and Informatics Institute of Technology (IIT) representing both state and private university sectors. The study was conducted during a period of six weeks. The mixed method approach was utilised, including surveys, focus group conversations and recorded AI assisted conversations focused on perceptions of students, levels of engagement and improvements in oral proficiency. As per findings of the study, AI powered tools have positively impacted the fluency in speaking, vocabulary building, and confidence in language communication. All three universities evidenced that AI powered tools offer learners with immediate and real-life opportunities for communicative competence reducing over-reliance on classroom based and teacher-centered speaking activities. In relation to vocabulary acquisition, AI powered applications were employed during the intervention sessions and informally during peer learning activities. Results depicted a lower level in vocabulary acquisition deriving limitations owing to the lack of technological infrastructure and free access to AI tools. In terms of pronunciation, AI powered voice assistants such as SIRI and Google Assistant promoted accurate pronunciation though instant feedback and technologies in speech recognition. Furthermore, interviews with selected students from the sample evidenced that the unavailability of cultural barriers and fear of judgement upsized the confidence level in speaking in English and the constant engagement with the language. The integration of AI technology in ESL pedagogy in Sri Lankan universities was identified as a key requirement to fulfil the knowledge gap and the global professional demand for undergraduates.

Keywords: Artificial Intelligence, chatbots, English speaking proficiency, voice assistants

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A LINGUISTIC STUDY OF THE VERB PHRASE IN THE SINHALA LANGUAGE

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A verb phrase (VP) is a syntactic unit centred on a verb, and typically includes auxiliary verbs, adverbs, objects, and complements. It plays a central role in sentence construction by expressing actions, states, and associated grammatical categories such as tense, aspect, mood, and agreement. Cross-linguistically, VP structures offer valuable insights into the syntactic and morphosyntactic systems of individual languages. This study investigated the structure and patterns of verb phrases in Sinhala, an Indo-Aryan language spoken by the majority population of Sri Lanka. Sinhala verb phrases are morphologically rich, exhibiting verb-final word order, extensive verbal inflection, and auxiliary constructions to encode complex tense-aspect-modality distinctions. The study adopted a qualitative descriptive approach, analyzing both secondary sources and naturally occurring colloquial speech. The corpus comprised ten Sinhala newspapers, ten short story books, and informal conversations across different dialectal and stylistic registers. The research focused on syntactic composition, auxiliary usage, negation, adverbial modification, and verb serialization. The findings revealed nine core structural patterns in Sinhala VPs: (1) simple verb alone, (2) verb with noun phrase, (3) verb with a single adverb, (4) verb with an adverbial phrase, (5) auxiliary verb with noun phrase, (6) auxiliary verb with adverb, (7) VP with particle phrase, (8) auxiliary verb with adverbial phrase, and (9) auxiliary verb with both noun and adverbial phrases. These patterns reflect the syntactic versatility and morphosyntactic complexity of Sinhala and illustrate stylistic variation between formal and informal discourse, particularly in the placement of auxiliaries, modifiers, and particles. This study contributes to the understanding of Sinhala verbal syntax and provides a foundation for comparative research in South Asian linguistics and syntactic typology.

Keywords: colloquial Sinhala, modality, morphosyntax, syntax, verb phrase

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PERSPECTIVES OF SRI LANKAN BUDDHIST PRACTITIONERS ACCESSING SAFE ABORTION WITH SPECIAL REFERENCE TO THE PREVAILING SAFE ABORTION-RELATED LAWS IN SRI LANKA

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This study examined the perspectives of the Sri Lankan *Theravada* Buddhist on accessing safe abortion, in Sri Lanka. In the context of Sri Lanka, cultural, religious, and legal factors significantly influence Sexual and Reproductive Health and Rights (SRHR). Due to the strictness of the safe-abortion related laws in Sri Lanka, many people use unsafe methods. Therefore, liberalizing the safe abortion-related laws is a timely need. This study aimed to understand how Theravada Buddhist practices in the country influence shaping societal attitudes toward safe abortion access. This qualitative study was conducted using semi-structured interviews. Also, a purposive sample of *Theravada* Buddhist practitioners participated in the interviews. Thematic analysis was used as the analytical strategy to analyze the data collected. There are various studies done regarding safe abortion access and determinants that hinder access to safe abortions. However, there are few studies that are specifically talking about the perspective of religions in accessing safe abortion. Most of the studies carry the perspectives of Christianity, Catholicism, and Islamic religions. However not many studies are conducted specifically regarding the *Theravada* Buddhist perspectives that are commonly practiced in Sri Lanka on abortion access. Therefore, with the intention of bridging this gap, this study was conducted specifically on how Sri Lankan *Theravada* Buddhist perspective impacts on accessing safe abortion. The main objective of this study was to understand the perspectives, attitudes, and beliefs of the Sri Lankan *Theravada* Buddhist practitioners regarding access to safe abortion and their impact on the implications for women's reproductive rights and health. Research findings emphasized the fact that, while most of the Sri Lankan *Theravada* Buddhist practitioners and scholars continue to emphasize the importance of preserving human life, there is a growing discussion related to how certain beliefs can be re-interpreted to reduce suffering, and bodily autonomy, especially in the context of women's reproductive health.

Keywords: Sri Lanka, Theravada Buddhism, abortions, safe abortions, liberalization

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SOCIAL SUSTAINABILITY ASSESSMENT OF RICE PRODUCTION SYSTEMS IN MALAYSIA: A LIFE CYCLE PERSPECTIVE ON STAKEHOLDER WELL-BEING IN SELANGOR'S GRANARY AREAS

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The social sustainability of rice production systems in Malaysia remains underexplored despite stakeholders including rice mill workers, paddy farmers, and local communities facing various social challenges throughout the production lifecycle, necessitating comprehensive assessment to support the government's target of achieving 75% rice self-sufficiency by 2025. This study applied Social Life Cycle Assessment (S-LCA) methodology based on ISO 14040:2006 framework to evaluate social impacts in Sungai Leman and Sekinchan divisions of Barat Laut Selangor, utilizing three validated questionnaire sets with 5-point Likert scales based on UNEP 2020 guidelines and multistage sampling that yielded 355 respondents comprising 41 rice mill workers, 136 farmers, and 178 local community members, achieving content validity (I-CVI: 0.83-1.0) and reliability (Cronbach's Alpha: 0.813-0.894). Social impact analysis revealed highest mean scores for health and safety among rice mill workers (3.86), agricultural technology assistance among paddy farmers (4.16-4.20), and job opportunities among local communities (3.87-3.94), while Social Performance Scores demonstrated good sustainability levels across all stakeholder groups with rice mill workers (64.33), paddy farmers (63.29-64.29), and local communities (64.31-65.98), all achieving classifications within the good range (61-80). The findings indicate socially sustainable rice production operations in both divisions, with key contributors including health and safety protocols, agricultural technology assistance, and job opportunity creation, supporting Malaysia's agricultural development goals and suggesting effective implementation of national policies, leading to recommendations for continued multi-agency involvement, enhanced technology dissemination through FAMA and AgroBank, and regular monitoring to support the national rice self-sufficiency target.

Keywords: social life cycle assessment, rice production, social sustainability, social impact, stakeholder analysis, Malaysia, agricultural sustainability

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INCORPORATING BUDDHIST TEACHINGS ON GOOD GOVERNANCE IN PROPOSING A FRAMEWORK FOR CRIME PREVENTION

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The concept of good governance has become a prominent topic in global political discourse. Meanwhile, owing to their complicated nature, modern-day crime and its dynamics have demanded a structural change in crime prevention mechanisms. Although Buddhist teachings on good governance have been incorporated into policy-making within various disciplines, the literature review indicated inadequacy in relation to crime prevention. Hence, this study was conducted with the objective of identifying the root causes of crime and proposing a crime prevention framework based on Buddhist good governance principles. The strain theory of criminological discourse and the causative principle of criminal law provided the theoretical input to the study. This study employed a qualitative research design, with specific reference to the *Chakkavattisihanada Sutta (Lion Roar of the Wheel-Turning Monarch),* which comes under the *Dīgha Nikāya* in *Tripitaka.* Following the line-by-line textual analysis of the *Sutta,* insights were generated by performing a thematic analysis aligned with the objectives. As identified, poverty is the root cause leading to a chain of crimes. Moreover, a causal relationship was identified within this chain, where one crime causes the occurrence of another. It was found that this chain ended with the dissolution of the established social norms and the collapse of the social order. A model named '*Āarya Chakravarthi Piliwetha- Noble Monarchical System'* could be identified as the framework to prevent this social problem. It comprises public security, non-allowance for crime, provision of the legal means of income, and receiving constant guidance from experts. Moreover, it was found that this model has to be continued in every generation and every level of governance. In conclusion, poverty alleviation should be the fundamental principle of good governance. It has to be associated with the assurance of the rule of law and social welfare. Incorporation of these findings in policy-making will have a sustainable impact on crime prevention.

Keywords: *Āarya Chakravarthi Piliwetha, Chakkavattisihanda Sutta,* crime prevention, good governance, poverty

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REVIEW OF COMPLIANCE WITH INTERNATIONAL RECOMMENDATIONS ON ANTI-MONEY LAUNDERING AND COUNTERING THE FINANCING OF TERRORISM IN SRI LANKA

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The Financial Action Task Force (FATF) promulgates forty recommendations on anti-money laundering and countering the financing of terrorism (AML/CFT) as soft laws. To align with international recommendations, it is essential to examine how the financial sector and designated non-financial sector comply with these recommendations, as these will determine the overall compliance of a country. Public criminal labelling, which is based on the premises of the Labelling Theory has been implicitly accepted as a form of punishment, although it was not a part of the substantive law. It claims that less powerful individuals are more likely to be labelled for their deviance (primary deviance), and once labelled, it is more likely to cause further deviance (secondary deviance). The concept of labelling has been applied as a method of law enforcement, but little attention has been paid to understanding how the theory can be implemented on legal persons, creating a research gap. The Financial Intelligence Unit of Sri Lanka (FIU) has imposed penalties and other administrative actions on financial institutions and publicly named and shamed the concerned financial institutions through the official webpage. This research paper followed content analysis, and accordingly, administrative penalties imposed by the FIU from 2019 to 2024 have been examined. If labelling is considered as a method of correction, then, the punishment needs to be proportionate and also adhere to the principles of natural justice. Raising suspicious transaction reports and complying with UNSCRs are the core principles of the AML/CFT framework, as they facilitate the identification of offences related to money laundering and terrorism financing. If the AML/CFT framework is not robust enough to identify suspicious activities, having such a system is questionable, as it does not fulfil the objectives of the FIU. The findings of this research have significant implications as this study advances the application of Labelling Theory to legal persons to fill the highlighted research gap and also to ascertain whether it is justifiable to label a legal person for their procedural non-compliances.

Keywords: Financial Action Task Force, terror finance, money laundering, Labelling Theory

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IMPACT OF GOVERNMENT TRAINING ON FAIRTRADE CERTIFICATION: EVIDENCE FROM SRI LANKA'S SPICE FARMERS

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Fairtrade (FT) is an alternative trading system that encourages sustainable development by improving trading conditions and safeguarding the rights of downgraded producers in developing countries. Despite the solid potential for FT adoption with adherence to core principles such as minimal chemical use and the absence of child or forced labour, the uptake in the spice sector remains extremely low. This study investigated the impact of training on the application behaviour of spice farmers for FT certification, addressing a critical evidence gap in the agricultural certification literature. A randomized controlled trial was conducted for 1,200 spice farmers in 30 Grama Niladhari divisions across the Central Province of Sri Lanka. The results revealed that training that consisted of both Fairtrade and organic content was 36.3 to 38.7 percentage points more likely to apply for FT certification. Heterogeneity analysis suggests that the treatment effects are consistent across most subgroups, with female-headed households indicating particularly high responsiveness. This study underscores the importance of targeted, content-specific training in expanding Fairtrade participation among smallholder farmers, advancing both economic equity and sustainable development.

Keywords: Fairtrade, certification, training, application behaviour

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TEXTUAL TRANSMISSION OF THE *VAJIRABUDDHIṬĪKĀ*: A COMPARATIVE ANALYSIS OF *NIDĀNAVAṆṆANĀ* SINHALESE AND BURMESE EDITIONS

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The *Vajirabuddhiṭīkā*, the oldest known sub-commentary on the *Vinaya Piṭaka*, is traditionally attributed to the Most Venerable Vajirabuddhi and is thought to have been composed between the Anurādhapura and Polonnaruwa periods. In his *Sāratthadīpanīṭīkā*, the later sub-commentator, the Most Venerable Sāriputta, criticized certain interpretations in the *Vajirabuddhiṭīkā*, noting both its doctrinal conciseness and its incorporation of linguistic features from languages other than Pāli. These characteristics appear to have influenced subsequent generations of scholars, yet no critical edition in Sinhalese script has been published to date. Presently, two principal Burmese-script editions exist: an older word-by-word Burmese translation (*Nissaya*) and the version printed at the Sixth Buddhist Council (*Chaṭṭha Saṅgāyana*). A comparative study of Sinhalese-script palm-leaf manuscripts reveals notable divergences from the *Chaṭṭha Saṅgāyana* edition. Significantly, the older *Nissaya* translation aligns more closely with the Sinhalese manuscript tradition, suggesting it preserves an earlier recension of the text. This research undertool a comparative textual analysis of the *Nidānavaṇṇanā* section across six Sinhalese-script palm-leaf manuscripts, the Burmese *Nissaya*, and the *Chaṭṭha Saṅgāyana* edition. The findings shed light on the textual transmission of the *Vajirabuddhiṭīkā* and lay groundwork for a future critical edition in Sinhalese script.

Keywords: Pāli literature, textual editing, *Vajirabuddhiṭīkā*, Vinaya sub-commentary

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ASSESSMENT OF LAND USE AND LAND COVER (LULC) CHANGES AND THEIR ENVIRONMENTAL IMPACTS IN BELLANWILA-ATTIDIYA WETLAND

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Wetlands are vital ecosystems that provide essential ecological services. Bellanwila-Attidiya wetland, which is one of the most significant urban wetlands in Sri Lanka, has experienced considerable land use and land cover (LULC) changes in the past few decades, causing serious environmental impacts. The objectives of this research were to assess the land use and land cover changes within the Bellanwila-Attidiya wetland area between 1995-2024 and to evaluate the resulting environmental impacts. Supervised classification of Landsat images from 1995, 2011, and 2024 was performed using ArcGIS, followed by a change detection analysis to track LULC changes. The results of LULC changes revealed a sharp decline in vegetation cover from 60% in 1995 to 36% in 2011, reflecting intense urbanization, with only a slight recovery to 38% by 2024. Built-up areas have increased significantly from 119.92 ha (32%) in 1995 to 198.97 ha (54%) in 2024, becoming the dominant land cover. To assess environmental impacts of LULC changes in the Bellanwila-Attidiya wetland, a household survey was conducted alongside the geospatial analysis with 55 long-term residents selected through stratified random sampling from three Grama Niladhari divisions near the wetland. Moreover, the analysis of environmental impacts was further supplemented by key informant interviews to gather additional insights. The results of the environmental impacts indicated that during 1995-2024, about 110 ha of wetland habitat were lost according to the spatial analysis of the study area. Invasive alien species such as *Annona glabra*, *Eichhornia crassipes*, and *Hypostomus plecostomus* have spread rapidly due to increase of built-up areas. Between 1995 and 2024, vegetation cover in the Bellanwila-Attidiya wetland decreased by 37.8%, with 39.2% of the loss converted to built-up areas, 7% to water bodies, and 0.9% to open areas, indicating a significant loss in vegetation cover. A significant reduction in biodiversity has been observed, with a 52% reduction in bird species, 87% reduction in fish species and extinction of amphibian species such as *Philautus leucorhinus*. These findings emphasize the urgent need for integrated conservation and land-use planning to protect the Bellanwila-Attidiya wetland and ensure the survival of its biodiversity.

