



PROCEEDINGS

of the
12th Undergraduate Research Symposium
UReS 2025

**"Fostering Innovations for
Resilient Food Systems"**

**Faculty of Livestock, Fisheries and Nutrition
Wayamba University of Sri Lanka**



8th April 2026

Wayamba University of Sri Lanka, Makandura, Gonawila, (NWP)



**Proceedings of the
Twelfth Undergraduate Research Symposium
UReS 2025**

“Fostering innovations for resilient food systems”

Organized by the
Faculty of Livestock, Fisheries & Nutrition
Wayamba University of Sri Lanka

April 8, 2026

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**Proceedings of the
Twelfth Undergraduate
Research Symposium-
UReS 2025**

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Published by
Faculty of Livestock, Fisheries & Nutrition
Wayamba University of Sri Lanka
Makandura
Gonawila (NWP) 60170
Sri Lanka

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UReS 2025

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ISSN: 2465-5821

Cover Page Design: Mr. Chathuranga

Page Settings, Abstract Index and Authors Index: Dr. G. Nishanthan

FOREWORD

It is with great pride and enthusiasm that we welcome you to the e-proceedings of the Undergraduate Research Symposium (UReS 2025), hosted by the Faculty of Livestock, Fisheries & Nutrition at the Wayamba University of Sri Lanka. This year, the symposium is centred around the theme “Fostering innovations for resilient food systems,” reflecting our dedication to advancing sustainable solutions in an ever-changing global landscape. The undergraduates from our premier degree programs, BSc. in Food Production and Technology Management and BSc. in Food Science and Nutrition, have worked with immense dedication to showcase the culmination of their research journeys. This compendium brings together 168 abstracts spanning the critical disciplines of nutrition & dietetics, aquaculture and fisheries, food science and technology, and livestock and avian sciences.

UReS remains a cornerstone annual event for our faculty, providing a prestigious platform for our students to share their experiences, innovations, and skills. It offers a golden opportunity for these young researchers to network with academics, industry experts, and entrepreneurs, bridging the gap between scientific inquiry and real-world application. These proceedings are the result of the untiring involvement of both students and academic supervisors. Each abstract has been meticulously reviewed by the editorial board to maintain the highest standards of scientific integrity. We take great pride in recognizing outstanding contributions through the “Academic Research Excellence” and “Award for the Best Undergraduate Inventor” accolades, which serve to promote high-quality research for the future.

I wish to extend my heartfelt congratulations to all our undergraduates and a sincere thank you to the authors and reviewers for their invaluable contributions. On behalf of the editorial committee, I express my gratitude to Prof. E.M.P. Ekanayake, the Vice-Chancellor of the Wayamba University of Sri Lanka, and Prof. Gamika A. Prathapasinghe, the Dean of the Faculty of Livestock, Fisheries and Nutrition, for their visionary leadership.

My special thanks go to the coordinator, Dr. P. Upamali S. Peiris, and her dedicated team for their exceptional coordination of the event. I also wish to acknowledge the hard work and commitment of the members of the editorial team, whose steadfast efforts have been instrumental in bringing UReS 2025 to fruition.

Dr. G. Nishanthan (PhD)

Editor-in-Chief / UReS 2025

Faculty of Livestock, Fisheries & Nutrition

Wayamba University of Sri Lanka

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Message from the Vice Chancellor

It is my great pleasure to extend warm greetings to all participants of the Undergraduate Research Symposium 2025, organized by the Faculty of Livestock, Fisheries and Nutrition of Wayamba University of Sri Lanka. This annual gathering celebrates intellectual curiosity, creativity, and the commitment of our undergraduates to advancing knowledge in areas vital to the nation and the world.



The theme, *“Fostering Innovations for Resilient Food Systems”*, is both timely and significant. In an era of climate change, resource constraints, and nutritional challenges, resilient food systems are essential for food security, public health, and sustainable livelihoods. Innovation through research, collaboration, and critical thinking is key to meeting these complex issues.

I am proud to see our undergraduates engaging with such pressing concerns and offering fresh perspectives. This symposium not only provides a platform to present research but also nurtures inquiry, communication, and collaboration skills essential for their future as scholars, professionals, and leaders.

I commend the Faculty for fostering a culture of research and innovation, and I extend my appreciation to the Dean, academic staff, organizers, and all who contributed to this success. In particular, I congratulate the students whose dedication and enthusiasm are at the heart of this event.

May this symposium inspire new ideas, strengthen collaborations, and pave the way for impactful contributions toward resilient food systems in Sri Lanka and beyond!

Prof. E.M.P. Ekanayake

The Vice-Chancellor

Wayamba University of Sri Lanka

Message from the Dean

It is with immense pleasure and academic pride that I extend my warmest greetings to the Twelfth Undergraduate Research Symposium (UReS 2025) of the Faculty of Livestock, Fisheries & Nutrition at the Wayamba University of Sri Lanka. As the most prestigious annual event of our faculty, UReS serves as a vital platform for our final-year undergraduates to disseminate their research innovations, technical inventions, and advanced scholarly competencies. This symposium further provides a significant opportunity for our students to engage with eminent researchers and industry professionals, fostering essential knowledge exchange and multidisciplinary collaboration.



The Twelfth UReS is convened under the theme “Fostering innovations for resilient food systems,” emphasizing the critical imperative of research in developing robust and sustainable food networks that safeguard human, animal, and environmental health. This year, we are proud to feature over 168 research abstracts across diverse scientific frontiers, including Nutrition and Dietetics, Aquaculture and Fisheries, Food Science and Technology, and Livestock and Avian Sciences.

In our steadfast commitment to promoting scientific inquiry and technological advancement, the faculty continues its tradition of recognizing outstanding scholarly contributions. Through the “Award for the Best Undergraduate Inventor” and the “Academic Research Excellence” accolades, we reinforce our dedication to incentivizing both students and mentors in their pursuit of research excellence and impactful innovation.