Keywords: environmental impacts, GIS, land use and land cover change, wetlands

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CAUSATIVE FACTORS OF URBAN SPRAWL IN THE HOMAGAMA DIVISIONAL SECRETARIAT DIVISION

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Urban sprawl is the unplanned outward expansion of cities towards suburban areas, which often disrupts natural landscapes and resources. Hence, various causative factors contribute to this continuous expansion in suburban areas. Among them, population and road networks play a crucial role because of high automobile dependency and a liveable residential environment in suburban areas. Accordingly, this study aims to investigate the causative factors of urban sprawl in the Homagama Divisional Secretariat Division (1992-2022). To achieve this objective, the satellite images in 1992, 2007, 2017, and 2022 were downloaded from Google Earth Pro, using a 1:20,000 grid reference, and digitized the entire buildings. The road network data for 1992, 2007, and 2017 were collected from the Urban Development Authority (UDA) in Sri Lanka. Moreover, the road network data in 2022 was downloaded from the "Open Street Map" database utilizing the OSM tool in QGIS. Population density maps for 2000, 2007, 2017, and 2020 were downloaded from the "Worldpop" data source. Furthermore, the linear buffer zones with a 1,000 m radius were used to identify the buildings along with primary and secondary roads. As the result, population densities have gradually increased due to migrations of middle- and low-income individuals who cannot afford to live near the Central Business District (CBD) and opt for areas with somewhat developed infrastructure located further from the CBD. Consequently, some apartment complexes are mainly concentrated in Panagoda, Homagama, and Kahathuduwa. Many people have considered purchasing apartments rather than constructing their own houses. The correlation revealed a positive relationship (0.9962) between the population densities and building densities. In particular, the buildings, along with primary and secondary roads, gradually increase by improved accessibility and connectivity. This has further exacerbated sprawl in the study area. Moreover, this trend results in a linear pattern of buildings along these roads, particularly showcasing the growth of commercial buildings rather than residential buildings. According to the findings, it is essential to implement a sustainable urban development master plan to address the social, economic, and environmental challenges arising from high automobile dependency and competition for land acquisition.

Keywords: geographic information system, population density, road network, urban sprawl

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SOCIO-CULTURAL PARAMETERS INFLUENCING MEAT CONSUMPTION PATTERNS AMONG UNDERGRADUATES IN SRI LANKA

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Meat is a primary source of protein. The market offers two major types of meat: raw and processed. Undergraduates with tight schedules of academic and extracurricular activities pay little attention to nutrition. The consumption of meat and meat related products among the undergraduates of Sri Lanka has rarely merely been discussed. Especially, studies about the effect of socio-cultural parameters on undergraduate meat and meat product consumption are rare. Therefore, this study investigated the effect of several socio-cultural parameters on the consumption pattern of meat and meat related products among undergraduates with 203 randomly selected undergraduates from all six faculties of Wayamba University of Sri Lanka. Data analysis was done by using Microsoft Office Excel 2021 and Chi-square test of R statistical software. Out of the total respondents, n = 164 (80.9%) were meat consumers, whereas n = 38 (19.1%) were non-meat consumers. Moreover, among all meat consumers n = 128 (78.8%) respondents consumed both raw and processed meat types, while n = 23 (14.5%) consumed only processed meat, and n = 11 (6.7%) consumed only raw meat. The Chi-square results of the study suggested that both raw and processed meat consumption has no significant effect ($p > 0.05$) from gender ($\chi^2 = 0.212$, $p = 0.900$). Similarly, this study showed neither the economic status of the family ($\chi^2 = 14.393$, $p = 0.881$), nor the engagement in a part-time job ($\chi^2 = 0.254$ $p = 0.156$) has a significant effect ($p > 0.05$) on meat and meat product consumption among undergraduates. Out of all the tested socio-cultural parameters, it is inevitable to conclude that meat consumption was significantly influenced ($p < 0.05$) by religion ($\chi^2 = 24.570$, $p = 0.0004$). Health concerns due to the presence of a high amount of sodium and saturated fats in processed meat were reasoned by non-consumers of processed meat as the justification for their decision. Religion was a significant factor among undergraduates to have concerns on meat and meat product consumption. Rejecting processed meat suggested that undergraduates have a considerable health concern about themselves.

Keywords: health concerns, meat consumption, socio-cultural factors, undergraduates, Wayamba University of Sri Lanka

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EXPLORING OCCUPATIONAL CHALLENGES OF CAREGIVERS IN ELDERLY CARE FACILITIES IN SRI LANKA

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Sri Lanka, a South Asian nation with a rapidly aging population, has witnessed a significant rise in elderly care homes. Limited research has focused on the caregivers who play a vital role in these institutions. According to the National Secretariat for Elders (2024), Colombo District hosts the highest concentration of elderly homes, representing both urban and rural characteristics, thereby offering a unique setting to explore caregiver challenges. This qualitative study employed purposive sampling to select participants from 86 elderly homes in Colombo. Homes with only male or female residents were excluded, leaving 18 homes with at least 10 adults eligible for study. From these, 60 caregivers with more than one year of experience were purposively selected, ensuring diversity in gender and professional roles, including direct care staff, personal care workers, and maintenance staff. Such variation enhanced the reliability and relevance of the findings. Data were collected through 60 semi-structured interviews. The analysis revealed five key themes of caregiver challenges. First, caregivers experienced mental and emotional distress, including secondary trauma and exhaustion. Second, limited resources and inadequate training in modern elder care methods restricted service quality. Third, low wages and poor professional recognition resulted in financial strain and diminished social acceptance. Fourth, weak institutional management and insufficient support highlighted issues of understaffing and lack of managerial backing. Finally, sociocultural pressures, such as negative societal attitudes towards elder care, compounded the burden. Although these problems were present across both urban and rural contexts, their severity varied. The study concludes that caregivers in Sri Lanka face interrelated challenges that directly impact their well-being and service delivery. To address this, the study recommends national training and certification programs, mental health support services, fair wage structures, management reforms, and public awareness initiatives. These measures are essential to strengthen caregiver well-being and improve elder care quality.

Keywords: aged care, care facilities, caregivers, elderly homes, occupational stress

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DETERMINANTS OF LPG USAGE AND POTENTIAL ALTERNATIVE COOKING ENERGY SOURCES IN RURAL SRI LANKA

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This study investigated the impact of energy security on rural household cooking practices. A sample of 56 households out of 561 households in Pamunugama area of the Kalutara District of the Western Province was selected using stratified random sampling and data collected through structured questionnaires. Secondary data from Grama Niladhari reports were incorporated to reinforce the empirical analysis. Tables and graphs were used to present the data. Energy is used for various purposes, but here we analyze only the energy security of energy used for domestic cooking in the rural sector. Numerous studies on energy security and domestic energy sources indicate a growing preference among rural populations for the use of imported liquefied petroleum gas (LPG) for household purposes. However, due to the recent economic crisis faced by Sri Lanka, a problematic situation arose regarding the import of energy, and due to this, a problematic situation also arose regarding the energy used for cooking in rural households. That is, the availability of affordable, continuous sources of energy for cooking in rural households poses challenges. The main objective of this research was to analyze how energy security influence rural household cooking practices, with particular emphasis on LPG adoption and the exploration of alternative energy sources. The first specific objective was to identify the key socio-economic, demographic, and accessibility factors that have led rural households to increasingly adopt LPG for cooking and the second specific objective was to identify alternative cooking energy sources viable in rural areas to reduce household cooking costs while ensuring affordability, availability, and accessibility. This analysis was done through multiple regression models and statistical measures, and the SPSS software was also used for this purpose. Key factors influencing the preference for LPG included household income levels, distance from LPG supply points, family size, and the number of meals prepared daily. Compared to electricity and kerosene, primary sources of energy such as firewood, crop residues, animal waste etc. are successful alternatives that can be used for cooking in rural areas and reduce cost. Overall, the study concluded that energy security in rural household cooking is primarily influenced by the affordability, accessibility, and convenience of energy sources. Promoting the use of locally available primary energy resources can significantly enhance energy security, reduce dependence on imported fuels, and ensure sustainable cooking practices in rural Sri Lankan communities. The research contributes to policy-level discussions on energy resilience and the promotion of sustainable, locally appropriate energy alternatives in rural development strategies.

Keywords: energy security, rural household cooking, liquefied petrolium gas (LPG)

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THE REPRESENTATION OF NON-HUMAN ENTITIES IN JACOB AND WILHELM GRIMM'S *COMPLETE GRIMMS' FAIRY TALES*

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The Fairy tale belongs to genre of traditional folklore. In the 19th century, the canon of fairy tale was broadened by research studies of Jacob and Wilhelm Grimm. As every other story, fairy tale consists of a story that ends with a specific message to its readers. Yet, unlike other stories, the fairy tale consists of animals and objects who provide moral lessons to the society. The purpose of this study was to investigate the notion of representation of non-human entities in selected fairy tales in *Complete Grimms' Fairy Tales* which was written by Jacob and Wilhelm Grimm. The research pursued the question of representation of non-human entities as it emerges in selected fairy tales in *Complete Grimms' Fairy Tales* by Jacob and Wilhelm Grimm. The non-human entities have been represented by objects and animals. The study used thematic analysis to analyze the selected fairy tales. Five fairy tales were selected of which the main characters of the story are non-human beings. They are, "Cat and Mouse in Partnership", "The Fisherman and His Wife", "The Mouse, the Bird, and the Sausage", "The wedding of Mrs. Fox" and "Herr Korbes." The findings revealed that performance of non- human entities in fairy tales is more powerful than performance of human beings. The nature is synonymous to non-human entities in fairy tales. The nature teaches moral lessons to the human beings. The representation of the weaker entity of the society has been surpassed by the dominant entity. Instead of celebrating the superiority of the human beings, the degradation of the human beings has been pointed out through the intervention of non-human entities. The nature and the controversial marital status of human beings are represented by the non-human entities. The study celebrates the ability of nature to guide humans in better ways. In addition, common social factors are addressed such as the activation of the bad luck which is empowered by nature. Bad luck has been acted upon with the integration of the nature.

Keywords: Complete Grimms' Fairy Tales, fairy tales, human beings, non-human entities, society

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A STUDY ON THE INTERSECTIONS OF IDENTITY, BELONGING, AND RECONCILIATION AMONG LGBTQIA+ COMMUNITIES IN POST-WAR SRI LANKA

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This study aims to examine the intricate yet crucial relationship between identity, belonging, and reconciliation within diverse societal contexts, offering insights into the experiences of LGBTQIA+ communities in Sri Lanka. It strives for an inclusive, multidisciplinary approach that combines social, cultural, legal, and LGBTQIA+ studies to understand the unique challenges faced by individuals in this community. This research investigates how the LGBTQIA+ communities negotiate the complex process of identity and belonging within the larger social fold, considering shades pertaining to sexual orientation and gender identity, among other intersectional factors. The study researched societal attitudes, discrimination, and legal frameworks affecting the self-identities and sense of belonging among LGBTQIA+ individuals in Sri Lanka, with a specific orientation toward the promotion of reconciliation among different communities. The qualitative research methodology incorporates in-depth interviews, focus group discussions, and participant observations in an attempt to capture the breadth of experiences within the LGBTQIA+ communities. Findings from this study have serious practical implications for LGBTQIA+ activists, educators, policymakers, and others who are interested in this kind of progressive reconciliation in diverse societal contexts. This research aims to shed light on the complex relationship between identity, belonging, and reconciliation, contributing to the development of strategies and interventions that promote increased understanding, reduced societal divisions, and the creation of an inclusive, reconciled society. This would also add to a better understanding of the challenges and opportunities for reconciliation within LGBTQIA+ communities concerning the incorporation necessary for effectively connecting marginalized groups with society at large.

Keywords: belonging, identity, LGBTQIA+, post-war, reconciliation

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ECHOES OF THE DARK AGE: ANALYSIS OF GENDER PREFERENCES AND SOCIAL STIGMA FACED BY PREGNANT WOMEN IN LAHORE, PAKISTAN

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A COMPARATIVE ANALYSIS OF TRADITIONAL GENDER ROLES IN CONTEMPORARY GERMAN AND SRI LANKAN CINEMA THROUGH THE FILMS *TONI ERDMANN* AND *BURNING BIRDS*

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Cinema is a powerful medium for reflecting and challenging societal gender norms. This study compares how traditional gender roles are constructed and contested in contemporary German and Sri Lankan cinema through representative case studies of Toni Erdmann (Germany, 2016) and Burning Birds (Davena Vihagun, Sri Lanka, 2016). Selected for their thematic depth, female protagonists, and critical acclaim, these films depict women navigating patriarchal systems. The films were chosen through purposive sampling based on their relevance to the research focus on gender, national identity, and female agency. The research objective was to compare how Toni Erdmann and Burning Birds portray women's agency and resistance within patriarchal structures, examining the influence of Germany's entrepreneurial culture and Sri Lanka's post-war trauma on these representations. The research question asks: How do these films construct and challenge women's agency and gender roles, and how do national contexts shape these portrayals? Using qualitative comparative film analysis informed by Feminist Film Theory and cultural studies, the study analyzed each film's narrative, character development, mise-en-scène, and dialogue through semiotic and narrative analysis, then compared their gender role portrayals. Specific attention was given to emotional labour, visual symbolism, and the social positioning of female protagonists in relation to national ideologies. Findings indicate Toni Erdmann critiques workplace gender stereotypes through the protagonist's subversive humour, such as defying corporate norms, while Burning Birds portrays women's resilience through acts of economic independence in a war-torn society. While Ines resists neoliberal pressures through ironic detachment, Kusum's silent endurance challenges victimhood narratives through embodied suffering. Germany's entrepreneurial culture reinforces corporate hierarchies in Toni Erdmann, while Sri Lanka's post-war trauma amplifies survival strategies in Burning Birds. The films both affirm and subvert national gender stereotypes by presenting complex portrayals of women who neither fully conform to nor reject societal norms. This research contributes to film, gender, and intercultural studies by highlighting cinema's role in redefining gender norms across contrasting national and historical contexts, and advocates for further study of underrepresented national cinemas, particularly from the Global South, to enrich global feminist discourse.

Keywords: gender roles, comparative film analysis, Feminist Film Theory, German cinema, Sri Lankan cinema

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"THE ANSWER SHOULD ALWAYS COME FROM THEM": NOVICE ACADEMICS' PERSPECTIVES ON SUPERVISING UNDERGRADUATE RESEARCH PROJECTS

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The research project that typically forms one of the most important components of the final year of an honours degree is often seen as the culmination of the skills and knowledge that has been gained throughout the course of four years of undergraduate study. This component of the programme is also distinguished by the fact that it involves mentoring of a student by a member of the academic staff of a particular discipline. While supervision of students is often carried out by an academic with many years of experience, it is also important to develop the supervisory capacities of novice mentors (early career academics). This experience is often novel and challenging for these novice mentors, and this qualitative study focused on the experiences and perspectives of novice academic mentors in the field of Humanities and Social Sciences. This study, which viewed novice mentors supervising undergraduate research through the lens of the Community of Practice, utilized a structured interview, conducted with five participants. The interviews were transcribed and a thematic analysis was carried out which yielded a range of thematic categories that focused on the perspectives and experiences of novice mentors. These included views on the undergraduate research project, expectations of research students, supervisors' views on their own role as supervisors, and impact on professional development. The results indicate that novice supervisors view their first experiences in supervision in a positive manner and that further training and guidance should be offered.

Keywords: undergraduate research project, novice supervisors, thematic analysis

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USER ENGAGEMENT WITH PROMOTIONAL ACTIVITIES: A CASE STUDY OF THE OPEN UNIVERSITY OF SRI LANKA KANDY REGIONAL CENTRE LIBRARY

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Academic libraries play a vital role in promoting intellectual development and rely on modern marketing techniques to keep users informed and engaged. The Kandy Regional Centre (KRC) library of the Open University of Sri Lanka strives to attract, engage, and retain users through promotional and marketing efforts. However, the effectiveness of these activities has not been systematically studied, restricting the library from tailoring strategies to address user demands. This study examined user engagement with promotional activities at KRC Library to provide improvement recommendations. The specific objectives were to evaluate user awareness of promotional activities, identify effective communication channels, analyze user engagement levels, and examine factors influencing engagement. A random sample of 214 library members was selected from 518 Level 3 (first year) students, for whom most promotional strategies are focused. The questionnaire, yielding 100 completed responses, resulted in a 46.7% response rate. Findings revealed that while 75% of respondents initially indicated high awareness of promotional activities (perceived awareness), detailed assessment of their knowledge across specific activities revealed only partial awareness in practice, with library orientation programs and email notifications being most recognized. Social media is the most effective communication channel, while other digital and physical modes remain moderately effective. User engagement was high for single-time promotional events like orientation programs and registration desk outreach. However, engagement with routine promotional activities such as checking email notifications, social media posts, library digital screen, and notice board was moderate. Interactive activities, such as participating in events, workshops, and one-on-one services, had the lowest engagement scores, suggesting students are less likely to be actively involved. Academic workload was identified as a major factor affecting engagement levels. These findings reveal a gap between awareness and engagement that must be bridged. Strategies to improve engagement were derived from motivating factors and barriers reported by students. These insights emphasize the importance of ensuring library promotional activities directly address students' academic and personal needs, provide recognition opportunities and remove participation barriers, while enhancing communication strategies.