On behalf of the Faculty, I offer my sincere congratulations to all the young researchers presenting their findings today. I also express my deep appreciation to the supervisors and collaborators for their academic guidance. Finally, I extend my heartfelt gratitude to the UReS 2025 organizing committee—headed by Dr. P. Upamali S. Peiris—along with our academic and non-academic staff, sponsors, and all stakeholders whose tireless dedication has ensured the success of this milestone event.

Prof. Gamika A. Prathapasinghe

Dean, Faculty of Livestock, Fisheries & Nutrition,
Wayamba University of Sri Lanka

Message from the Coordinator

It is my pleasure to welcome you all to the Twelfth Undergraduate Research Symposium (UReS) 2025, themed “Fostering innovations for resilient food systems”, organized by the Faculty of Livestock, Fisheries, and Nutrition, Wayamba University of Sri Lanka. UReS 2025 serves as a dynamic platform for final-year undergraduates to showcase their ground-breaking research, innovations, and inventions to an esteemed scientific audience, fostering meaningful knowledge exchange and collaborative opportunities.



On behalf of the organizing committee, I would like to express my sincere gratitude to Professor E.M.P. Ekanayake, Vice-Chancellor, Wayamba University of Sri Lanka, and Professor Gamika A. Prathapasinghe, Dean, Faculty of Livestock, Fisheries & Nutrition, for their continuous support and guidance in organizing this event. I extend my heartfelt appreciation to Eng. Alain Pibot for accepting our invitation to deliver the keynote address and inspire the next generation of researchers. Further I truly appreciate the Ms. Anaïs Delbarre for willingly joining us and delivering how our students plan their future studies in France. Additionally, I congratulate Professor G.A.P. Chandrasekara for being felicitated for research excellence.

I wish to express my heartfelt gratitude to the academic staff of the faculty and the external supervisors from various institutions for their unwavering commitment to nurturing students’ research and for offering invaluable guidance throughout their journey. I am equally grateful to the distinguished panel of judges for graciously accepting our invitation to evaluate the research presentations.

I would extend my appreciation to the partnership of the Bank of Ceylon and sponsorship from BSC Food Quality management degree programme for UReS 2025. My profound gratitude also goes to the UReS 2025 Organizing Committee, Dr. HACK Jayathilake, Director of the Information and Communication Centre, Makandura, and his dedicated team, as well as the Deputy Registrar and all non-academic staff of the faculty, whose unwavering support has been instrumental in ensuring the success of this event. I extend my deepest appreciation to final year students whose dedication and efforts have brought UReS 2025 to fruition. This symposium stands as a testament to the collective effort of faculty, staff, sponsors, volunteers and final year students, all working together to advance the frontiers of knowledge.

Finally, I extend my warmest congratulations to all presenters and convey my best wishes for the twelfth UReS to achieve outstanding success, leaving a lasting impact on the community.

Dr. P. Upamali S. Peiris

Coordinator- UReS 2025

Faculty of Livestock, Fisheries and Nutrition

Wayamba University of Sri Lanka

Keynote Address

The ocean and food resources in the face of global change.

A global perspective



PIBOT Alain

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Keywords

Ocean balance
Climate change
Food resources
Global management

ABSTRACT

Our planet functions through a delicate global balance. The ocean, often overlooked, plays a crucial role in this balance. However, our practices in urban development, transport, agriculture, livestock farming and fishing have a profound impact on this balance. Scientific findings help to guide the policies, collective and individual practices that are essential.

An alarming assessment

Without resorting to pessimism or excessive catastrophism, but with responsible realism, it is now possible to state that current scientific knowledge clearly demonstrates that we have entered the Anthropocene—a new epoch in the history of our planet in which the dominant driving force shaping the Earth system is the global impact of human activities on its physical, chemical, and biological processes.

Since the 1970s, early scientific observations began to draw attention to the accelerating degradation of ecosystems, the atmosphere, the hydrosphere, and the global ocean. In response, the international community gradually established a framework for environmental governance. This process began with the first Earth Summit held in Stockholm, Sweden, in 1972, and was followed in 1992 by the adoption of two major agreements: the United Nations Framework Convention on Climate Change (UNFCCC) and the Convention on Biological Diversity (CBD).

Since then, hundreds of international meetings have been organized, including 31

Conferences of the Parties on climate change, 17 on biodiversity, and 3 United Nations Ocean Conferences. Yet despite these efforts, both climate stability and biodiversity continue to deteriorate. Current projections indicate that global warming is following one of the least optimistic trajectories, with a potential increase of approximately 3 °C by the end of the century (IPCC, 2026).

At the same time, the erosion of biodiversity is occurring at an unprecedented rate. Species are disappearing 100 to 1,000 times faster than the natural background rate, and more than one million species are currently threatened with extinction.

Why Do These Observations Matter?

One fundamental truth that humanity has progressively forgotten is that our species is itself part of nature. Humans are not external to ecosystems; we are embedded within them and deeply dependent on their functioning.

The ecosystems that sustain life on Earth are the result of millions of years of evolutionary processes, during which species have progressively occupied ecological niches and

formed complex food webs. These systems have evolved toward dynamic equilibria shaped by available resources and by the natural cycles of the planet and its climate.

The transformations initiated since the mid-twentieth century, particularly the global expansion of industrialization, the massive consumption of fossil fuels, and the widespread artificialization of natural environments, have disrupted these equilibria. The consequences are increasingly visible in the loss of essential ecosystem services, including the decline of fisheries resources, the degradation of soil fertility, reductions in oxygen production and atmospheric carbon sequestration, the loss of protective coastal ecosystems, and the disappearance of potential pharmaceutical resources.