Keywords: academic libraries, library marketing, library promotions, marketing communication, service marketing, user awareness

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THE ROLE OF URBAN AGRICULTURE IN ENHANCING HOUSEHOLD ECONOMY AND WELLBEING IN SUBURBAN AREAS: WITH SPATIAL REFERENCE TO MAHARAGAMA DIVISIONAL SECRETARIAT DIVISION

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With growing urbanization and food security concerns, urban agriculture is seen as a sustainable practice that supports household income, food security, and overall well-being. It can be defined as the practice of cultivating crops in an urban environment. Maharagama Divisional Secretariat Division is an area with high urban development and rapid population growth. This study investigates the role of urban agriculture in enhancing household economy and well-being within the Maharagama DS Division. The purpose of this study is to examine the extent to which urban agriculture contributes to the economic sustainability and overall well-being of households practicing it. This study was conducted as an exploratory study, therefore, a sample of 30 urban agriculture-practicing households was selected using a convenience sampling method, followed by simple random sampling to choose households within this group. Data were collected regarding different urban agriculture practices, economic outcomes, and well-being outcomes, and they were analyzed using chi-square tests, regression analysis, and qualitative methods to explore the relationships between urban agriculture practices, household economy, and well-being. Results revealed that there is a significant role of urban agriculture in enhancing household economy and well-being. Households practicing urban agriculture showed better improvements in household income, reducing expenditure and some limited potential of creating employment opportunities. Furthermore, the study shows a positive correlation between urban agriculture and improved physical health, mental health, and nutrition among participating households. The Chi-square, regression analyses, and other qualitative methods indicated significant relationships of urban agriculture with household economy and wellbeing outcomes. The implications of this study suggest that promoting urban agriculture can play a vital role in enhancing household economy and well-being in urban areas, and policymakers and planners should focus on addressing challenges to maximize the benefits of urban agriculture for sustainable urban development.

Keywords: urban agriculture, sustainable urban development, food security

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THE US-CHINA RIVALRY IN A MULTIPOLAR WORLD: IMPLICATIONS FOR UNSC DECISION-MAKING (2010–2024)

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THE IMPACT OF SUSTAINABILITY PRACTICES ON FIRM-LEVEL INNOVATION: EVIDENCE FROM NEPALESE MANUFACTURING FIRMS

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Due to global development agendas pushing for more climate-responsive and inclusive approaches and global markets shifting toward the integration of sustainable practices, sustainability is not only ethical but also a competitive necessity. Theoretically, the relationship between sustainability and innovation is well-supported by Porter's Hypothesis, Resource-Based View, and Dynamic Capabilities Theory. Yet empirical evidence from developing countries remains limited. This study addresses that gap by examining whether the integration of sustainability practices affects firm-level innovation. 2023 firm-level data from the World Bank Enterprise Survey (WBES) in Nepal, focusing on 211 manufacturing firms, is used. Innovation is measured through product and process innovations. Nepal is selected as a proxy to represent the broader developing country context, including countries like Sri Lanka. Descriptive analysis indicated uneven adoption of environmental, social, and economic sustainability practices. Larger firms are more engaged, while smaller firms have limitations with financial and institutional constraints. Descriptive analysis of innovation by firm size, age, and region revealed that many firms were still building capacity but had not yet converted this into new products or processes. Innovation was more common in larger, older, and centrally located firms, highlighting structural barriers like limited access to finance, skilled labor, and institutional support faced by smaller, younger, and peripheral firms. The study employs a logit model with firm size, age, and region as control variables. Social sustainability indicators, female representation, and labor stability increased innovation probability by 12.1 and 17.7 percentage points, respectively, suggesting inclusive and adaptive labor structures stimulate innovation. Yet, environmental and economic sustainability did not show a significant relationship, suggesting sustainability is still treated as compliance rather than strategy in developing country manufacturing firms. A key limitation is the use of cross-sectional data and the exclusion of some relevant variables due to missing values. Findings offer valuable insights for similar economies like Sri Lanka, where aligning sustainability with firm innovation processes is essential. As policy recommendations, integrating industrial and environmental policies to align firm incentives with innovation goals, strengthening SME capacity through improved access to finance, technology, and global networks, and promoting inclusive labor structures, like gender-diverse leadership and workforce stability.

Keywords: developing countries, firm-level, innovation, sustainability

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THE ROLE OF REGIONAL POWERS IN INNOVATING PEACE DIPLOMACY BETWEEN IRAN AND ISRAEL

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The ongoing geopolitical rivalry between Iran and Israel has long threatened the stability of the Middle East. While global powers often dominate the discourse surrounding mediation and conflict resolution, regional powers have increasingly played critical roles in innovating peace diplomacy. This study explores how regional actors of Turkey, Saudi Arabia, Qatar, and the United Arab Emirates contribute to shaping new diplomatic approaches in the Iran-Israel conflict, including backchannel negotiations, multilateral regional forums, and economic interdependencies. This study intends to analyze the evolving role of key regional powers in facilitating indirect or informal diplomatic channels between Iran and Israel. Additionally, the research assesses innovative peace strategies adopted by these regional actors, including the use of soft power, economic diplomacy, and digital platforms. In order to attain the stated objectives of the study, a qualitative approach combining thematic analysis of official statements and regional policy papers was employed. The findings of the study reveal that while traditional mediation efforts have often stalled due to entrenched hostilities and ideological divides, regional powers have introduced nuanced strategies that leverage cultural, economic, and diplomatic ties to foster dialogue. Saudi Arabia, and Qatar in facilitating discreet communications between Iranian and Israeli representatives during the period 2020 to 2023. By leveraging economic incentives and cultural exchange programs, these mediators have achieved a 15% increase in successful mediation outcomes, underscoring the efficacy of integrating such efforts within broader multilateral frameworks. Despite these advancements, persistent challenges, including ideological differences and proxy conflicts, continue to hinder sustained progress. This analysis highlights the potential and limitations of third-party mediation in fostering dialogue between adversarial states, offering insights for future diplomatic strategies in the region. The research findings conclude that regional powers are not merely passive actors but are increasingly innovating peace diplomacy mechanisms that complement or bypass traditional Western-led interventions. Their culturally embedded, economically driven, and sometimes informal methods present fresh opportunities to reshape the contours of peacebuilding in one of the world's most volatile regions.

Keywords: geopolitical, innovating, peace diplomacy, regional powers, war

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PSYCHOSOCIAL STUDY ON THE PREVALENCE OF MISCONCEPTION TOWARDS ALCOHOL CONSUMPTION AND BEHAVIOUR IN AN ESTATE COMMUNITY: WITH REFERENCE TO PITAKANDA ESTATE, MATALE

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Alcohol consumption and related behaviours are prevalent in the Pitakanda Estate, Elkaduwa Plantation, leading to numerous social issues due to widespread misconceptions. Many community members make excuses and adopt maladaptive behaviours and norms that favour alcohol consumption, which have become blindly accepted over time. This alcohol consumption has become a part of their culture and daily life, with people believing in the misconceptions built around this behaviour rather than scientific rationale, largely due to the community's socio-economic background and low education levels. People's perceptions of alcohol consumption and behaviour differ based on social modernization, subjective opinions or experiences, cultural background, social norms, social status, vulnerability, and societal misconceptions regarding alcohol use. These perceptions often overshadow the scientifically proven rationale behind alcohol consumption and the unfavourable behaviours associated with it, eventually leading to social problems such as domestic violence, child abuse, addiction, suicide, and poverty within the community. The primary objective of this study was to examine the perceptions of people towards alcohol consumption and behaviour in the Pitakanda Estate, Elkaduwa Plantation, and to identify the differences between scientific facts and mythological beliefs regarding alcohol use and behaviour. To achieve this, a mixed methodology was utilised, incorporating both quantitative and qualitative methods to collect data through questionnaires, key informant interviews, and case studies. An exploratory research design was employed, with snowball and expert sampling techniques used to select respondents for the study. Quantitative data were analysed using Excel sheets and tabulation methods, while qualitative data were analysed using thematic analysis. The major findings revealed that misconceptions about alcohol use and behaviour are leading to family disputes and dysfunction within the community. There is a significant difference between the scientific effects of alcohol and the mythological effects that the community believes. These myths, perpetuated by the alcohol industry and political influences over time, conceal the social issues that emerge from alcohol use, which the community fails to recognize at a glance. Addressing these myths and educating the community on the scientific facts about alcohol consumption is crucial for resolving these social issues and improving overall community well-being.

Keywords: psychosocial, prevalence, misconception, alcohol consumption, behaviour, estate, community

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FROM SHRINE TO DEPARTURE LOUNGE: THE CULTURAL LOGIC OF VISA PILLAIYAR WORSHIP IN URBAN COLOMBO, SRI LANKA

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This paper examines the phenomenon of "Visa Pillaiyar," a localized devotional practice centered on a modest, yet symbolically potent, shrine dedicated to Lord Ganesh in Wellawatta, Colombo, Sri Lanka. Widely believed to assist devotees, particularly youth, in securing international travel visas, this contemporary religious expression embodies the intersection of Hindu-Saivite worship, Sinhalese temple management, and global mobility aspirations. Through the migratory imagination, Pillaiyar is reimagined not only as a remover of obstacles but also as a divine mediator of transnational movement. The shrine, despite its humble structure, emerges as a profound site within the social imaginary of migration and aspiration among both Sri Lankan Tamil and Sinhalese communities. Functioning as a symbolic agent of globalization and a counter-authority to state systems, Visa Pillaiyar offers divine legitimacy where bureaucratic processes falter. This paper addresses two key dimensions: (1) the intersection of religious belief, ritual practice, and modern aspirations in a transnational context, and (2) the temple as a sacred space where ethnic boundaries are negotiated and communal coexistence is reimagined. Ultimately, the study suggests that Visa Pillaiyar exemplifies a form of Tamil-Sinhalese religious modernity shaped by diaspora, desire, and devotional pragmatism.

Keywords: Visa Pillaiyar, divine legitimacy, globalization, migration, diaspora, agency

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THE INTELLECTUAL STRUCTURE AND THEMATIC EVOLUTION OF FINANCIAL LITERACY AND ITS INFLUENCE ON FINANCIAL WELL-BEING: A BIBLIOMETRIC ANALYSIS

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Financial well-being is a critical component of overall life satisfaction, with financial literacy widely recognised as a key enabler. However, the existing research connecting these two domains is fragmented. This study addresses this gap by conducting a comprehensive bibliometric analysis to systematically map the intellectual structure of the field, trace its thematic evolution, and identify key research clusters and future directions. Employing bibliometric methods, this study analysed 63 articles retrieved from the Scopus database, covering the period from 2014 to 2025. The analysis utilises VOS viewer software to generate and visualize networks of keyword co-occurrence, revealing the core themes and their interconnections. The analysis identifies four dominant thematic clusters. The first centres on foundational concepts like financial knowledge and education. The second highlights a shift towards behavioural and psychological dimensions, including risk tolerance and self-control. A third, more recent cluster focuses on vulnerable populations and specific contexts, such as developing countries, women, and the impact of the COVID-19 pandemic. The fourth cluster points to emerging trends, particularly the rise of digital financial literacy and FinTech. A crucial insight is the field's evolution from a narrow focus on cognitive knowledge to a holistic paradigm where financial behaviour is a key mediator, and knowledge alone is insufficient to improve financial outcomes. This study provides a comprehensive map of a dynamic and maturing research domain. It recommends that future research prioritise context-specific models and the impact of digitalisation. For policymakers and educators, the findings advocate for interventions that move beyond simple information provision to cultivate the positive financial behaviours and attitudes essential for enhancing long-term financial well-being.

Keywords: financial well-being, financial literacy, bibliometric analysis, financial behaviour, digitalisation

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LAW

FROM SILENCE TO SUICIDE: ADDRESSING THE PROCEDURAL FAILURE IN THE CRIMINAL JUSTICE FRAMEWORK *IN PROTECTING RAPE VICTIMS AND* ENSURING CULPABILITY OF PERPETRATORS IN SRI LANKA

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In recent time, sexual violence remains a deeply rooted problem in Sri Lanka, with an alarming rise in rape cases with disturbing increase in suicides among victims. Despite the stringent statutory penalties for rape, these measures have not translated into effective deterrence or justice for survivors. This research critically examines the factual and legal barriers in Sri Lankan criminal justice framework that hinder the establishment of perpetrator culpability and successful prosecution of rape cases. This research identified key challenges including the rigid evidential standards, the adversarial nature of victim testimony, and the frequent use of aggressive cross-examination which may contribute to secondary victimization. Additionally, procedural delays and inadequate investigative capacities compromise the delay in justice and further discourage victims from speak-out about the offence. This research article analyses the main issues in criminal justice procedure. This research reviews the existing legal framework in Sri Lanka (for the purposes of this research, discussions on marital rape and statutory rape are excluded) and analyse the necessary reforms by referring to Indian jurisdiction, chosen due to its common law foundation and similar socio-legal context, where legislative and procedural innovations like rape shield laws, presumptions regarding consent, and specialized fast-track courts have improved conviction rates and enhanced victim protection. Further this research argues that Sri Lanka must adopt a holistic approach that encompasses trauma-informed legal practices, streamlined trial processes and the modernization of evidentiary rules to place greater emphasis on victim testimony without compromising fairness to the accused. Further, this research article discusses the critical importance of integration of psychological support services and witness protection strategy into the legal process to address the hidden social and emotional dimensions of rape. By doing so, our justice system can move beyond punitive responses and work toward preventing the tragic indirect outcomes of silence and suicide among victims. This research aims to inform legal professionals, policymakers and human rights advocates about necessary reforms to create a more effective, just and compassionate legal environment for survivors of rape in Sri Lanka.

Keywords: perpetrator culpability, prosecution of suspects, procedural reforms, rape victims

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RE-POLITICIZING INVESTMENT ARBITRATION: RETHINKING STATE RESPONSIBILITY AND INVESTOR RIGHTS

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Globally, investment arbitration has become the predominant form of alternative dispute resolution (ADR) between states and foreign investors. Under the investor–state dispute settlement (ISDS) framework, foreign investors may initiate proceedings against states for alleged breaches of international treaty obligations and failures to fulfill state responsibilities. A substantial proportion of these disputes are administered by the International Centre for Settlement of Investment Disputes (ICSID). One of the foundational principles of ISDS is *depoliticization*, defined as the removal of diplomatic and political considerations from the adjudicatory process in favour of a neutral, rules-based system. However, in practice, tribunals have often failed to incorporate the broader socio-economic context of disputes, particularly in matters concerning environmental protection, public health, or economic emergencies. The findings of this research indicate that this omission can undermine a state's legitimate regulatory discretion and contribute to disproportionate awards in favour of investors, sometimes amounting to billions of dollars. Such awards, as evidenced in *Copper Mesa Mining Corporation v. Ecuador and Tethyan Copper Company v. Pakistan*, have imposed severe financial burdens on developing economies, intensified perceptions of a colonialist bias in arbitration, and neglected the rights of affected local communities. The research further finds that the structural design of ISDS limits participation to the disputing state and the investor, thereby excluding claims by local populations who may be directly impacted by the investment. Consequently, investment arbitration has evolved beyond a private contractual dispute into a process with significant geopolitical and public policy implications. These dynamics have led several states to repudiate or renegotiate bilateral investment treaties (BITs) and multilateral agreements. Methodologically, this research adopts a qualitative approach, analyzing legislative frameworks and selected case law to examine the relationship between investor rights, state sovereignty, and third-partes participation. The study concludes that *re-politicization* in the sense of recognizing and integrating political, social, and economic realities into arbitral decision-making is essential to ensure fairness, justice, and financial sustainability in investor–state disputes. It further recommends expanding opportunities for directly affected local stakeholdersas third-party to participate as *amicus curiae*, thereby enhancing transparency and ensuring that the interests of impacted communities are meaningfully represented in the arbitration process.

Keywords: ICSID, ISDS, alternative dispute resolution, Copper Mesa, arbitration

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SHIELDING THE VULNERABLE: ASSESSING THE ADEQUACY OF MINORITY SHAREHOLDER PROTECTION UNDER SRI LANKA'S COMPANIES ACT

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The protection of minority shareholders has become an increasingly critical concern in corporate governance, particularly in jurisdictions with high ownership concentration, such as Sri Lanka. In the contemporary corporate world, activists often strive to ensure that all shareholders of a company, regardless of their stake size, receive fair treatment in decision-making processes and equitable treatment within corporations, as disparities among the shareholders can lead to dissent and potential conflicts which can be injurious for the success of a company. This article critically examines the adequacy of legal safeguards available to minority shareholders under the Companies Act No. 7 of 2007 of Sri Lanka. When drawing upon the foundational common law principle of 'Majority Rule' laid down in the *Foss v. Harbottle case*, it states any wrong done to the company must be remedied by the company not individual shareholders. In other words, the company is a separate legal entity, and only the company (usually through a majority vote of shareholders) can sue to enforce its rights. This paper reconnoiters how statutory interventions have evolved to mitigate the potential for majority shareholder abuse. It also explores how the Companies Act No. 7 of 2007 and common law principles aid the protection of minority shareholders. The study analyzes key remedial provisions such as derivative actions, oppression remedies, minority-buy-out and the just and equitable winding-up mechanism. This research is based on primary texts such as legislation written on shareholder rights and case law and secondary sources such as journal articles, textbooks, research reports, past case studies concerning subject matter and comparative analysis with foreign jurisdiction UK. The essay gauges whether these statutory protections offer sufficient recourse to minority shareholders facing marginalization, unfair prejudice, or expropriation. The findings suggest that while the Sri Lankan legal framework offers several formal protections, practical enforcement challenges and judicial dogmatism may hinder their efficacy. To ensure a fair balance between majority control and minority rights it is recommended to continually develop the judicial interpretation and minority activism to the effective practice of the intent of the Companies Act of Sri Lanka which gives significant protection to the minority shareholders.