Sri Lanka is already experiencing the front-line impacts of these changes. The Cyclone Ditwa of November 2025 was among the most severe storms recorded in the country. One of the underlying causes lies in the Bay of Bengal, which is already approximately 2 °C warmer than its historical average, and it is well established that the intensity of tropical cyclones is closely correlated with ocean temperature.

Similarly, the 2004 Indian Ocean tsunami demonstrated how essential coastal ecosystems such as coral reefs and mangrove forests are in absorbing and dissipating the energy of ocean waves.

The Central Role of the Ocean

Ocean waters are constantly on the move. It home to large currents that travels from one ocean basin to the next often thousands of kilometres away. The largest of these is known as the “ocean overturning circulation”.

In winter in the north hemisphere, warm surface waters are converted to cold waters. These cold waters, pushed northward by the current, become denser, as cold water is denser than warm water. At depth, these now-cold waters flow into the deep-ocean current that travels towards Antarctica, runs alongside it, and then flows back up towards the tropical latitudes of the Indian and Pacific Oceans. As they warm up again, these waters rise to the surface, generate up-welling current, joining the surface ocean current flowing westward, and so on. This vast ocean current, combined with atmospheric currents, redistributes heat across the entire planet, maintaining a 30°C temperature difference between the equator and the poles. Without these currents, scientists have calculated that this difference would be 110°C. The poles would be completely and permanently frozen, and the intertropical zone uninhabitable, leaving the habitable land area for 8.3 billion people woefully inadequate.

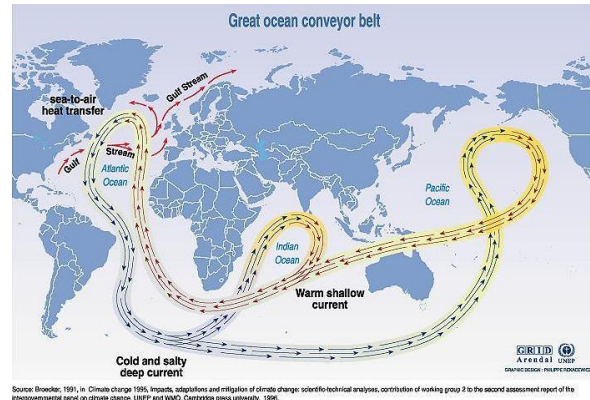


Fig. 1: 1991_ Broecker_ Great ocean conveyor belt¹.

But this current does not only regulate the temperature. As it plunges to depths, the cold waters carry with them the carbon dioxide they have absorbed from contact with the atmosphere. It is estimated that the ocean sequesters 30% of the carbon dioxide produced by humanity.

¹ Broecker 1991, In Climate change 1995, Impacts, adaptation and mitigation of climate change: scientific-technical analyses, contribution of

working groupe 2 to the second assessment report of the intergovernmental panel on climat change, UNEP and WMO, Cambridge press University, 1996.

This capacity could be good news, unfortunately, this increase in oceanic CO₂ leads to an increase in oceanic acidity, which complicates the life of organisms whose shell or skeleton is made of calcium carbonate, an element eroded by acidity.

Finally, this large ocean current, as it rises along the continental slopes, brings to the surface a large quantity of nutrients from the degradation of oceanic organic matter, generating phytoplankton bloom, which are the source of the rich fish stocks in some regions, as is the case for south-western Sri Lanka.

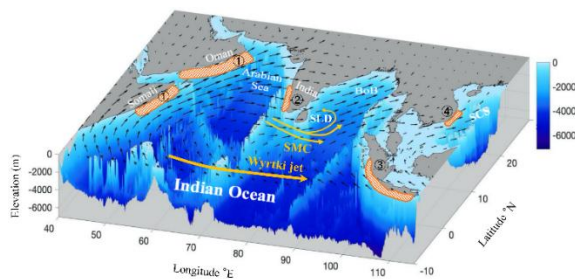


Fig. 2: Sri Lanka dome (SLD) and southwest monsoon current (SMC) with other coastal upwelling systems. Black arrows are averaged wind vectors from June to September².



Fig. 3: Average Apparent fishing effort – AIS – Global fishing watch.

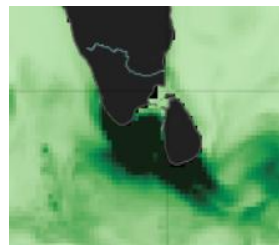


Fig. 4: Average concentration on Chlorophyll-a(mg/m³) - May to July- <https://www.mercator-ocean.eu/>.

If temperatures continue to rise, surface waters will become less cold and less dense, and ocean currents will slow down. Tropical waters will cool less, and we know that heat is the primary driver of cyclones. Rainfall will increase, leading to more flooding and soil erosion.

What are the consequences for food resources?

Sri Lanka is considered highly vulnerable to the impacts of climate change due to its geographic location and its dependence on natural resources³.

The country is expected to experience a range of impacts from climate change including sea level rise, changes in precipitation patterns, increased frequency and intensity of extreme weather events such as floods, droughts, shifts in temperature, and weather patterns that can affect agriculture and food security.

Consequences for marine resources:

The slowing of ocean currents, water stratification, and rising surface temperatures will lead to reduced productivity in fishing areas such as the south-western Sri Lankan shelf, while the growing global population demands ever-increasing protein resources. While fishery resources account for 17% of the protein consumed by humanity, they account for over 50% of protein intake in Sri Lanka. Concentrating exploitation on a depleted resource will cause a rapid decline in stocks, potentially even a collapse of the resource through biological collapse.

Consequence for land resources⁴

Climate change is already having a serious impact on Sri Lankan agriculture. The main consequences are reflected in worsening hydrological imbalances: increasing aridity in the driest areas and flooding in the wettest regions.

Changes in rainfall patterns and extreme weather events are particularly affecting rice cultivation in arid areas, reducing yields.