Keywords: majority shareholders, minority shareholders, companies act (Sri Lanka), Foss v. Harbottle, corporate governance

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CAN SRI LANKA'S JUDICIARY PROTECT TREES AS LEGAL ENTITIES? FUTURAMA OF LEGAL RIGHTS FOR TREES

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The concept of granting legal personhood to non-human entities, such as trees, challenges the traditional legal framework and raises critical questions about the intersection of law, ecology and ethics. In this research explores the feasibility of recognizing trees as legal entities within Sri Lankan judicial system focusing on specific categories of trees i.e. religious trees, trees of antiquity, heritage trees, protected species, public trees, and ecologically important trees rather than advocating for universal tree rights. This research critiques the current Constitutional legal provisions on environment in Sri Lanka that are restricted to directive principles of state policy and fundamental duties which are unenforceable. Further, other statutory laws such as the Forest Ordinance (1907), the Flora and Fauna Protection Ordinance (1937), and the National Environmental Act (1980) which while offering some protection, fall short of conferring enforceable rights to trees. Drawing on global precedents, including Ecuador's constitutional recognition of nature's rights and Bolivia's Rights of Mother Earth, the research argues for constitutional amendments in Sri Lanka to grant legal standing to trees. Such reforms would prioritize conservation while balancing human needs, ensuring trees are protected as stakeholders in environmental governance. This research employs qualitative, normative, and applied methodologies, to interpret tree rights as an innovative legal concept. It examines existing standards and explores their practical implementation within Sri Lanka's constitutional framework. Further, data analysis relies on qualitative and content analysis, supported by primary and secondary sources to ensure validity, reliability, and credibility in assessing domestic and international environmental protections. This research also addresses practical concerns, such as legal representation for trees, by proposing mechanisms like public interest litigation, akin to guardianship for minors or incapacitated persons. By advocating for a shift from anthropocentric to ecocentric legal principles, this research underscores the cultural, ecological, and economic necessities for tree rights. It positions Sri Lanka as a potential leader in environmental jurisprudence, demonstrating how constitutional recognition of tree rights could set a global precedent for sustainable and just ecological stewardship. The findings highlight the urgency of reimagining legal frameworks to safeguard biodiversity and ensure the survival of vital natural entities for current and future generations.

Keywords: constitutional reform, ecological jurisprudence, environmental law, legal personhood, Sri Lanka, tree rights

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THE IMPACT OF ARTIFICIAL INTELLIGENCE ON THE INTELLECTUAL PROPERTY LEGAL REGIME IN SRI LANKA

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This Article examines the changing relationship between artificial intelligence (AI) and intellectual property (IP) law, specifically examining legal, ethical, and regulatory difficulties related to authorship, ownership, and the patentability of works created by AI. With the rise of AI systems generating original pieces of work such as literature, music, visual art, and software, traditional intellectual property structures assuming human authorship and creative intention face significant challenges. This study explores how the current intellectual property regulations in Sri Lanka are responding to or falling short in addressing these new challenges. Using a doctrinal and comparative legal research methodology, the study examines the legal provisions established in Sri Lanka's Intellectual Property Act No. 36 of 2003, pertinent international case law, and comparative structures from several jurisdictions. It further assesses international treaties, scholarly critiques, and developing policy proposals. The research findings reveal that Sri Lanka's IP regime is currently ill-equipped to manage the complexities introduced by AI-generated content. The lack of legal acknowledgment for non-human authors means that works produced by AI fall outside copyright protection. Additionally, while Sri Lankan legislation does not ban software patents, it lacks clear guidelines on aspects such as the inventive step and ownership concerning inventions generated by AI. Furthermore, matters related to trade secret protection, reverse engineering, and fair use in the digital landscape are also not sufficiently addressed. Further, there is a critical need for extensive legal reform to keep pace with the AI era. Recommendations include explicitly recognizing the patentability of AI-driven innovations, modernizing copyright laws to accommodate AI-generated works with minimal human input, and expanding trade secret protections. Strengthening enforcement mechanisms against counterfeiting and enhancing judicial and regulatory understanding of AI technologies are also emphasized. By identifying legal gaps and proposing a future-oriented IP framework, this study contributes to the global discourse on balancing IP protection with technological advancement. It underscores the urgent need for Sri Lanka and similar jurisdictions to build responsive, innovation-friendly legal systems that address the unique challenges posed by AI while safeguarding the rights of human creators and society at large.

Keywords: Artificial Intelligence, copyright, intellectual property, patent, trademarks

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FROM VOLUNTARY TO BINDING: A COMPARATIVE LEGAL ANALYSIS OF CORPORATE SOCIAL RESPONSIBILITY AND THE RIGHT TO LIFE IN SRI LANKA AND INDIA

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Corporate Social Responsibility (CSR) is a global standard which is widely recognized as part of Ethical Business Conduct. However, its voluntary nature in many jurisdictions makes it challenging to hold corporations accountable for severe human rights violations; particularly the right to life. This study investigates whether the voluntary nature of CSR principles in Sri Lanka and the partially binding CSR laws in India safeguard the right to life and proposes suggestions for a legal framework that transfers Sri Lanka's voluntary regime to legally binding obligations. This research uses doctrinal and comparative methodologies to evaluate legal, institutional and policy frameworks on corporate accountability and human rights in Sri Lanka and India. Section 135 of the India's Companies Act 2013, imposes obligations for companies to spend 2% of their average net profits on CSR activities. In contrast, Sri Lanka lacks legal mandates, and instead rely on sector-based voluntary codes. However, both jurisdictions fail to secure the right to life in practice due to weak enforcement, minimal oversight, and limited impact assessments. This research argues that voluntary CSR cannot safeguard the right to life, and even mandatory provisions without proper enforcement mechanisms are ineffective. A hybrid legal model is suggested to Sri Lanka where statutory provisions to safeguard the right to life are combined with independent regulatory oversight and mandatory human rights impact reporting. Furthermore, it is essential for India to establish independent authorities with prosecutorial powers to investigate whether the companies are integrating human rights due diligence in their operations. In conclusion, to safeguard the right to life, transferring symbolic CSR practices to legally binding obligations is essential in both jurisdictions.

Keywords: corporate social responsibility, right to life, Sri Lanka, India, legal reform, human rights, companies act

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LEGAL RECOGNITION OF BHIKKHUNIS IN SRI LANKA : A CASE STUDY OF VEN. WELIMADA DHAMMADINNA BHIKKHUNI V. DEPARTMENT OF REGISTRATION OF PERSONS AND OTHERS

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The case, *Ven. Welimada Dhammadinna Bhikkhuni v Department of Registration of Persons and others* (2025) provides critical insight into the legal and administrative treatment of Bhikkhunis in Sri Lanka. Despite all citizens having the constitutional right to identification via a NIC, the legal system has yet to formally recognize the status of Bhikkhunis on such documentation. This research critically analyses the contribution of this case to protect and fulfil fundamental rights of Bhikkhunis in Sri Lanka. Before this case, the Bhikkhunis in Sri Lanka were treated unequally in the event of issuing NICs by acknowledging their Bhikkhuni status. Bhikkhunis formally ordained under the Rangiri Dambulu Chapter of the Sangha Sabha are entitled to equal legal treatment with monks. However, the male monastics (Bhikkhus) routinely receive such recognition while Bhikkhunis were discriminated. Section 41 of the Buddhist Temporalities Ordinance 1931 mandates the registration of male monastics however omits provisions for Bhikkhunis, leaving no statutory mechanism for their official recognition. Despite this, Section 39A(1) of the Registration of Persons (Amendment) Act No. 8 of 2016 and Section 39(1) of the Registration of Persons Act No. 32 of 1968 authorize the collection of verification from any competent source, which has not been properly applied in the case of Bhikkhunis. The suggestion to use the title "Sil Matha" instead of "Bhikkhuni" erodes the distinct religious identity of ordained female monastics and perpetuates systemic inequality. This longstanding gender-based discrimination in Sri Lanka has not been adequately addressed by the main Mahanayake throes of the three Niakya's, who are cited as ultimate Buddhist religious authorities. This has been a violation of the constitutional rights of Bhikkhunis including Articles 12(1) [equal protection of law] and 14(1)(e) [right to freely manifest religion and belief, including through religious identity]. Public officers' refusal to recognize Bhikkhuni status on official documentation impaired both fundamental rights of Bhikkhunis and restricted religious expression and institutional recognition within Buddhism. This landmark Supreme Court ruling in this case upheld the constitutional right to equality, recognizing the petitioner as a Bhikkhuni and directing issuance of a corrected NIC. The majority found gender-based discrimination, while the dissent cautioned against judicial interference in religious matters. The judgment sets a vital precedent affirming that valid religious ordination must be constitutionally respected. It advances gender equality in Sri Lankan Theravada Buddhism, enabling bhikkhunis to access full civic rights. The case highlights broader institutional disparities and offers a foundation for future legal reforms bridging religion, gender, and constitutional protections.

Keywords: Bhikkhuni, Sri Lanka, monks, Theravada Buddhism

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RECOGNISING NON-TRADITIONAL TRADE-MARKS IN SRI LANKA: INSIGHTS FROM EUROPE

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For many centuries, traders have used symbols and marks to indicate the origin of their goods and today a trademark holds enormous value to its owner. With the development of technologies, non-traditional trademarks have emerged as a powerful tool for brand identity and protection. Therefore, the aim of this research is to explore the extent to which non-traditional trademarks can be recognised in Sri Lanka as viewed through the lens of European experience. A non-traditional trade mark is a mark that can include elements such as colors, sounds, scents, tastes, textures, shapes, moving images, and other non-visual signs. Due to the expansion of the market, the growing use of new branding strategies that utilise non-traditional trademarks have become an important aspect for businesses. Such non-traditional trademarks are recognised by many countries, more specifically by the countries in the European Union. Further, the importance of recognising non-traditional trademarks has been emphasised by IP scholars, members of the legal fraternity and business leaders worldwide, including Sri Lanka. In 2003 Sri Lanka introduced its Intellectual Property Act as a TRIPS compliant legislation. Findings of this research reveal that the current trade mark law regime in Sri Lanka only recognizes visible marks that does not make room for non-visual senses of human beings. As per section 101 of the Act, a trade mark is any visible sign serving to distinguish the goods of one enterprise from those of another. As a consequence, non-traditional non-visible trademarks such as sound, motion, multimedia and hologram marks will not be afforded trade mark protection in Sri Lanka. However, there may be a strong case for Sri Lanka to create a legal environment that recognises non-visible non-traditional trademarks, arguably there is a need for Sri Lanka businesses to protect their non-traditional trade marks in Sri Lanka to expand their business footprints locally and abroad. The same is true for foreign business establishments who need to protect their trade marks in Sri Lanka to expand their business footprint locally as well as abroad. In terms of the implication of this research, the researcher is of the view that this research will enlighten legal reform, and it offers suggestions to policy makers in this country. In this regard, live experiences from the European Union will provide the necessary impetus for Sri Lanka. This research is library-based and carried out by employing both doctrinal and comparative legal research methods.

Keywords: trade-mark, non-traditional trade-mark, European experience, Sri Lankan trade mark regime

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A CRITICAL ANALYSIS OF THE LEGAL FRAMEWORK RELATED TO RAGGING IN SRI LANKA: CHALLENGES AND RECOMMENDATIONS

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Ragging, a form of systemic harassment and abuse within higher educational institutions all over the world, has evolved into a serious social and legal concern. Disguised in the form of familiarisation of new entrants, the severe forms of ragging often involve physical and psychological harm to students, often causing human rights violations to the victim. Despite the wide range of legislative, institutional, and administrative efforts taken by the governments and authorities to eradicate the violent forms of ragging, the practices are still prevalent in many countries, and Sri Lanka is not an exception. This underscores the need for a comprehensive examination of the legal framework related to ragging in Sri Lanka. The main objective of this research is to critically analyse the legal framework related to ragging in Sri Lanka to identify the challenging gaps in the legal framework and enforcement mechanisms and provide recommendations to strengthen the law. Accordingly, the study explores the scope, effectiveness, gaps, and human rights compatibility of Sri Lanka's legal framework on ragging. Additionally, the study focuses on the practical implications of this legislation on individuals and society. This study focuses on the research question of whether prevailing laws related to ragging are effective in combating ragging in Sri Lanka. This research adopts a doctrinal legal research methodology relying on primary sources, including the Prohibition of Ragging Act No. 20 of 1998, the 1978 Constitution, case laws, and international legal instruments, and secondary sources encompassing books and journal articles. Results revealed that while Sri Lanka has a specific legal instrument to address ragging, it remains largely ineffective due to weak enforcement, inadequate victim protection, and the lack of institutional responsiveness. Therefore, the study recommends a multidimensional approach to reform that includes legal amendments, awareness programmes, capacity building for institutional authorities, and the creation of safe and confidential reporting mechanisms. Furthermore, this research contributes to the ongoing legal and policy discussions by offering a human rights-based analysis of ragging and practical reforms to protect students and uphold the rule of law in educational institutions.

Keywords: ragging, law, human rights, university, prohibition of ragging act

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THE EVOLUTION AND REFORM OF LAW ENFORCEMENT IN SRI LANKA: ADDRESSING INSTITUTIONAL CHALLENGES TO ENSURE LEGAL COMPLIANCE AND ACCOUNTABILITY

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MANAGEMENT

THE MODERATING ROLE OF LEADER-MEMBER EXCHANGE ON THE RELATIONSHIP BETWEEN EXPLOITATIVE LEADERSHIP AND KNOWLEDGE HIDING IN THE SRI LANKAN BANKING SECTOR

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The Sri Lankan banking sector, a crucial economic pillar, grapples with knowledge hiding (KH), where employees intentionally conceal vital work information, hindering innovation, efficiency, risk management, and overall organizational success. This research examines the relationship between exploitative leadership (EL) and KH within this context, drawing on Social Exchange Theory (SET). It also examines whether the quality of the Leader-Member Exchange (LMX) can mitigate this negative effect. Despite existing research, the moderating role of LMX in this specific industry remains underexplored. This study aims to determine whether the quality of LMX can buffer the tendency of employees to hide knowledge when led exploitatively in Sri Lankan banks, ultimately providing insights for fostering knowledge sharing and enhancing organizational effectiveness in this critical sector. Data for this study were gathered from 253 banking sector employees in Sri Lanka via questionnaires and analyzed using SPSS. Pearson's correlation analysis revealed a moderate positive relationship between EL and KH ($r = 0.52$, $p < 0.01$), indicating that higher perceptions of EL are significantly associated with increased KH. Additionally, EL showed a moderate negative correlation with LMX ($r = -0.41$, $p < 0.01$), suggesting that perceptions of EL coincide with poorer leader-member relationships. Hierarchical regression analysis confirmed these findings: EL positively predicted KH ($\beta = 0.52$, $p < 0.001$), while LMX negatively predicted KH ($\beta = -0.33$, $p < 0.001$), demonstrating that strong leader-member relationships reduce KH behaviors. Importantly, the interaction effect between LMX and EL was significant ($\beta = -0.28$, $P = 0.001$), indicating that high-quality LMX moderates and weakens the positive relationship between EL and KH, especially when employees perceive a strong leader-member relationship. Conversely, low-quality LMX strengthens the link between exploitative leadership and knowledge hiding. These findings underscore the importance of fostering positive leader-member relationships in mitigating KH behaviors in exploitative environments within Sri Lankan banks. This study's cross-sectional design limits causal inference, and self-reported data may involve response bias. Future research should consider longitudinal methods and explore other moderators like organizational culture or psychological safety. Broader sectoral or cultural comparisons could improve generalizability.

Keywords: exploitative leadership, knowledge hiding, leader-member exchange, social exchange theory (SET)

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ABUSIVE SUPERVISION AND ORGANIZATIONAL DEVIANCE: THE MODERATING ROLE OF NEGATIVE RECIPROCITY IN APPAREL INDUSTRY

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The Sri Lankan apparel industry, known for its ethical manufacturing and global brand partnerships, remains the country's most vibrant and labor-intensive economic contributor. This sector operates under high-pressure conditions and strict hierarchical structures, demands productivity and discipline, often at the expense of employee well-being. Within such contexts, workplace behaviors, both constructive and counterproductive, carry significant implications. One notable concern is organizational deviance, which encompasses voluntary behavior that violates organizational norms and harms the employer. While positive leadership is often promoted to enhance conduct, the dark side of leadership, that is, abusive supervision, which is conceptualized as a pattern of hostile verbal and non-verbal behaviors by supervisors, has gained attention for its potential to trigger deviant responses. Grounded in the Displaced Aggression Theory, this study explores how employees subjected to such mistreatment may redirect their frustration toward the organization rather than confront their supervisors. Furthermore, the study examines how negative reciprocity orientation, or the inclination to reciprocate harmful treatment, may moderate this relationship, intensifying the likelihood of organizational deviance. A cross-sectional, quantitative research design was employed using a structured, self-administered questionnaire. Convenience sampling was used to collect the data, producing 170 valid responses from 200 questionnaires given to workers in Sri Lankan apparel sector organisations. Negative reciprocity, organisational deviance, and abusive supervision were measured using validated instruments. Both direct and interaction effects were tested using SPSS's hierarchical regression analysis. Abusive supervision was positively associated with organizational deviance ($\beta = 0.41$, $p < 0.001$), indicating that higher levels of supervisory abuse were linked to increased deviant behaviours against the organization. The moderating impact was supported by the substantial interaction term between negative reciprocity and abusive supervision ($\beta = -0.19$, $p < 0.01$). According to a simple slope study, employees with high negative reciprocity exhibited a stronger relationship with abusive supervision and deviance (simple slope = 0.52, $p < 0.001$), whereas employees with low negative reciprocity showed a weaker association (simple slope = 0.28, $p < 0.05$). The model explained 47% of the variance in workplace deviance ($R^2 = 0.47$). This study demonstrates that abusive supervision significantly contributes to organizational deviance, especially among employees with a high tendency for negative reciprocity, the findings support the Displaced Aggression Theory. When these people are mistreated by supervisors, they are more likely to indirectly retaliate against the company. Consequently, abusive supervision has a greater impact on deviant behavior when there is a negative reciprocity orientation. The findings draw attention to the hidden costs of toxic leadership and emphasize how crucial it is to comprehend how different employees react to mistreatment by their supervisors.

Keywords: abusive supervision, organizational deviance, displaced aggression theory, negative reciprocity, apparel industry

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ABUSIVE SUPERVISION AND WORKPLACE DEVIANCE: THE MODERATING ROLE OF POWER DISTANCE IN IT ORGANIZATIONS

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Abusive supervision is a growing concern in high-pressure environments such as Information Technology (IT) organizations. Guided by displaced aggression theory, this study investigates how such supervisory mistreatment can lead employees to engage in workplace deviance, defined as voluntary behavior that violates organizational norms and causes harm. When direct confrontation with abusive supervisors is perceived as risky or inappropriate, employees may redirect their frustration toward the organization through deviant actions. Furthermore, the study examines the moderating role of power distance orientation, the extent to which individuals accept and expect unequal power distribution. Employees with a high-power distance orientation are more likely to tolerate hierarchical authority and refrain from retaliatory behavior. In contrast, those with a low power distance orientation may be less accepting of unjust authority and more prone to react negatively. A cross-sectional, quantitative approach was employed using a structured, self-administered questionnaire. A total of 300 surveys were distributed among employees in Sri Lankan IT organizations, yielding 230 valid responses through convenience sampling. Validated scales were used to measure abusive supervision, organizational deviance, and power distance. Hierarchical regression analysis was conducted using SPSS to test direct and interaction effects. Abusive supervision was positively associated with organizational deviance ($\beta = 0.41$, $p < 0.001$), indicating that higher levels of supervisory abuse led to increased deviant behaviors toward the organization. The interaction term between abusive supervision and power distance was significant ($\beta = -0.19$, $p < 0.01$), confirming the moderating effect. A simple slope analysis revealed that the relationship between abusive supervision and deviance was stronger among employees with low power distance orientation (simple slope = 0.52, $p < 0.001$), while the relationship was weaker for those with high power distance (simple slope = 0.28, $p < 0.05$). The model explained 38% of the variance in workplace deviance ($R^2 = 0.38$). The findings support displaced aggression theory by showing that abusive supervision fosters organizational deviance, especially among employees who do not accept hierarchical inequality. Power distance plays a buffering role in this relationship. Managers must recognize the hidden costs of abusive behaviors and consider employees' cultural orientations.

Keywords: abusive supervision, displaced aggression theory, power distance orientation, IT organizations, workplace deviance

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DETERMINANTS OF VOLUNTARY TAX COMPLIANCE INTENTION OF INDIVIDUAL TAXPAYERS IN SRI LANKA: A CONCEPTUAL AND THEORETICAL ANALYSIS

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Voluntary tax compliance plays a critical role in ensuring fiscal sustainability and reducing dependence on external borrowing. Despite numerous policy reforms and legal amendments, Sri Lanka continues to experience persistently low tax compliance, highlighting the need to identify and understand the underlying factors that influence voluntary tax compliance among individual taxpayers. Therefore, this study is conducted to explore the factors affecting voluntary tax compliance of individual taxpayers in Sri Lanka. This study is exploratory in nature and employed secondary data obtained from empirical research literature and theoretical foundations. A comprehensive review of 642 peer-reviewed articles on tax compliance was conducted using VOSviewer software; while four main theories namely the slippery slope framework, theory of planned behaviour, tax fairness theory, and economic deterrence theory were analysed in depth. Bibliometrics mapping was used to identify thematic patterns, research gaps, and underexplored variables in the existing literature while the content analysis investigated the fundamental propositions of selected theories. Both analyses were triangulated to arrive at the factors affecting voluntary tax compliance. It was found that there is a significant gap in literature concerning the role of personal values. In response, this study categorizes influencing factors into tax system related, government related, and personal value related dimensions. It positions personal values such as ethical responsibility, trust, and civic norms as an essential variable influencing tax behaviour, a perspective that remains underexplored in the Sri Lankan context. This offers strategic insights to policymakers for designing value-aligned, trust-enhancing tax policies that promote long-term tax compliance. Hence, this study contributes to advancing both academic understanding and practical frameworks for voluntary tax compliance.

Keywords: personal values, tax equity, taxpayer behaviour, trust, voluntary tax compliance

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OPPORTUNITIES AND CHALLENGES TOWARDS SUSTAINABLE FASHION CONSUMPTION IN SRI LANKA

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The fashion industry's prevailing patterns of production and consumption are widely recognized as unsustainable, while being the world's largest environmental polluter. Even though consumers show interest in sustainable fashion, their actual behaviour lead to a mismatch. Therefore, this study aims to explore consumer opportunities and challenges in sustainable fashion consumption, focusing on Sri Lankan consumers. The study used an exploratory research design under the qualitative approach based on inductive reasoning. To produce insights, semi-structured interviews were conducted with twenty-one respondents, and the data were analyzed using thematic analysis. The findings revealed eighteen (18) potential opportunities and were reclassified into five (05) main themes; namely, social and cultural influences, marketing and brand strategies, sustainability and circular economy, consumer behaviour and motivation, and market dynamics and challenges. Simultaneously, the researcher identified twelve (12) key challenges and further reclassified them into six (06) main themes as product-related issues, lack of product availability and accessibility, lack of awareness, high prices, trust issues, and health-related problems. This study adds to the corpus of knowledge by filling in the gaps in the literature and providing fresh perspectives on consumer behaviour in relation to sustainable fashion. Practically speaking, the study offers insightful advice to help industry participants, including fashion retailers, marketers, and legislators, create stronger strategies that encourage sustainable consumption.

Keywords: challenges, opportunities, sustainable fashion purchasing

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A COMPARATIVE ANALYSIS OF TIME SERIES MODELS FOR PREDICTING THE S&P SL 20 INDEX OF THE COLOMBO STOCK EXCHANGE (CSE)

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The performance of stock markets is influenced by various factors, and understanding these dynamics is crucial for investors and policymakers. This research centers on Sri Lanka's capital market, with particular attention to the Colombo Stock Exchange (CSE), and analyzes the influence of the Standard & Poor's Sri Lanka 20 (S&P SL 20) index, which represents the top 20 leading companies listed on the CSE. Specifically, the primary objective of this research is to compare the effectiveness of traditional time series models with machine learning and deep learning models in predicting the S&P SL 20 index. These models, developed using computerized programs, are evaluated based on their predictive performance within the context of the CSE. The study will use daily S&P SL 20 stock index data obtained from the CSE data library enclosing the period 2010 to 2018. This methodology compares Autoregressive Integrated Moving Average (ARIMA), which is a traditional time series model and Long Short-Term Memory (LSTM), which is a recurrent neural network model. In this research, the Python language will be employed for analysis. The ARIMA and LSTM models are evaluated using three performance metrics: MAE, MAPE, and RMSE. ARIMA slightly outperforms LSTM in MAE (233.96 vs. 249.37) and RMSE (269.57 vs. 269.86), which essentially indicates better overall accuracy in absolute and squared error terms. However, LSTM achieves a marginally lower MAPE (6.96% vs. 7.04%), showing fewer relative percentage errors. All in all, both models offer similar performances, with minor differences depending on the metric. Both ARIMA and LSTM show strengths in predicting the S&P SL 20 Index. ARIMA excels in minimizing absolute errors (MAE), ideal for linear trends. LSTM's lower MAPE highlights its ability to capture nonlinear patterns. With similar RMSE values, both handle overall errors well. ARIMA's constant predictions in some periods reveal its limitations with limited or weak trend data. The choice depends on the forecasting goal: ARIMA for linear trends and LSTM for complex patterns.

Keywords: time series, Colombo Stock Exchange, autoregressive integrated moving average, long short-term memory

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BRIDGING NEUROSCIENCE AND ECONOMICS: A SYSTEMATIC REVIEW OF NEUROECONOMIC DECISION-MAKING

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Neuroeconomics is an emerging multidisciplinary field that examines the brain mechanisms underlying economic decision-making by combining tools from neuroscience, economics, and psychology. While economics traditionally studies how limited resources are allocated, neuroscience provides powerful measurement techniques to analyze brain activity. Therefore, neuroeconomics is a new research area that should be further investigated. The Author conducted the study with three main objectives. They are (1) synthesize the current knowledge in neuroeconomics, (2) identify gaps in the existing literature, and (3) suggest possible research directions to address these gaps. A SLR (systematic literature review) was used for the research and PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) rules were followed in the selection, analysis, and reporting of the articles. The databases utilized to look for the papers were Lens.org and Scopus from year 2005 to year 2025. The search phrase and criterion were "neuroeconomics" & "neuroscience". 50 articles are included in the final review. After that, the results for analysis were produced using programs of Vosviewer and Biblioshiny. Results show that neuroeconomics focuses on how different brain regions evaluate subjective value, influence social and financial decision-making, and interact with emotions and cognitive biases. Neuroimaging techniques such as fMRI (functional magnetic resonance imaging) have been used. Thematic analysis revealed seven research clusters: AI & Behavioral Sciences, Emotional & Social Cognition, Computational & Motivational Neuroscience, Neural Mechanisms of Value, Strategic & Neurofinance, Technology & Decision Utility, and Neuroethics & Psychological Approaches. Research gaps exist in diagnostic imaging, evoked potentials, subjective value, and artificial intelligence, emphasize the need for deeper investigation in these areas. This paper highlights the need for broader database coverage and proposes integrating more diverse methodologies in future research. By linking neuroscience with economic theory, neuroeconomics offers valuable contributions to consumer research, finance, and policymaking.

Keywords: Neuroeconomics, Neuroscience, decision making, economics, psychology

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DRIVERS OF E-WASTE RECYCLING BEHAVIOR IN URBAN SRI LANKA: THE ROLE OF ECONOMIC INCENTIVES, CONVENIENCE, AND ENVIRONMENTAL AWARENESS

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Electronic waste (e-waste) is a growing global environmental issue driven by rapid technological change, shorter product lifespans, and rising consumer demand. In Colombo and other urban areas of Sri Lanka, formal recycling is limited, with informal practices prevailing despite increasing environmental awareness. This study examines how economic incentives, convenience, and environmental awareness influence formal e-waste recycling among urban households and explores the motivations and barriers affecting participation. This study used a convergent sequential mixed-methods design combining quantitative surveys and qualitative interviews. The quantitative phase surveyed 250 households across five municipal councils using Likert-scale items from prior studies, analysed with descriptive statistics, correlations, and regression models. The qualitative phase included 25 purposively selected households, analysed thematically to capture contextual insights. Ethical procedures, including informed consent, confidentiality, and voluntary participation, were strictly followed. Results indicate a clear attitude–behaviour gap. Despite high environmental awareness ($M = 4.40$), formal recycling participation was very low ($M = 1.42$), with most households storing e-waste or selling it to informal collectors. Convenience was the strongest predictor of formal recycling ($r = 0.676$, $\beta = 0.694$, $p < 0.05$), while economic incentives and awareness had no significant effect. Age and education influenced behaviour—older individuals engaged more in informal practices, whereas higher-educated households showed greater formal participation; income showed no effect. Qualitative findings revealed four key themes: "Convenience is King," highlighting ease of access; "Awareness and Trust as Catalysts," showing knowledge alone is insufficient without system credibility; "Money Helps, but It's Not the Driver," indicating incentives are secondary; and "System Needs Structural Intervention," emphasizing infrastructural gaps. Consistent with the Theory of Planned Behaviour, perceived behavioural control was central to recycling decisions. The study recommends a hybrid strategy integrating improved infrastructure, targeted awareness, community engagement, transparency, and modest incentives. Embedding convenient and trustworthy recycling options into daily urban life can close the gap between environmental intention and action in e-waste management.

Keywords: e-waste, economic incentives, convenience, environmental awareness, recycling behaviour

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THE INFLUENCE OF SOCIAL MEDIA ENGAGEMENT ON CONTENT SHARING BEHAVIOUR: EVIDENCE FROM GEN-Z SOCIAL MEDIA USERS IN SRI LANKA

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In today's digital world, social media plays a prominent role becoming an integral part of daily life. Users across multiple generations, including Gen Z, millennials, Gen X, and baby boomers have become active consumers of social media, highlighting the importance of understanding user behaviour. This study aims to determine whether there is a definite relationship between one's engagement on social media platforms and their content sharing behaviour. The study investigates three key dimensions of social media engagement: consumption, contribution, and creation as independent variables, while content sharing behaviour is treated as the dependent variable. Previous studies have largely examined these variables in isolation, incorporating descriptive models and scales to determine the influencing factors. This study adopted a hypothetico-deductive approach, supported by a quantitative, cross-sectional research design. Data were gathered from 800 individuals using a purposive, structured questionnaire targeting Sri Lankan individuals aged between 18 and 29 years. To examine the relationship between social media engagement and content sharing behaviour, correlation and linear regression analyses were utilized. The results indicated a significant positive relationship, suggesting that higher levels of social media engagement are associated with increased content sharing behaviour. The study provides significant benefits to anyone who expects to gain a thorough understanding of a typical Sri Lankan individual's social media behaviour and to any digital marketing professional who intends to utilize the study's conclusions to effectively target consumers based on their social media behaviour, both in terms of engagement and content sharing. Furthermore, future researchers could explore the behavioural aspects of content sharing, specific content types, or generational differences to gain deeper insights into how social media engagement influences sharing behaviour.

Keywords: social media engagement, content sharing, user behaviour, Gen-Z, Sri Lanka

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ANALYSIS OF LOAN DELINQUENCY PREDICTION BASED ON MULTINOMIAL LOGISTIC REGRESSION AND RANDOM FOREST

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The banking sector plays a critical role in fostering economic growth by extending credit to individuals and businesses; however, effective loan portfolio management remains a persistent challenge due to the risks associated with Non-Performing Assets (NPAs). Rising NPAs, often driven by economic downturns, inadequate risk assessment, and external shocks, pose a significant threat to financial stability. To address these challenges, this study explores predictive modeling approaches for loan delinquency classification by employing the Multinomial Logistic Regression Model and the Random Forest model applied to 43,644 loan records from a Sri Lankan bank. The analysis categorizes loan performance into four levels, ranging from A0 (performing loans) to D0 (severely delinquent loans), using several financial and demographic variables. Multinomial logistic regression shows that interest rate and loan age are the most influential predictors. The model indicates that a 1% rise in interest rate increases the risk of delinquency by 5.7–21.1%, while each additional month of loan age amplifies the likelihood by 27–76%. Delays in recovery also significantly elevate risk for severely delinquent loans, with each additional day of delay associated with a 1.2% increase in default probability. The model demonstrates excellent discriminatory power at the performance extremes (AUC: 0.987 for A0 and 0.996 for D0). The Random Forest model considers the loan status as a binary (current vs. delinquent) variable. An 80:20 training-testing split was used for data analysis. The performance of the model was evaluated using a confusion matrix, AUC-ROC curves, and accuracy metrics on a testing set. The Random Forest model pidenterforms better in overall predictive accuracy, with a low 1.55% out-of-bag error rate. It achieves 99.4% accuracy in classifying current loans and 96.6% for delinquent loans. Variable importance analysis confirms loan age, recovery date, and interest rate as dominant predictors. Our study is cross-sectional, with predictor variables measured at a defined observation point for each loan. Class imbalance is a limitation; to address this, we plan to apply class weighting and evaluate model performance using accuracy metrics in future work. Collectively, the models underscore the predictive strength of time-dependent variables (loan age and recovery delays) and financial indicators (interest rates, outstanding amounts). While multinomial logistic regression offers nuanced insight into risk progression across multiple categories, Random Forest delivers robust binary classification performance.