² Ma, W.; Wang, Y.; Bai, Y.; Ma, X.; Yu, Y.; Zhang, Z.; Xi, J. Seasonal Variability in Chlorophyll and Air-Sea CO₂ Flux in the Sri Lanka Dome: Hydrodynamic Implications. *Remote Sens.* 2022, 14, 3239. <https://doi.org/10.3390/rs14143239>

³ Amarasingha, R., Marambe, B., Suriyagoda, L., Punyawardena, R., Herath, H., Jayawardena, S., Jayakody, P. et

al. 2021. Climate change impacts on crops in Sri Lanka. Rome, FAO. <https://doi.org/10.4060/cb5152en>

⁴ <https://openknowledge.fao.org/items/8eddc6f8-8319-4f71-b9dc-ef10e4381f4e>

At the same time, heavy rainfall causes soil erosion, whilst reduced rainfall affects the flow of essential water sources. This decline in water resources for irrigation leads to soil salinisation and sterilisation due to the intrusion of salt water resulting from excessive pumping – which affects several crops such as rice and coconuts. More than 45,000 hectares of land are already affected by this phenomenon, particularly in the north-western regions⁽⁴⁾.

What strategy should we adopt?

In a world now inhabited by more than 8.3 billion people, a shift in paradigm is unavoidable. This does not mean returning to a pre-industrial way of life, but it does require profound adjustments in our practices and priorities.

You are studying at a university dedicated to food systems, agriculture, and fisheries, which places you directly at the heart of these transformations.

Agricultural practices, for example, have significant impacts on ecosystems. Excessive pesticide use—now known to generate counterproductive effects on agro-pastoral systems—as well as soil management practices such as mulching, fertilization, tillage, and land protection, all play crucial roles in ecological stability.

On an island such as Sri Lanka, where coastal ecosystems like seagrass meadows and coral reefs depend heavily on photosynthetic activity, increases in water turbidity represent a major environmental pressure. Agricultural activities contribute significantly to soil erosion, which increases sediment runoff and thus turbidity in coastal waters.

Fisheries present another critical challenge. Experience worldwide demonstrates that effective management is essential. The well-known concept of the tragedy of the commons

applies particularly strongly to marine fisheries. The collapse of Atlantic cod stocks off the coast of Canada remains one of the most striking examples of the consequences of unmanaged exploitation.

Nature possesses an extraordinary capacity for resilience, provided that ecosystems have the opportunity to recover. This can be achieved through measures such as:

On land:

- Adapting crops to climate change. For example, in Europe there are gradually replacing maize, which requires a great deal of water, with millet and sorghum, which are better suited to drought.
- Reducing pumping from depleted coastal aquifers
- Adapting farming practices (reducing drainage in the north-western coconut plantations, developing agroforestry and mulching to limit soil erosion, etc.)

On sea:

- Establishing marine protected areas, such as those implemented in the Great Barrier Reef Marine Park in Australia, or in the Antarctica MPAs
- Creating regulated fishing zones and seasonal closures,
- Adapting fishing techniques to ecosystem sensitivity, for example by replacing bottom-trawling gear with passive fishing gear or longlines.

And globally:

- Reduce our carbon emissions (transport, energy generation, waste incineration)
- Increase carbon sequestration by protecting ecosystems that naturally absorb and sequester the carbon and heat we produce (coastal marshes, lagoons, mangroves, forests, seagrass beds)

A Necessary and Realistic Optimism

Having worked for more than thirty years in the conservation and management of marine and coastal ecosystems around the world, I draw several important conclusions.

First of all, the deterioration of the biosphere is significant, far-reaching and extremely worrying, but it is neither inevitable nor irreversible.

Second, wherever strong measures have been implemented to reduce human pressures and align resource use with ecosystem sensitivity, nature has recovered, and human societies have regained the ecosystem services upon which they depend.

Third, there is no environmental challenge for which we do not already know the solutions.

The argument that environmental protection is incompatible with economic development is simply incorrect. It is often promoted by industrial lobbies that benefit from short-term exploitation at the expense of global populations. Economic analyses—particularly those conducted by the World Bank, the International Monetary Fund, and the FAO—consistently demonstrate that ecosystem degradation is far more costly than their protection and sustainable management.

For this reason, political leaders must be educated and equipped to implement ambitious strategies for sustainable governance, and they must be supported by informed citizens who understand and embrace the necessary transitions.

But we must remain vigilant. The status quo is no longer an option. There is no 'Planet B', and the stakes are global. The changes required are far-reaching and significant, but they will not place a burden on people if the structural models underpinning our lifestyles and consumption patterns are transformed – free

from the influence of corrupt economic lobbies – in favour of sensible and sustainable practices.

Plenary speech

Choosing France as a study destination



DELBARRE Anaïs

Attaché for educational, academic and scientific cooperation
Embassy of France in Sri Lanka and the Maldives
Head of Campus France Sri Lanka

Keywords

Campus France Sri Lanka
Studies in France
Scientific research in France
Scholarships
Living in France
France alumni

ABSTRACT

Studying abroad is an exciting challenge that can raise many questions for students and their families. France welcomes thousands of international students every year and strives to make their stay as comfortable as possible. French embassies abroad, with the support of Campus France—a public French agency dedicated to guiding international students to France—are responsible for promoting the French higher education system abroad and answering students' questions. This presentation provides Wayamba University students with the information they need to make the best choice for their studies in France.

Why studying in France?

1/ By choosing to study in France, you will have the chance to discover a society that is multicultural and open, proud of its history and looking forward to the future.

2/ For your future professional life, this academic stay in France will be an advantage. You will be leaving with essential knowledge, backed up by internationally-recognised certification.