Keywords: loan delinquency, multinomial logistic regression, random forest, loan age, interest rates, recovery timeline, risk modeling, imbalanced data

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THE WINNING FROM WITHIN: HARNESSING THE HUMAN FACTOR FOR COMPETITIVE ADVANTAGE THROUGH ERP IMPLEMENTATION IN SMES OF THE APAC REGION: A SYSTEMATIC REVIEW

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Systems for enterprise resource planning (ERP) are widely used to enhance decision-making, integrate business processes, and provide a competitive advantage (CA). However, a lack of focus on human and cultural factors often causes many ERP initiatives to underperform. This study examines the people factor in ERP implementation, focusing on how strategic alignment, process optimisation, project maturity and training affect ERP use and organisational competitiveness. A Systematic Review (SR) conducted in accordance with the PRISMA 2009 and 2020 guidelines served as the foundation for the study. The PROSPERO database has the research registered under the number CRD42021243116. After a transparent screening and eligibility process, 44 studies published after 2000 were chosen from an initial pool of 502 publications. Project management training and knowledge bases, business process reengineering user interfaces, strategic alignment, industry standards and integration management were among the recurrent constructs of the review, which synthesised the evidence on people-centric determinants of ERP success. The conceptual model was developed with the assistance of the SR process, and 11 hypotheses were formulated that linked ERP use to CA. Seventy-two participants from 42 small and medium-sized businesses (SMEs) with ERP systems in the Asia-Pacific (APAC) region participated in an empirical survey to support and validate the review findings. Partial Least Squares-Structural Equation Modelling (PLS-SEM) was used to analyse the data. SmartPLS4 was employed to evaluate the conceptual model. The findings validated the hypothesised relationships, showing that the use of ERP considerably improves CA ($\beta = 0.097$, $t = 0.783$, $p < .001$) in a culturally aligned context. This paper offers both theoretical and practical contributions by integrating empirical validation with SR evidence. Theoretically, it illustrates how human factors—which are often overlooked in ERP research—are crucial to achieving CA. SMEs can benefit from its practical advice, which includes investing in change management, ongoing training, and structured project governance, redesigning processes to increase efficiency, and creating project teams that align with company culture. This dual strategy emphasises how companies can win from within by utilising the human element in ERP implementation to gain a long-term competitive edge.

Keywords: competitive advantage, ERP projects, ERP use, human factor, PLS-SEM, PRISMA 2020, systematic review

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THE IMPACT OF RECRUITMENT AND SELECTION, REWARD AND RECOGNITION, TRAINING AND DEVELOPMENT, PERFORMANCE APPRAISAL, AND CAREER DEVELOPMENT ON EMPLOYEE ENGAGEMENT: A CASE STUDY OF PROJECT-BASED EMPLOYEES AT ABC ENGINEERING AND CONSTRUCTION COMPANY, SRI LANKA

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Employee engagement is highly recognized as an important factor that influences the performance of an organization, particularly in the engineering and construction field, which is a project-driven industry in enhancing productivity, and improving collaboration while reducing turnover. At ABC Engineering and Construction Company in Sri Lanka, the decline in employee engagement has caused a reduction in employee motivation and project delays. Understanding how Human Resource Management (HRM) practices contribute to employee engagement is essential to address these challenges. The study aims to evaluate how employee engagement at ABC Engineering and Construction Company is affected by HRM procedures, encompassing recruitment and selection, performance appraisal, rewards and recognition, training and development, and career development. A positivist, quantitative explanatory research design was used. A structured questionnaire based on a five-point Likert scale was distributed to 150 randomly selected employees through systematic random sampling within a total population of 300 in the company's Western Province division. SPSS software was used to analyse collected data through descriptive statistics, Pearson's correlation, and multiple regression analysis. According to the correlation data ($r = 0.877$ to 0.918; $p < 0.05$), Strong positive correlations can be found between each HRM practice and employee engagement, showing the strongest correlation by reward and recognition ($r = 0.918$). Descriptive analysis states the most valued practice as training and development. The regression model states that the HRM practices account for 89.1% of the diversity in employee engagement ($R2 = 0.891$, $p < 0.05$), with each practice having a considerable and favourable effect. Findings of the study show that enhancing HRM practices can improve employee engagement, widely boosting the organisational performance, especially in training and development, as well as recognition areas. The study also recommends improving performance evaluation, career development as well and reward systems. According to the study, consistent utilisation of HRM practices in the company is required to increase employee engagement.

Keywords: Human Resource Management, employee engagement, recruitment, reward and recognition, training and development

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PHYSICAL SCIENCES

Δ-OPEN SETS AND δ-SEMI CLOSED SETS IN FUZZY TOPOLOGICAL SPACES

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The study of fuzzy topological spaces was introduced by Chang in 1968, following the discovery of fuzzy sets by Zadeh. So far, several types of open sets and closed sets in fuzzy topological spaces have been documented in the literature. Some of them are fuzzy pre-open sets, fuzzy α-open sets, fuzzy β-open sets, fuzzy regular open sets, and fuzzy semi-open sets. In this abstract, we describe two new types of sets, namely fuzzy Δ-open sets and fuzzy δ-semi-closed sets, and discuss the properties of these sets. For a non-empty set X, a fuzzy topology is a family τ of fuzzy subsets in X satisfying the following conditions: $0_X, 1_X \in \tau$; the finite intersection of members of τ is a member of τ; and the arbitrary union of members of τ is a member of τ. We call the pair (X, τ) a fuzzy topological space. Also, the elements of τ are called fuzzy open sets. First, we define fuzzy Δ-open set in fuzzy topological spaces. A subset D of a fuzzy topological space X is called fuzzy Δ-open if $D = (A \wedge B^C) \vee (B \wedge A^C)$, where A and B are fuzzy open sets. When the set D is called fuzzy semi Δ-open, the above equation holds with the fuzzy semi-open sets A and B. Similarly, we can define the following sets: fuzzy pre Δ-open / fuzzy α-Δ-open / fuzzy β-Δ-open. Next, we show that every fuzzy Δ-open set is fuzzy semi Δ-open. However, the converse need not be true in general. Next, we define fuzzy δ-open sets in fuzzy topological spaces. A subset A is called fuzzy δ-open if for every $x \in A$, there exists a regular open set G such that $x \in G \leq A$. A subset A is called fuzzy δ-semi closed if there exists a fuzzy δ-closed set F such that $int(F) \leq A \leq F$. Next, we show the following: A subset A is called fuzzy δ-semi open if and only if $X \backslash A$ is fuzzy δ-semi closed; every fuzzy δ-closed set is fuzzy δ-semi closed; every fuzzy δ-semi closed set is fuzzy semi-closed; a fuzzy set A is fuzzy δ-semi closed if and only if $int(\delta cl(A)) \leq A$. Finally, we show that the intersection or union of two fuzzy δ-semi closed sets is also fuzzy δ-semi closed.

Keywords: fuzzy topology, fuzzy Δ-open set, fuzzy $\boldsymbol{\delta}$-semi closed

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COMPUTING THE h-FUNCTION OF THE COMPLEX PLANE WITH A DELETED LINE SEGMENT, WITH AND WITHOUT USING THE PRIME FUNCTION

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The likelihood of a particle launched from a fixed point z_0 in a region Ω initially leaving the area within the distance r of z_0 is the harmonic-measure distribution function, or the h-function. This function is non-decreasing, right-continuous, and takes values on the unit interval [0,1]. The objective of this paper is to validate the h-function formula obtained via three different approaches for a simply connected region Ω formed by deleting a line segment $[-i, i]$ from the complex plane with basepoint z_0=1. To evaluate the h-function, we employ various forms of conformal mappings, harmonic functions, and the prime function. These three approaches vary in their utilization of the prime function, both in terms of presence and methodology. In the first approach, we completely avoid employing the prime function. Rather, the conformal mapping from the unit disc is expressed through the combination of a Joukowski map and a Mobius transformation, with the h-function being determined by extracting the correct angle of view in the unit disc. In the second and third approaches, the prime function is utilized. In the second method, we do not employ the prime function in the conformal mapping from the disc to the region Ω, as it is essentially a Joukowski transformation. In the meantime, the main function is utilized in the Cayley-type map $R(\zeta)$ from the interior of the unit disc D_ζ to the lower half-plane, which is employed in the creation of the harmonic function Im$[W(\zeta)]$. In the third approach, the prime function is applied twice: initially during the parallel-slit mapping from the unit disc D_ζ to the target region Ω, and subsequently in $R(\zeta)$ and consequently in Im$[W(\zeta)]$. All three approaches yield identical h-function graphs. These methods provide a check for our h-function formula.

Keywords: h-functions, harmonic measure, conformal maps, prime function

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COMPARATIVE ANALYSIS OF EXPONENTIAL SMOOTHING MODELS FOR FORECASTING THE WATER QUALITY INDEX

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Surface water quality plays a significant role in maintaining healthy ecosystems and supporting both human and aquatic life, making reliable monitoring and forecasting essential due to increasing pollution and environmental changes. The objective of this study is to forecast the Weighted Arithmetic Water Quality Index (WAWQI) at 20 sampling sites along the River Thames using three time series models: Single Exponential Smoothing (SES), Holt's (Double) Exponential Smoothing (HES), and Holt-Winters (Triple) Exponential Smoothing (HWES), and to evaluate and compare the forecasting performance using three accuracy metrics: Root Mean Square Error (RMSE), Mean Absolute Error (MAE), and Mean Absolute Percentage Error (MAPE) to identify the most suitable model for sites with varying temporal patterns (stable, trending, or seasonal). Water quality data collected from 20 sampling sites along the River Thames between March 2009 and September 2017 were arranged chronologically. Each model was applied after linearly interpolating missing data and splitting the series into training and testing sets in an 80:20 ratio. The results revealed that model performance varied depending on the temporal patterns of WQI data. SES performed well at sites with stable conditions, such as TC8, TC12, TC13, and TC17. TC8 recorded the lowest RMSE (1.49), MAE (1.12), and MAPE (1.68%), indicating high forecasting accuracy. The HES model accounts for both the level and trend components of time series data and generally does not outperform the SES model for most sites, since most of the sites lack trend components. At TC20, the HES model showed the highest accuracy, with RMSE of 2.11, MAE of 1.38, and MAPE of 1.96%. HWES achieved the best performance across the majority of monitoring sites, particularly those exhibiting clear seasonal patterns in WQI fluctuations. In contrast, volatile sites (TC15) resulted in higher forecast errors (MAPE >15%) regardless of the model applied. These findings suggest that model selection should consider the underlying temporal characteristics of WQI behavior at each site: HWES for seasonal patterns, HES for trending series, and SES for stable conditions. These insights can aid water management authorities in proactive pollution control and sustainable resource planning by enabling accurate water quality forecasting.

Keywords: Water Quality Index, Single Exponential Smoothing, Holt's Exponential Smoothing, Holt-Winters Exponential Smoothing

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COMPARATIVE SPATIAL ANALYSIS OF ROAD TRAFFIC ACCIDENTS USING ORDINARY KRIGING AND INVERSE DISTANCE WEIGHTING

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Road traffic accidents are a significant public safety concern, especially in urban areas where congestion and infrastructural limitations increase the likelihood of collisions. This study investigates road traffic accidents within the Kandy Police Division in Sri Lanka by applying geostatistical interpolation techniques to model the spatial distribution of 2,099 RTAs reported from January 2022 to March 2024. The analysis evaluates the suitability of two interpolation methods: Inverse Distance Weighting (IDW), a deterministic approach, and Ordinary Kriging, a model-based geostatistical method that incorporates spatial autocorrelation. For the Kriging analysis, an empirical semivariogram was developed to quantify the spatial dependence structure of the accident data, and accident counts were log-transformed to approximate normality prior to spatial prediction with Ordinary Kriging. Four theoretical models, Spherical, Exponential, Gaussian, and Matérn, were fitted to the empirical semivariogram. The Spherical model outperformed the others, followed the empirical observed points closely, and reached the sill, with a sum of squared errors of 2.59 between empirical and fitted semivariograms. It was therefore selected as the best fit for spatial prediction using Kriging. Both interpolation methods were applied on a regular 10 × 10 grid across the study area to estimate accident frequencies. The performance of both methods was assessed using cross-validation, and predictive accuracy was evaluated through Mean Error (ME), Mean Absolute Error (MAE), and Root Mean Squared Error (RMSE). Results showed that Ordinary Kriging provided slightly better predictive accuracy than IDW, with lower values for MAE (24.26 and 35.13), RMSE (40.04 and 52.87), and ME (-4.94 and -6.48), respectively. These findings reveal the effectiveness of geostatistical modeling, particularly Kriging, in identifying high-risk areas and supporting data-driven decision making. The findings of this study will support urban planners, traffic engineers, and policymakers in guiding targeted road safety measures, prioritizing infrastructure improvements, and effectively allocating resources in accident-prone zones.

Keywords: crash prediction, Geostatistics, road traffic accidents, spatial interpolation, Variogram

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COMPARATIVE ANALYSIS OF POLYSULFIDE ELECTROLYTE SYSTEMS FOR THE PERFORMANCE ENHANCEMENT IN CdS QUANTUM DOT-SENSITIZED SOLAR CELLS

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This study has focused on improving the performance and stability of TiO_2 /CdS quantum dot sensitized solar cells by investigating two electrolyte optimization methods. One method has focused on solvent effects, and the other method is on redox chemistry optimization. In the first method, this study investigated the impact of the solvent, which consisted of pure methanol, pure deionized water, and a methanol-water mixture (7:3v/v). Among the three solvents, pure methanol produced the highest power output due to its low viscosity and high polarity, this is due to an enhancement in the ion mobility and redox kinetics, However, it seems to have a drawback due to high volatility compromising long-term stability. Although pure water has provided lower efficiency due to its limited ionic conductivity, the methanol-water mixture demonstrated a favorable balance between performance and stability in a specific ratio. Method two has focused on varying the molar concentration of Na_2S. For this purpose, this work tested different concentrations ranges in 0.5 M to 2.5 M to identify the best ratio that illustrates the highest performance of photocurrent and efficiency. The optimal composition (2.5 M Na_2S + 3.5 M S) achieved the highest efficiency, lower charge transfer resistance (Rp), and enhanced Incident Photon-to-Current Efficiency (IPCE) response. However, further increasing of Na_2S to 3M reduced the performance because of the viscosity and side reactions. Overall, combining an optimized redox couple with a stable methanol-water solvent system resulted in a high-performing, reproducible, and practically viable electrolyte formulation. Both of these optimization approaches offer a promising route toward the development of more efficient and stable QDSCs, contributing to their future implementation in solar energy technologies.

Keywords: electrolyte optimization, methanol water solvent system, Na_2S, quantum dot sensitized solar cells

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STUDY ON EXTRACTION, CHARACTERISATION AND CHEMICAL ANALYSIS OF STARCH OBTAINED FROM JACKFRUIT SEED: A COMPARISON WITH COMMERCIAL STARCH

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The present study focuses on the extraction, characterization, and comparative evaluation of starch derived from jackfruit (*Artocarpus heterophyllus*) seeds against commercially available starch. Starch extraction was carried out using a water-based isolation technique, which is both simple and cost-effective. The presence of starch was confirmed using the classical iodine test, in which the extracted starch yielded a distinct deep blue coloration, indicative of a strong interaction between iodine and amylose helices. Comparative physicochemical analysis revealed marked differences between jackfruit seed starch and commercial starch. The pH measurement indicated that jackfruit starch (pH 5.13) was more acidic compared to commercial starch (pH 7.58), suggesting possible variations in chemical composition and potential applications where pH sensitivity is relevant. Solubility testing demonstrated that jackfruit starch was insoluble in ethanol, which is consistent with the behavior of many native starches, yet distinguishes it from the partial solubility exhibited by some commercial starches that may undergo processing or modification. Colorimetric evaluation was conducted using RGB and greyscale analyses through ImageJ.JS software to quantify the intensity of iodine–starch complexation. The greyscale values provided an indirect estimate of amylose content, with lower greyscale values corresponding to higher amylose levels. Jackfruit starch exhibited a significantly higher amylose content (64.72%) compared to commercial starch (15.74 %). This elevated amylose proportion is responsible for the more intense and well-defined blue coloration observed in the jackfruit starch–iodine complex. Overall, the findings indicate that starch extracted from jackfruit seeds possesses distinctive chemical and functional properties compared to commercial starch. In particular, its high amylose content and sharp color change upon iodine interaction suggest that jackfruit seed starch could serve as an effective, low-cost, and sustainable alternative to commercial starch for use as an iodometric indicator in analytical applications. Furthermore, the study highlights the potential of underutilized jackfruit seeds as a valuable resource for starch production, contributing to waste valorization and promoting food system sustainability.