3/ The excellence in higher education and research in France is widely acknowledged around the world. Numerous French universities place highly in the most reputable international rankings, such as the Times Higher Education, the *Financial Times* ranking, the QS, the Shanghai ranking and the European Union's U-Multirank. Studying in France means benefiting from this recognition.

4/ This renown is in particular due to the exceptional achievements of French

researchers. With thirteen Fields Medals, France is second in the world in mathematics. It has also had sixty-five Nobel Prize winners, including Marie Curie. The first woman to receive a Nobel, for Physics in 1903, in 1911 she became the first researcher in the world to obtain a second, this time for Chemistry.

5/ The quality of higher education in France is the result of long-term and continuous political vision. Each year, public authorities invest massively in education and research. Education is the State's biggest budget item, representing over 20% of the budget. This policy has enabled France to provide students with one of the best systems of higher education in the world and, above all, one of the most accessible.



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Department of Aquaculture and Fisheries

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Department of Aquaculture and Fisheries

Setting the baselines before control: the spread, density and associated plant species of *Leucaena leucocephala* (Lam.) de Wit in an accelerated natural regeneration mangrove site at Anawilundawa Sanctuary, Sri Lanka

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Invasive plants are a major challenge for mangrove restoration; they alter vegetation structure and reduce native biodiversity. This study aimed to establish baseline information on *Leucaena leucocephala* in the Accelerated Natural Regeneration of Mangroves (ANRM) site at Anawilundawa Sanctuary. Field surveys were carried out for 6 months between 2025 and 2026 using a stratified sampling in four density categories: high, moderate, low and no spread. A total of 51 line transects (1 m width with varying length) were established across pond dykes, further divided into five zones. Within each transect, plant density, Diameter at Breast Height (DBH), canopy height of the tallest plant, salinity and associated plant species were recorded. Diversity indices, including the Shannon–Wiener Index, Margalef Species Richness and Dominance index, were calculated and compared using ANOVA. The results showed no significant differences in density (plants per m²) of *L. leucocephala* in high (6.22 ± 1.75) and moderate (5.32 ± 3.12) density areas. Densities of small and medium plants were significantly higher in high-density areas compared to low-density areas (p < 0.05). Seedling densities did not show significant differences among strata (p > 0.05). Large trees (DBH above 5cm) were absent in low-density zones. The species showed a clear preference for elevated dyke tops, where a significantly higher density (53 plants per m²) was observed (p < 0.05). Species diversity was the highest in low-density areas, with a significantly higher Shannon–Wiener index compared to high-density zones, suggesting that heavy invasion may suppress native plants. Overall, these findings emphasize the urgent need for targeted invasive management. The study establishes important baseline information for effective monitoring once control starts.

Keywords: Invasive species, mangrove restoration, *Leucaena leucocephala*

Acknowledgement: Wildlife and Nature Protection Society and the French Embassy.

Assessment of microplastic removal efficiency of fish bone-derived biochar in drinking water

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Microplastics (MP) contamination in drinking water has become an emerging environmental and public health issue due to the persistence and bioavailability of plastic particles. This study investigates the effectiveness of fish bone-derived biochar as a sustainable and low-cost filtration material for microplastic removal. Biochar was produced via controlled pyrolysis of fish bone waste and subsequently conditioned using hot distilled water to enhance its adsorption properties. A total of 30 drinking water samples collected from multiple sources, including well, tube well, municipal, and reverse osmosis (RO) water, were analyzed using a laboratory-scale four-chamber filtration system operating at a constant flow rate of 40 mL/min. Microplastic concentrations were quantified before and after filtration using stereomicroscopic analysis. The mean initial microplastic concentration was 1.0 ± 0.0 particles L⁻¹, which decreased to 0.0 particles L⁻¹ following treatment, indicating a mean removal efficiency of 100%. Complete removal was also observed in municipal water samples containing 20 particles per 10 L. Physicochemical water quality parameters showed slight improvements after filtration. The mean pH decreased from 8.32 to 7.83, remaining within acceptable drinking water standards. Total Dissolved Solids (TDS) reduced from 71.7 ppm to 56.3 ppm, and electrical conductivity decreased from 137.7 μ S/cm to 115.3 μ S/cm, while salinity remained unchanged at 0 ppm. The findings demonstrate that fish bone-derived biochar is highly effective in removing microplastics without compromising water quality. This study highlights its potential as an eco-friendly and cost-effective material for sustainable drinking water treatment and supports the valorization of fish processing waste.

Keywords: Biochar, drinking water treatment, removal efficiency, sustainable materials, microplastics

Comprehensive assessment of microplastics abundance in *Halodule uninervis*, *Halophila ovalis*, adjacent water and sediment in Negombo Estuary, Sri Lanka

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Microplastics (MPs) are an increasing concern in coastal environments, where seagrass meadows may act as sinks of MPs due to their structural complexity. However, their role in tropical ecosystems remains poorly examined, this study aims MPs contamination in above-ground and below-ground biomass of two seagrass species: *Halodule uninervis* and *Halophila ovalis*, and its surrounded water and sediment (seagrass-associated and non-associated) across the Negombo estuary. Nine sampling sites within the estuary were selected using stratified random sampling based on seagrass distribution and anthropogenic influence. Triplicate samples of seagrass, surface water (30 L), and sediments (0–5 cm depth) were collected and appropriate controls were maintained. Samples were subjected to organic matter digestion (30 % H₂O₂, 30% KOH, FeSO₄), followed by density separation (1.2g/cm³>NaCl) and filtration (0.45 µm). MPs were identified and quantified using a stereomicroscope, while salinity, pH, and total solids of water were measured by standard methods. No significant difference was recorded in MPs abundance in the *H. uninervis* (3.36±1.80 items/g) and *H. ovalis* (4.46±2.55 items/g) ($p>0.05$). However, leaf blades exhibited the highest MPs accumulation (2.89±2.07 items/g), compared to roots (1.71±1.16 items/g), seagrass-associated sediment (0.018±0.016 items/g), non-seagrass-associated sediment (0.009±0.008 items/g), and water (0.08±0.06 items/L), indicating their strong capacity to trap MPs within the estuarine environment. Seagrass-associated sediments exhibited elevated MPs levels compared to non-seagrass sediments. Fiber was the dominant MPs morphotype (82.87%) followed by film, while blue was the predominant color (41.57%) in all samples except in surface water (50% black and 16 % blue). These findings emphasize the seagrass as an effective sink for MPs and highlight the need for improved MPs management strategies in coastal environments.

Keywords: Microplastics, seagrass leaves and rhizome, stereo microscope, tropical estuary

Acknowledgement: Ocean Country Partnership Programme (OCP), and Ms G.K.A.W. Fernando

8th April 2026, Faculty of Livestock, Fisheries & Nutrition, Wayamba University of Sri Lanka

Assessment of water quality changes on DNA methylation patterns in guppy (*Poecilia reticulata*)

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Water quality can influence gene activity through various regulatory mechanisms, with DNA methylation being one of the most important epigenetic processes involved. However, limited studies have examined the effects of physicochemical parameters and heavy metals on DNA methylation in fish. This study aimed to evaluate the effects of selected water quality parameters, including pH, water hardness, and heavy metals (lead - Pb and cadmium - Cd), on DNA methylation patterns in guppy (*Poecilia reticulata*). A controlled laboratory experiment was conducted over a period of two weeks with different levels of treatments such as Pb (0, 0.025, 0.075 ppm), Cd (0, 0.02, 0.04 ppm), pH (6.5, 7.5, 8.5), and water hardness (80, 90, 100 ppm), with appropriate control groups. DNA methylation was determined by DNA extraction, quantification, and restriction digestion (*HpaII* and *MspI*), followed by PCR and gel electrophoresis. The findings showed that exposure to Pb and Cd caused a clear dose-dependent effect of DNA methylation, with decreased intensity of the *HpaII* bands. Cd exposure induced rapid methylation changes even at low methylation levels, which revealed high sensitivity to epigenetic impact. Variations in pH also affected methylation levels, with both acidic (pH 6.5) and alkaline (pH 8.5) conditions exhibiting higher methylation compared to neutral pH (7.5). Water hardness demonstrated a non-linear response, with peak methylation observed at 90 ppm and a slight decline at 100 ppm. Behavioural observations supported these findings, with stress-related changes such as initial hyperactivity followed by reduced feeding and weakness. Overall, the study confirms that environmental stressors significantly alter DNA methylation in *Poecilia reticulata*, suggesting a potential adaptive or protective epigenetic response. These findings emphasize the importance of maintaining optimal water quality and provide a foundation for future research in environmental epigenetics.

Keywords: DNA methylation, epigenetics, guppy, heavy metals, water quality

Acknowledgement: This study was funded by Wayamba University Research Grant (SRHDC/URG/2024/10)

Assessment of heavy metal contamination and health risks in some imported and locally produced dried and Maldives Fish, in Sri Lanka

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Although heavy metal contamination in fresh fish is common, the health risks of dried fish are rarely discussed in scientific literature. This study assesses heavy metal contamination in imported and locally produced dried fish and Maldives fish and evaluates health risk. Popular dried fish species: Skipjack tuna (*Katsuwonus pelamis*, SJ), Yellowfin tuna (*Thunnus albacares*, YT), Sailfish (*Istiophorus platypterus*), Shark (*Carcharhinus* sp.), Queen fish (*Scomberoides commersonianus*, QF) and Maldives fish (MF) were collected from Negombo, Kalpitiya, Mannar, Trincomalee and dried fish exporters. Samples were subjected to microwave digestion followed by Inductively Coupled Plasma Mass Spectrometry analysis. Health risk was estimated based on the Hazard Index (HI), calculated using Estimated Daily Intake (EDI) and Target Hazard Quotient (THQ). Mercury levels were recorded lower than SLS and FAO standards in many samples, except YF from Trincomalee and QF from Oman. Pb contamination was below FAO standards in all samples, except for imported and Negombo shark, YF from Mannar, Kalpitiya QF, and all MF, which exceeded SLS standards. None of the samples exceeded FAO standard for Cd, while majority exceeding SLS standard, except for QF from Oman, Dubai, and Shark from Manner, and MF originated from India and the Maldives. All dried fish and MF samples have exceeded the SLS standard for As, while all shark and SJ from Kalipitya exceed FAO threshold levels. Some samples exceeded FAO standards for Zn, Co, and Se. Zn was identified as the dominant contributor to overall exposure. In all samples exceeded the Sri Lankan standards. Shark exhibited the highest risk (HI: 1.76-9.07 adults; 3.87-20.01 children), SJ showed (HI: 1.18-2.80 adults; 2.60-1.68 children), Sailfish (HI: 2.80 adults; 1.5-6.2 children) and QF (HI: 1.1-1.8 adults; 2.5-4.1 children) posed potential health risk (HI>1). Therefore, this study recommends establishing safe consumption limits for minimizing potential health hazards associated with dried fish consumption in Sri Lanka.

Keywords: Heavy metals contamination; health risk; target hazard quotient.