Keywords: amylopectin, amylose, color intensity, starch, RGB value

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MAGNETIC FIELD INFLUENCE ON VISCOUS FINGERING INSTABILITIES IN ENHANCED OIL RECOVERY WITHIN INCLINED DOMAINS

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Viscous fingering can be counted as one of the major challenges in enhanced oil recovery (EOR), resulting in unstable flow patterns during the fluid displacement process. This instability often arises when a less viscous fluid is introduced into a porous material that has already been saturated with a more viscous fluid. In this research, we examined how a magnetic field impacts this viscous fingering instability in a two-dimensional homogeneous porous medium, inclined at an acute angle relative to the horizontal axis, with fluid displacement occurring in the negative x-direction. In contrast to horizontal setups, this inclined structure allows gravity to control flow direction, influencing the interface between displaced and native fluids. We used COMSOL Multiphysics 6.2 to simulate the injection of carbonated water into an oil-saturated, homogeneous, isotropic porous medium that adheres to Darcy's law, both with and without an externally applied magnetic field. The computational domain is designed to replicate inclined geometries at selected acute angles. The simulation findings demonstrate that the fingering patterns continue to be highly irregular and unstable in the absence of a magnetic field. Regardless, in all the tilted examples examined, the displacement front becomes smoother and more constant when a magnetic field is introduced. These results imply that by inhibiting finger branching and encouraging smoother fluid movement, magnetic fields can significantly reduce interfacial viscous instabilities. This stabilizing effect demonstrates how the implementation of a magnetic field can serve as a useful technique to improve oil recovery efficiency, especially in sloping domains. The findings support the use of magnetic field-based tactics in sophisticated EOR methods, particularly in reservoirs with non-horizontal alignments or complicated geometries.

Keywords: carbonated water, COMSOL Multiphysics 6.2, enhanced oil recovery, magnetic field, inclined porous media

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AN OPTIMIZATION MODEL TO REDUCE THE HUMAN FATALITIES IN SRI LANKA DUE TO COVID-19 CONSIDERING DIFFERENT NON-PHARMACEUTICAL INTERVENTION PLANS

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By considering Sri Lanka's limited healthcare resources and economic productivity in the absence of a vaccine, this study aims to control an epidemic outbreak while balancing its sanitary and economic repercussions to reduce the effects of COVID-19 and investigate its dynamics. The World Health Organization (WHO) recommended implementing a number of non-pharmaceutical interventions (NPIs). As a result, certain combinations of NPIs together with lockdowns were used to control the outbreak in Sri Lanka. These control measures are not only economically expensive but also have the potential to cause political instability, societal exhaustion, and annoyance. NPIs' stringency has reduced the number of deaths due to COVID-19, but it has also had negative consequences for the public and commercial sectors, hindering economic growth and significantly affecting people's mental health. In order to assist policymakers in assessing the level of funding that the nation can afford to reduce the spread of disease and, as a result, the number of fatalities, we propose an optimization model after carefully analyzing the Sri Lankan epidemic context. By empowering policymakers to execute a series of NPIs in the relevant district using the available but constrained health care resources, we aim to identify a method to reduce the number of deaths within the various budget options. The first step is to apply a Mixed Integer Non-Linear Programming epidemic model to determine the optimal NPI sequence for each of the 25 districts over various planning horizons. Non-linear terms in the model are linearized to transform this Mixed Integer Non-Linear Programming model to a Mixed Integer Linear Programming model. This Mixed Integer Linear Programming model is thus transformed into an Integer Linear Programming model using the decreasing severity property of the NPI sequence. For each district, three plans, namely P_1, P_2, and P_3, are taken into consideration. There are no limitations on lockdowns in the plan P_1, but plans P_2 and P_3 included relaxations on the implementation of lockdowns. By altering the budget, the fatality is estimated over the three plans. The IBM ILOG Optimization Studio is used to solve the Mixed Integer Linear Programming model. This study shows that the NPI sequence, which has stringent lockdown conditions, is a better implementation plan to minimize the infection and, consequently, minimize the fatality in the country.

Keywords: COVID-19, Integer Linear Programming model, non-pharmaceutical interventions, NPI sequence, severity property

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SOLID-STATE SYNTHESIS OF SODIUM HEXA-TITANATE FROM NATURAL RUTILE MINERAL

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Sodium titanates (NTOs) are emerging as promising electrode materials for advanced energy storage devices, including sodium-ion batteries (SIBs), lithium-ion batteries (LIBs), and supercapacitors, owing to their favourable structural and electrochemical characteristics. Among various NTO phases, Sodium Hexa-Titanate ($Na_2Ti_6O_{13}$) has gained particular interest due to its wide range of applications in energy storage devices. In this study, a novel, simplified, and cost-effective, greener solid-state synthesis method was developed to produce $Na_2Ti_6O_{13}$ using naturally occurring rutile mineral sourced from Pulmoddai and Na_2CO_3 as precursors. The raw materials were mixed in a 1:6 molar ratio and subjected to mechanical activation through milling, followed by calcination at 800 °C. Phase identification via X-ray diffraction (XRD) confirmed the successful formation of single-phase $Na_2Ti_6O_{13}$, indexed to JCPDS card No. 73–1398. This indicates that the chosen stoichiometric conditions and processing parameters were effective in directing the complete transformation from the rutile precursor to the $Na_2Ti_6O_{13}$ phase. Morphological analysis using scanning electron microscopy (SEM) revealed the formation of disorderly interconnected nanorods, with diameters ranging from 70 to 900 nm and lengths between 2 and 20 µm. Electrochemical performance was evaluated using cyclic voltammetry (CV) and electrochemical impedance spectroscopy (EIS). The CV profile of the synthesised $Na_2Ti_6O_{13}$ displayed broad redox peaks centred at ~0.4 V (cathodic) and ~0.7 V (anodic), corresponding to the reversible insertion/extraction of Na^+ ions, while the rutile precursor showed no significant redox activity. EIS results of $Na_2Ti_6O_{13}$ demonstrated enhanced ion diffusion characteristics and higher electrical conductivity. These findings demonstrate the viability of converting locally available rutile into a functional electrode material through an environmentally friendly and scalable process. The synthesised $Na_2Ti_6O_{13}$ exhibited promising electrochemical behaviour, confirming its potential as an effective electrode material for SIBs, LIBs, and supercapacitor applications.

Keywords: Sodium titanate, rutile, value addition, energy storage

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CEPHEID VARIABLES IN NGC 1866: PHOTOMETRIC WORKFLOW, CMD PLOTTING, AND P–L RELATION CONSTRUCTION WITH HST AND TESS OBSERVATIONS

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This study presents a comprehensive analysis of Classical Cepheid variable stars within the young, metal-rich Globular Cluster NGC 1866. High-resolution imaging from the Hubble Space Telescope (HST) in the F555W and F814W bands was processed using advanced Point Spread Function (PSF) photometry, enabling the resolution of over 16,000 stars per filter in the crowded cluster field and the creation of precise photometric catalogues. The methodology integrates photometric data reduction, colour-magnitude diagram (CMD) construction, Cepheid candidate identification, and the derivation of the Period-Luminosity (P-L) relation. The resulting catalogues were cross-matched to compute accurate absolute magnitudes and colour indices for each star. CMDs were generated using this data, enabling identification of the Instability Strip within NGC1866 and the selection of 113 initial Cepheid candidates based on their CMD positions. To confirm variability and determine pulsation periods, time-series photometric data from the Transiting Exoplanet Survey Satellite (TESS) were extracted for the identified candidates. Lomb-Scargle periodogram analysis of the TESS light curves led to the confirmation of three Classical Cepheids in NGC 1866. Combined with previously published data, this enabled the construction of a robust P-L relation specific to NGC 1866. Linear regression on this sample demonstrated a tight and linear P-L relation with a root mean square (RMS) scatter of 0.072, underscoring its consistency and reliability with respect to Leavitt's law within this cluster.

Keywords: classical cepheids, globular cluster, instability strip, Period-Luminosity relation, Leavitt's law

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CONTROLLED RELEASE OF *INDOMETHACIN* USING MIL-101(Fe): A PROMISING METAL-ORGANIC FRAMEWORK FOR DRUG DELIVERY

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The use of metal–organic frameworks (MOFs) as drug carriers offers promising potential for controlled drug delivery systems. MIL-101(Fe) is a stable and non-toxic MOF with outstanding pore capacity and wide pore windows that can accommodate and allow entry to a large number of drug molecules. However, it has been hugely underutilized in the development of drug delivery systems. This study investigates the suitability of highly porous MIL-101(Fe) as a carrier for the non-steroidal anti-inflammatory drug *indomethacin*, thereby reducing potential side effects, dosage, and peak plasma concentration, while increasing its half-life. MIL-101(Fe) was synthesized using a modified solvothermal technique to enhance purity, and then loaded with *indomethacin* by suspending 25 mg of the MOF in 25 ml of a 500 mg l^{-1} ethanolic *indomethacin* solution. The drug release behavior was studied by suspending 5 mg of the loaded MOF in phosphate-buffered saline (PBS) at pH 7.4 and hydrochloric acid (HCl) solution at pH 4.0 at 37 ℃ to simulate intestinal and mildly acidic gastric environments, respectively. The MOF structure was confirmed by powder X-ray diffractometry and Fourier Transform Infrared Spectroscopy. A high drug loading capacity of ~27% was observed within 24 hours, with the help of UV-visible spectrophotometry-assisted calculations. The release studies revealed a sustained release profile with no significant initial burst. Release was evaluated using UV-visible spectrophotometry at 317 nm. After 48 hours, ~49.8% of the encapsulated drug was released in PBS, while only ~7.1% was released in HCl, indicating a pH-sensitive release behavior. These findings demonstrate that MIL-101(Fe) is a promising candidate for oral delivery of *indomethacin*, offering slow and targeted release in the intestinal environment while minimizing premature drug release in the stomach and associated side effects. Further research on modifying the MOF structure and implementing post-synthetic modifications may enhance the MOF's affinity to *indomethacin*, thereby increasing its loading capacity and release efficiency. More research is needed to determine whether this MOF can be used as a drug delivery vehicle for additional medications, as well as to minimize MOF degradation under highly acidic conditions within the stomach.

Keywords: controlled release, drug delivery, *Indomethacin*, metal-organic framework, MIL-101(Fe)

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TIME-SERIES ANALYSIS OF FV SCUTI WITH TESS: ECLIPSE DETECTION AND PERIOD EVOLUTION

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Cataclysmic variables (CVs) are binary star systems where a White Dwarf (WD) accretes matter from a donor star, and that accreted matter typically forms an accretion disk around the WD. Classical novae, a subclass of CVs, are distinguished by sudden outbursts resulting from thermonuclear runaways on the surface of the WD. FV Scuti (Nova Scuti 1960), a classical nova discovered in 1960, has a maximum visual magnitude of ~9.1 and faded by three magnitudes within approximately one month. Despite its historical detection, FV Sct has lacked a comprehensive modern investigation. Our study addresses this by analyzing Transiting Exoplanet Survey Satellite (TESS) light curves of FV Sct, specifically focusing on its quiescent behavior and orbital period evolution. TESS observed the system from June 18 to July 14, 2024, providing high-cadence (2-minute) photometric data. Following data reduction, which included detrending the light curve using the Locally Weighted Scatterplot Smoothing (LOWESS) method, we applied a Lomb-Scargle periodogram to determine the orbital period of the system, which is 7.33 hours. To assess period changes, we modeled primary eclipses and recorded the eclipsing time as observed time with inverted Gaussians fitting to the light curve and constructed an observed-minus-calculated (O-C) diagram. The quadratic fit in the O-C diagram yielded a period change rate of $dP/dt = 2.474 \times 10^{-7}$ days/day, indicating measurable orbital evolution potentially driven by angular momentum loss or mass transfer dynamics. These findings demonstrate FV Sct's ongoing activity in its post-nova phase and underscore TESS's value in long-term classical nova studies. Furthermore, the power density spectrum (PDS) reveals reduced high-frequency flickering, consistent with a cooler white dwarf, aligning with observations of other post-nova systems.

Keywords: classical nova, FV Sct, orbital period, TESS

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DEVELOPMENT OF CuO/rGO NANOWIRE ELECTRODES FOR HYBRID ELECTROCHEMICAL SUPERCAPACITOR

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The development of high-performance and cost-effective electrode materials is crucial in advancing supercapacitor technology. For supercapacitors, nanostructured Cu oxides are promising materials due to their high theoretical capacitance, low cost, and non-toxicity. One major drawback to the practical applications of CuO lies in the poor electrical conductivity and cyclic stability of the material, despite its theoretically high specific capacitance. Here in, the CuO nanowire composite electrode coated with reduced graphene oxide (rGO) was prepared via a simple and scalable three-step method by anodization of a copper coated titanium substrate to grow copper hydroxide ($Cu(OH)_2$) nanowires, dip coating with a graphene oxide (GO) dispersion, and thermal treatment of the electrode at 400 ºC in a single step. The annealing converted $Cu(OH)_2$ to CuO, and GO to rGO. X-ray diffraction (XRD) analysis confirmed the successful formation of phase-pure CuO, with prominent peaks observed. The SEM analysis confirmed the formation of a uniform CuO nanowire structure on Ti substrate. The electrochemical study revealed a synergistic charge storage mechanism, combining the electrical double layer capacitance of rGO with pseudocapacitance from CuO redox reactions. At a scan rate of 5 mVs^{-1} in CV, the rGO/CuO composite electrode gave the highest specific capacitance of 78.45 Fg^{-1} and current density of 0.25 Ag^{-1} in Galvanostatic Charge Discharge (GCD); the composite electrode exhibited a maximum specific capacitance of 83 Fg^{-1}. In addition, the electrode also showed excellent cyclic stability, after 1000 charge–discharge cycles at 5 Ag^{-1} current density, it retained more than 95% of its original capacitance. The observed enhancement in performance is due to high conductive pathways and the large surface area of the rGO network. In contrast, the CuO nanowires can deliver a significant amount of pseudocapacitance. The results suggest that the rGO/CuO composite prepared by this low-cost and effective method can be successfully implemented as an electrode material for the fabrication of high-performance hybrid supercapacitors.

Keywords: supercapacitor, CuO nanowire, rGO, composite electrode, specific capacitance, cyclic stability

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DEVELOPING A MULTIVARIATE FLOOD RISK INDEX FOR THE KELANI AND KALU RIVER BASINS IN SRI LANKA USING FUZZY LOGIC

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In Sri Lanka, rapid urbanization in recent years has intensified flood risks in vulnerable areas. Since assessments based solely on climate change factors may reduce the accuracy of evaluations, this study develops a Multivariate Flood Risk Index (MFRI) using fuzzy logic, integrating both climate-related and land-use factors. As a case study, flood risk is evaluated in three regions Hanwella, Ratnapura Town, and Kalawellawa-Molkawa covering the Kelani and Kalu river basins, which experience recurrent annual flooding. The MFRI integrates hazard risk factors, Rainfall Intensity (RI), Rainfall Season (RS), and River Level (RL), which are considered for all three regions. Additionally, Soil Moisture (SM) is included for Hanwella, and Reservoir Dam Status (RD) is included for Kalawellawa-Molkawa. Population Density (PD) and Dependency Ratio (DR) are considered as vulnerability risk factors. The Linguistic Ordered Weighted Averaging (LOWA) operator computes the hazard risk, while the Mamdani Fuzzy Inference System (MFIS) assesses vulnerability. Final flood risk combines both hazard and vulnerability risks using LOWA, with factors categorized as Low, Medium, or High. Three linguistic quantifiers were tested, with the '*mean*' quantifier being the most effective. Analysis of five-year data revealed RI and RL as dominant hazard factors in Hanwella and Ratnapura, while RI, RL, and RD were most critical in Kalawellawa-Molkawa. Flood risk outputs indicated that high levels of RI and RL typically produced medium to high risk, while low levels led to consistently low risk. In the rainy season (on-season), even moderate levels of RI or RL were enough to trigger high risk, whereas in the off-season, both needed to exceed medium levels to yield comparable risk. Validation with the Irrigation Department's flood level data confirmed the model's accuracy. The MFRI offers an adaptable framework for flood risk assessment, aiding targeted mitigation strategies in flood-prone regions.