Extraction and characterisation of carrageenan from *Kappaphycus alvarezii* for development of cosmetic hydrogel beads

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Kappaphycus alvarezii is the only commercially cultivated seaweed species in Sri Lanka and serves as a major source of carrageenan, a sulphated polysaccharide widely recognised for its excellent gelling, thickening, and moisturising properties. With the increasing demand for natural and eco-friendly ingredients in cosmetic formulations, carrageenan has gained considerable attention for hydrogel-based applications. However, despite the rapid expansion of *Kappaphycus alvarezii* farming in Sri Lanka, the lack of simple and efficient extraction techniques limits its utilisation for value-added cosmetic products at the local level. This study aimed to optimise the extraction of carrageenan from *Kappaphycus alvarezii*, characterise the extracted material, and develop hydrogel beads for cosmetic applications. Carrageenan extraction was conducted under different temperature conditions (room temperature, 60 °C, 80 °C, and 100 °C) combined with varying potassium hydroxide (KOH) concentrations (4%, 6%, and 8%). The extracted carrageenan powder was evaluated for yield, powder colour, gel colour, moisture content, pH, viscosity, and gel strength. Structural characteristics were analysed using Fourier Transform Infrared (FTIR) spectroscopy and X-Ray Diffraction (XRD) spectroscopy. Hydrogel beads were prepared using two carrageenan concentrations (0.5% and 1%) and subjected to different drying methods, namely air drying, oven drying, incubator drying, and freeze drying. These beads were further analysed for diameter and weight. Results indicated that extraction at room temperature yielded the highest carrageenan content, while moderate temperatures (60 °C, 80 °C) enhanced gel strength and viscosity. A 4% KOH concentration was found to preserve the native and crystalline structure of carrageenan. Among the drying methods, freeze drying was most effective in producing lightweight beads and retaining their spherical shape. Overall, the study identifies optimal conditions for carrageenan extraction and hydrogel bead development, demonstrating its potential for sustainable cosmetic applications.

Keywords: Carrageenan, cost-effectiveness, hydrogel beads, *Kappaphycus alvarezii*, simple method

Acknowledgement: This work was financially supported by the Wayamba University Research Grant (WUSL/FLFN/SRHDC/URG/2024/07)

Deep learning-based real-time detection of histamine level in yellowfin tuna: A rapid, non-invasive mobile app

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Histamine accumulation in scombroid fish such as Yellowfin tuna (*Thunnus albacares*) poses a serious food safety risk and challenges the global seafood export industry. Conventional detection using ELISA is accurate but destructive, time-consuming (40–45 minutes per sample), and costly (~USD 8 per fish), limiting real-time use. Current mobile applications assess fish quality indirectly, and no validated tool links eye features directly to histamine levels, the key safety standard. This study introduces a deep learning-based mobile application for non-invasive, real-time histamine prediction from tuna eye images. A dataset of 5,082 images was acquired under real-world operational conditions (uncontrolled lighting, fish receiving points) and paired with ground-truth histamine concentrations determined by ELISA. A convolutional neural network (CNN) based on the ResNet18 architecture was trained to extract multi-dimensional features, including colorimetric parameters, quantified corneal opacity, and micro-textural patterns imperceptible to human vision, against histamine levels. The application incorporates an automated incremental learning mechanism whereby the model retrains upon the addition of every 250 new labeled images, enabling continuous performance refinement without manual intervention. The model established a statistically significant correlation between comprehensive eye characteristics and histamine concentration ($p < 0.05$). On the test dataset, the system achieved 97.5% predictive accuracy, with output delivered in under one minute. Validation against ELISA reference values demonstrated strong concordance (e.g., 1.2 ppm vs. 1.25 ppm). The approach reduces per-fish testing costs by approximately 90% relative to ELISA, with projected annual savings exceeding USD 400,000 based on current export volumes. These findings demonstrate that a deep learning framework leveraging multi-parameter eye analysis can accurately predict histamine levels in a rapid, non-invasive, and cost-effective manner. This technology offers a scalable solution for seafood quality control, with potential to enhance food safety, reduce post-harvest losses, and strengthen supply chain traceability in high-value fisheries.

Keywords: Computer vision, Convolutional Neural Network (CNN), deep learning, histamine prediction, real-time detection

Acknowledgement: The authors sincerely thank Ceylon Fresh Seafood (Pvt) Ltd for their full cooperation and technical support. Access to their histamine analysis reports was critical to the successful development and validation of the model presented in this study.

8th April 2026, Faculty of Livestock, Fisheries & Nutrition, Wayamba University of Sri Lanka

Feasibility of home-scale microalgae cultivation: Growth performance and lipid productivity under optimised light intensity

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Microalgae are photosynthetic microorganisms with immense potential for biotechnology applications, including food, nutraceuticals, aquaculture feed, and biofuel production. Despite the global advancements in industrial-scale microalgae cultivation, validated low-cost culture systems suitable for small-scale or household-level applications remain unexplored in Sri Lanka. Thus, this study aimed to establish a small-scale microalgae culture facility, evaluate growth performance and lipid productivity of selected species, and assess the economic feasibility of such a system. Pure cultures of locally available microalgae species were initially established using plate culture techniques and subsequently scaled up through a stepwise process from 5 mL to 15 L using f/2 medium. Culture conditions were maintained at salinity levels of 30–33 ppt, temperature between 24–28 °C and two controlled light intensities of 3000 lux (culture cycle 1) and 5000 lux (culture cycle 2). Growth was monitored via optical density (680 nm) and cell counts using a Sedgwick–Rafter chamber. Biomass was harvested via centrifugation, and lipid content was extracted using the Bligh and Dyer method. Species-specific growth parameters, including specific growth rate (range: 0.21–0.35 day⁻¹) and duplication time (range: 1.98–3.30 days), were within ranges comparable to reference values. Results indicated that microalgal growth and lipid accumulation were significantly influenced by light intensity and harvesting time. Culture cycle 2 demonstrated significantly ($p < 0.05$) higher lipid yields compared to cycle 1, suggesting that correct harvesting time and optimal light intensity enhances lipid productivity. These findings demonstrate that a low-cost, home-scale microalgae culture system can effectively support microalgal growth and lipid production. This approach offers a practical platform for decentralised biotechnology applications, with particular relevance for aquaculture feed supplementation and community-based biofuel initiatives in resource-limited settings.