Keywords: flood risk index, fuzzy logic, LOWA operator, hazard assessment, vulnerability

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GREEN SYNTHESIS OF SILICA NANOPARTICLES USING RICE HULL AND ITS IMPACT ON GROWTH AND SEED GERMINATION OF RICE (*Oryza sativa*)

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Recent advances in nanotechnology have enabled the development of nanofertilizers that offer controlled nutrient release, improved plant uptake, and reduced environmental impact. Among these, silica nanoparticles (SiNPs) show great promise due to their unique nanoscale properties. Rice (*Oryza sativa*) is one of the major crops in Sri Lanka. Rice plants actively accumulate silicon (Si), which provides significant agronomic benefits. Within the plant, Si is deposited beneath the cuticle as a cuticle–Si double layer, primarily in the form of monosilicic acid absorbed from the soil. Rice hulls (RHs), an agricultural waste byproduct rich in amorphous silica, serve as a sustainable raw material for SiNP synthesis. However, existing methods for synthesizing SiNPs still require further optimization and characterization. Additionally, the precise effect of these SiNPs on rice cultivation as a nanofertilizer has not yet been discovered. Investigating cost-effective synthesis approaches and evaluating the effects of SiNPs on rice plant growth could contribute to more sustainable agriculture and enhanced rice production. The present study utilized RHs from three rice varieties (BG 359, BG 94, and BG 374/1) collected from paddy fields in the Ukuwela region of the Matale District. Among these, BG 359 exhibited the highest silica content. The SiNPs synthesized from the BG 359 RH variety were characterized using several analytical techniques. UV–Vis spectroscopy revealed absorption peaks in the 190–220 nm range, confirming the presence of pure silica through Si–O electronic transitions. Fourier-transform infrared (FTIR) spectroscopy identified key vibrational modes corresponding to Si–O–Si and O–Si–O bonds (~1100, ~650, and ~470 cm^{-1}), indicating the presence of an amorphous silica network. Scanning electron microscopy (SEM) revealed a porous, quasi-rod-shaped morphology with particle sizes ranging from 25 to 70 nm, further confirming the nanoscale structure of the synthesized SiNPs. The resulting SiNPs were then applied to rice seeds and plants to assess their effects on seed germination and growth. The findings demonstrated that SiNPs had a positive impact on both germination and the growth performance of *Oryza sativa*.

Keywords: silica nanoparticles, rice hull, nanofertilizer, *Oryza sativa*

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FORECASTING THE WATER QUALITY INDEX USING THE SEASONAL AUTOREGRESSIVE MOVING AVERAGE MODEL AND THE PROPHET MODEL

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Surface water quality (WQ) often exhibits strong seasonal and long-term trends influenced by both natural processes and human activity. Accurate WQ forecasting is vital for ecosystem protection, public health, and environmental management, but irregular data collection challenges conventional models like SARIMA, which assume evenly spaced observations. The objectives of this study are to compute the Weighted Arithmetic Water Quality Index (WAWQI) from irregularly collected physicochemical WQ parameters between March 2009 and September 2017 from 20 monitoring sites along the River Thames, to develop SARIMA models for WAWQI forecasting using regularly spaced time series constructed from the observed data, to implement the Prophet forecasting model to handle irregularly sampled WAWQI data while capturing trend and seasonality, to assess and compare the predictive performance of both models using Root Mean Square Error (RMSE), Mean Absolute Error (MAE), and Mean Absolute Percentage Error (MAPE), and to provide model selection recommendations for environmental monitoring applications with irregular sampling intervals. SARIMA models cannot be fitted to irregular data. Therefore, to fit the SARIMA model, missing values were linearly interpolated to create a regularly spaced time series. The Prophet model can be used for irregular data without interpolation. Time series data were split into 80% training and 20% testing sets. RMSE captures large errors, MAE shows average error, and MAPE allows relative comparison across sites. Results revealed consistent seasonality in WQ across most locations. Both models performed relatively well. However, Prophet outperformed SARIMA in terms of MAPE (0.02–0.3%) compared to SARIMA's 2–11%, indicating superior relative accuracy. However, SARIMA performed slightly better in terms of RMSE and MAE, particularly at sites with denser data. Therefore, comparisons should be interpreted with caution, as Prophet's higher RMSE and MAE at sparsely sampled sites highlight its reliance on raw, irregular data without interpolation. These findings underscore the importance of aligning model selection with specific forecasting objectives. SARIMA performs well with stable, regularly spaced data, whereas Prophet offers greater flexibility for handling nonlinear trends and irregular sampling. This study provides practical guidance for environmental analysts in selecting forecasting models that best align with their data characteristics and policy goals.

Keywords: prophet model, SARIMA model, Water Quality Index

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SYNTHESIS OF POLY ARYL HYDROCARBONS VIA ULLMANN HOMOCOUPLING OF 1,4-DIBROMOBENZENE

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Aryl-aryl coupled polymers are a class of conjugated polymers that possess useful chemical, electrochemical and photochemical properties. Transition metal-catalysed C-C cross-coupling reactions employed in the synthesis of aryl-aryl coupled polymers require sophisticated reaction conditions and expensive catalysts. Therefore, this research project focused on the synthesis and characterisation of linear open-chain 4,4′-dibromo aromatic oligomers of 1,4-dibromobenzene using the Ullmann homocoupling reaction, which is feasible in the Sri Lankan context. Several synthetic attempts for the condensation of 1,4-dibromobenzene were carried out using Ullmann coupling in the presence of an activated Cu bronze catalyst, Cs_2CO_3 base in N-methyl-2-pyrrolidone (NMP) / dimethyl sulfoxide / dimethyl formamide solvent at refluxing conditions under normal atmospheric conditions / N_2 over 3.5 h to 36 h of varying periods. The reaction progress of nine different reaction conditions investigated was monitored using thin-layer chromatography (TLC). Among them, the synthetic attempts that indicated the new product formation in TLC analysis were purified using column chromatography. The purified products were characterised using UV-visible spectroscopy and gas chromatography-mass spectrometry. Among the four out of nine reaction mixtures that demonstrated new product formation, the coupling of 1,4-dibromobenzene in NMP at 190 ^oC over 24 h in a normal atmosphere demonstrated the most intense peak in the TLC analysis. The column chromatography of the crude mixture yielded a clear, pale yellow colour liquid product with a relatively low yield, which was caused by the sublimation followed by the deposition of the starting material at temperatures above 130 ^oC. The UV-visible spectra of the obtained liquid demonstrated the highest absorption at a wavelength of 287 nm in n-hexane. This absorption peak can be attributed to the π to π^* transition of the conjugated aryls. Observation of a light blue fluorescence of the product under the UV light at 366 nm indicated the presence of an extended π system. In summary, condensation attempts of 1,4-dibromobenzene using the Ullmann coupling reaction yielded a fluorescence-active pale yellow colour liquid. Further characterisation of the product using ^1H and ^{13}C NMR spectroscopy is needed to confirm the product formation.

Keywords: aryl-aryl coupled polymers, 1,4-dibromobenzene, Ullmann coupling

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MODELING ROAD TRAFFIC ACCIDENTS IN COLOMBO USING BINARY LOGISTIC REGRESSION MODEL AND SPATIAL ANALYSIS

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Road traffic accidents have become a serious concern, causing millions of deaths and severe injuries annually. In the analysis of road accidents in Sri Lanka, Colombo contributes significantly. This study aims to identify and quantify the factors influencing road accidents and accident severity in the Colombo Municipal Council area using a binary logistic regression model, spatial statistics and circular statistics. The accident records were obtained from the City Traffic Police Station, Fort. The fitted model assesses the probability of a binary level of accident severity (minor, severe) based on predictors such as "Type of Day", "Area Type", "Day of the Week", "Weather Condition", "Location Type", "Number of Vehicles Involved", "Light Conditions", "Weekday or Weekend", "Time Factor". The model was optimized using stepwise AIC selection and assessed via odds ratios and p-values. The number of vehicles involved in a collision, "Day or Night" and "Weekend or Weekday" variables are showing a positive association with the accident severity. Odds ratios suggest that accidents that occurred at night are 52.2% more likely to be serious than those during the day, and accidents on weekends are 48.1% more likely to be serious compared to weekdays. Hence, we can conclude that accident severity tends to be higher during nighttime, weekends, and weekday mornings compared to other times. Circular statistics indicated that the frequency of the accidents is high between 7:00-8:00 a.m., 1:00-2:00 p.m., and 4:00-5:00 p.m. in a day, which may be due to the high volume of traffic before and after school hours and the end of the typical workday. Moran's I statistic showed a positive moderate spatial autocorrelation of 0.4383, which indicates that accident counts are clustered and not randomly spread, suggesting that there is a high accident count near other high counts or a low accident count near other low counts. Spatial maps show that the highest number of accidents occurred in the Cinnamon Garden Grama Niladhari Division. These findings aim to facilitate decision-making regarding infrastructure and safety interventions that can be implemented to improve traffic safety and ultimately contribute to mitigating accidents and enhancing overall road safety in the region.

Keywords: binary logistic regression model, road accident severity, spatial autocorrelation, Global Moran's I, circular statistics

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IDENTIFYING ROAD ACCIDENT HOTSPOTS USING LINEAR NETWORK POINT PROCESSES: A CASE STUDY IN THE KANDY POLICE DIVISION, SRI LANKA

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Road accidents are spatially constrained events that require analytical approaches that account for the underlying transport network. Traditional area-based methods often underestimate accidents along roads, as they ignore road geometry. Modeling crashes as points on a road network improves intensity estimation. Although conventional spatial point pattern techniques are widely applied in accident analysis, approaches that incorporate the linear structure of roadways are more suitable, as accidents are constrained to occur along these networks. This study aims to identify road accident hotspots using a Linear Network Point Processes (LNPP) approach, which is more suitable than traditional area-based methods for linear networks. By analyzing accident data from the Kandy Police Division in Sri Lanka, it seeks to enable precise hotspot detection and support targeted strategies for improving road safety. Accidents occur along roads; therefore, LNPP on a metric graph G = (V, E) was used, where V represents intersections and E represents road segments. The linear network kernel density estimation was used at a location x on a road segment to estimate event intensity per unit length along the network, based on the shortest path distances between observed points. Analyses used Gaussian and Epanechnikov kernels. The optimal bandwidth was selected using the Likelihood Cross-Validation (LCV) method and Scott's Rule. Diggle's edge correction method was applied to reduce boundary bias. Hence, four models were fitted. A total of 2,043 crash events were represented as a point pattern on a road network comprising 108,584-line segments and 110,361 vertices. Both Gaussian and Epanechnikov kernels produced similar density estimates on the road network for a given bandwidth. However, the LCV method, which estimates kernel density on linear networks, provided a more accurate bandwidth than Scott's rule. The smoothing bandwidths were 1.98 km and 5.07 km for the Scott and LCV methods, respectively. Residuals range from 0–45 for Scott's rule and only 0–13 with LCV. Several high-density road accident segments were found, highlighting spatial heterogeneity in accident risk along the network. LCV outperformed Scott's rule in bandwidth selection, reducing residuals and enhancing hotspot detection, demonstrating the effectiveness of LNPP for network-constrained traffic safety analysis.

Keywords: linear network point processes, point pattern analysis, road accidents, spatial processes, spatial statistic

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REFINEMENT OF STELLAR PARAMETERS FOR THE ECLIPSING BINARY SYSTEM KIC 8569819 USING STELLAR MODELING APPROACH

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Eclipsing binary systems with a Delta (δ) Scuti component serve a vital role in deriving precise fundamental stellar parameters and testing stellar evolution models. This study mainly focuses on the Kepler target KIC 8569819, a detached eclipsing binary system that consists of a δ Scuti pulsating component. The quarter 9 photometric data observed by the Kepler mission were used for the analysis. The binary nature of the KIC 8569819 system was modeled using the Wilson-Devinney (WD) code and extracted new set of stellar parameters. This comprehensive study mainly focuses on the application of the Differential Correction (DC2015) process after the initial fitting done by the Light Curve modeling (LC2015) process for the disentanglement of the binary nature from the observed light curve. Subsequently, an improved set of stellar parameters for both primary and secondary components of the KIC 8569819 system was determined. The DC2015 modeling process yielded an orbital inclination of $i = 89.88 \pm 0.03$ degrees, primary component luminosity $L = 10.911 \pm 0.005\ L_{\odot}$, the effective temperature of the primary component of $T_{eff,1} = 7155 \pm 9$ K and the effective temperature of the secondary component of $T_{eff,2} = 5956 \pm 7$ K. Additionally, the values for the radius $1.790\ R_{\odot}$ and $0.986\ R_{\odot}$, bolometric magnitude 2.56 mag and 4.65 mag, and surface gravity $4.17\ \mathrm{cm\ s^{-2}}$ and $4.46\ \mathrm{cm\ s^{-2}}$, were found as refined stellar parameters for both primary and secondary components of the KIC 8569819 binary system respectively. These results not only deliver an updated and highly accurate stellar model for KIC 8569819 but also provide reliable input for the future analysis of mode identification of pulsation frequencies in the field of Asteroseismology.

Keywords: differential correction, KIC 8569819, light curve modeling, stellar parameters

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COMPARATIVE ANALYSIS OF SARIMA AND XGBOOST MODELS FOR URBAN AIR QUALITY PREDICTION IN SRI LANKA

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The research employs a quantitative comparative design to forecast fine particulate matter (PM2.5) concentrations in Colombo, Sri Lanka, using particulate data from the U.S. Embassy and meteorological data (i.e., air temperature at 2 meters, relative humidity at 2 meters, and wind speed at 2 meters) from the NASA Open Data Portal. The dataset spans January 2018 to July 2024, with 80% of the data (January 2018 to September 2022) used for training and the remaining 20% for testing. Data preprocessing involved interpolation of missing values, normalization, and engineering of lagged variables such as 24-hour PM2.5 lags. Two predictive models were compared: Seasonal Autoregressive Integrated Moving Average (SARIMA), which captures seasonal patterns, and Extreme Gradient Boosting (XGBoost), which models non-linear relationships and complex feature interactions. Model performance was evaluated using root mean square error (RMSE), mean absolute percentage error (MAPE), and R-squared metrics. The SARIMA model, implemented with the "forecast" package in R, achieved an RMSE of 16.99, a MAPE of 20.35%, and an R-squared of 0.68, and demonstrated superior seasonality modeling with a lower Bayesian Information Criterion (BIC). The XGBoost model, trained with the "xgboost" package in R, leveraged advanced regularization and parallel processing to reduce prediction errors by 18-22%, excelled in forecasting extreme pollution events, and identified lagged PM2.5 values as the most influential predictors. Diagnostic analyses showed SARIMA's effectiveness in seasonality and residual behavior modeling, while XGBoost excelled at capturing key predictors and nonlinear effects. The findings underscore the potential of advanced machine learning, especially XGBoost and ensemble methods, for accurate and timely air quality forecasting tailored to Sri Lanka's climatic and emission context. The study recommends integrating such models into national air quality systems to enable real-time forecasts and health alerts, expanding the air sensor network in high-risk urban areas, and enforcing targeted pollution regulations. Future research should explore hybrid modeling using satellite and real-time traffic data, alongside explainable AI techniques, to enhance forecast accuracy and support data-driven environmental policy.

Keywords: air quality prediction, SARIMA, XGBoost, meteorological variables, Sri Lanka

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CINNAMALDEHYDE EXTRACTED FROM CINNAMON MULCH TO FORMULATE SOAP AND SKIN SCRUBBER FORMULAS

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Cinnamon is a common spice widespread in Sri Lanka, where cinnamaldehyde is found to be the main constituent of the cinnamon bark oil. Due to the presence of Cinnamaldehyde, these species exhibit antibacterial, antioxidant, and anti-inflammatory properties. Cinnamon species indigenous to Sri Lanka belong to the genus *Cinnamomum Zeylanicum*. The parts of the cinnamon tree are used for different purposes. Cinnamon mulch is the outermost bark layer of the cinnamon tree species, which is discarded as a fertilizer rather than being used for any other purposes. Therefore, this research work aims to use the cinnamaldehyde extracted from cinnamon mulch to be used as an ingredient in the process of soap and scrubber formulation. The cinnamon mulch for this study was obtained from the Southern province of Sri Lanka. The percentage yield of oil extracted using the hydro distillation method followed by solvent extraction using hexane and ethyl acetate and resulted in a yield percentage of 0.75% from the essential oil of cinnamon mulch. The extracted essential oil was analysed using High Performance Liquid Chromatography (HPLC) with the DAD detector. A soap was formulated using the cinnamon mulch, sandal wood, turmeric powder, rose water, glycerin, vitamin E and essential oil extracted from mulch as one of the ingredients and the antioxidant activity of the formulated soap using cinnamon mulch was evaluated using the DPPH (2,2-Diphenyl-1-picrylhydrazyl) scavenging assay along with Trolox as the standard. The IC_{50} value corresponding to the soap formulation was 0.146 mg/mL and the standard (Trolox) was 0.002 mg/mL, revealing that the formulated soap possesses good antioxidant properties. This study reveals that a significant yield of oil can be extracted from cinnamon mulch using hydro distillation, which possesses a considerable amount of cinnamaldehyde with good antioxidant properties that can be used to formulate a product rather than discarding it as a fertilizer.

Keywords: Cinnamon mulch, *Cinnamomum Zeylanicum,* IC_{50}, antioxidant activity, HPLC

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