Keywords: Economic feasibility, home-scale culture, lipid productivity, microalgae

Development and evaluation of sustainable ornamental fish feed for Guppy (*Poecilia reticulata*) grow-out stage utilizing shrimp and sea cucumber processing by-products

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Aquaculture is essential for food and ornamental fish production, but high feed costs remain a key constraint. Nutrient-rich by-products such as shrimp heads and sea cucumber guts are often discarded, contributing to environmental pollution. This study developed a cost-effective, sustainable feed from these by-products and evaluated its effects on the growth, colouration, and performance of guppy (*Poecilia reticulata*). Four diets were formulated: a control and three experimental treatments containing sea cucumber gut powder and shrimp head powder at ratios of 1:3 (Diet A), 1:1 (Diet B), and 3:1 (Diet C), with all other ingredients kept constant. Thirty-five-day-old *P. reticulata* were stocked in 12 glass tanks (three replicates per treatment) and reared until 80 days of age over a 45-day trial. Fish were fed at 10% of body weight per day in two meals. Growth performance, feed utilization, survival, colouration, and water quality were monitored, and data were evaluated using one-way ANOVA with Tukey's HSD test ($p < 0.05$). Shrimp head powder and sea cucumber gut powder were rich in crude protein (58.81 ± 0.01 and 44.43 ± 0.53 DM%, respectively). The control diet had significantly higher protein (48.29 DM%) than the experimental diets (32.91–36.96 DM%). Diet B (1:1 ratio) performed best, recording the highest weight gain (0.0086 g), length gain (0.515 cm), specific growth rate (0.0893%/day), and lowest feed conversion ratio (1,934.07). Diet B also achieved the highest caudal fin red colour intensity at 80 days of age ($p < 0.05$). Overall survival was 96.15% with no disease observed. Experimental diet production cost (Rs. 125.90/kg) was substantially lower than commercial feed (Rs. 615.60/kg). These findings demonstrate that seafood waste-based diets can effectively replace conventional feeds, improving growth and colouration at markedly lower cost, supporting their viability as a sustainable option for ornamental fish culture.

Keywords: Cost-effective feed formulation, ornamental fish feed, *Poecilia reticulata*, seafood waste utilization, sustainable aquaculture,

Acknowledgement: The authors gratefully acknowledge Ton Ton Lanka (Pvt) Ltd.

A stakeholder perspective mapping of threats and issues and role of stakeholders in shark and ray fishery in Western, Northwestern and Eastern Provinces in Sri Lanka.

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Sharks and rays are important in maintaining ecological balance in the ocean as apex predators. However, they are threatened due to overexploitation. Sri Lanka is infamous for mishandling shark and ray fishery. For efficient management of sharks and rays in Sri Lanka, it is important to identify the perceptions of stakeholders regarding other stakeholders and the threats and issues faced. A study was conducted with 109 respondents selected through snowball sampling using a pretested questionnaire that required each stakeholder to indicate the level of influence and interest of other stakeholders. Similarly, stakeholders indicated the significance and likelihood of occurrence of threats and issues. Respondents represented Western, Northwestern, and Eastern provinces of Sri Lanka. Overall, 44% were fishers, 21% traders and exporters, 16% government officers, 10% boat owners, 5% net repairers, and 4% middleman. The stakeholder influence-interest analysis showed that government departments such as the Department of Fisheries and Aquatic Resources, Navy, Coast Guard, and National Aquatic Resources Research and Development Agency had high influence. Although fishers and traders showed high interest, they had a relatively low influence, considering their high dependency on the fishery. Some of the identified key threats to shark and ray fisheries in the three provinces included the decline of shark and ray populations, high fuel and repair costs, damaged fishing gears, illegal fishing practices, poor quality of fishing gears, environmental pollution, and lack of landing site facilities. Other regional problems included conflict between migrant fishermen in Northwestern, port city development in Western, and effluent discharge and lack of data on fisheries in Eastern province. Interestingly, fishers indicated that VMS installation as a threat to fisheries as the initial cost is high. The findings emphasize the importance of stakeholder awareness, monitoring, data collection, and management strategies in achieving sustainable shark and ray fisheries in Sri Lanka with capacitated stakeholders.

Keywords: Fisheries management, sharks and rays, stakeholder perceptions, threat assessment

Acknowledgement: This study was funded by Ocean Country Partnership Project, UK

Effect of partial replacement of fish meal with duckweed (*Lemna minor*) on growth performance and feed utilization efficiency of Nile tilapia (*Oreochromis niloticus*) fingerlings

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Fish meal is a major source of protein in the feed of aquaculture though it is becoming unsustainable because of its high prices and unavailability. Duckweed (*Lemna minor*) is a fast-growing, protein based aquatic plant which grows rapidly in Sri Lanka and can replace fish meal. This experiment compared the impacts of replacing fish meal with *L. minor* meal partially with regard to growth performance, feed intake, and survival of Nile tilapia (*Oreochromis niloticus*) fingerling. The number of fingerlings was 240 (three replications; 20 fish in each tank). The experimental diets consisted of control diet (10% fish meal, 0% *L. minor*), 10% *L. minor* meal (5% fish meal), 15% *L. minor* meal (2.5% fish meal) and a commercial diet. Six weeks of fish being fed until satiation was done. 10 fish were selected on a random basis and sampled and weighed weekly and the feed consumption was measured every day. Feed utilization, growth performance and survival were checked and was subjected to proximate analysis of feeds. Parameters of water quality were maintained within optimum levels. The findings were that the 15% *L. minor* diet was the diet that resulted in the highest weight gain of the mean weight of the fish (20.7 ± 1.79 g/fish) which was significantly higher ($p < 0.05$) compared to the control and commercial diet. In addition, the highest feed intake was found with the 15% *L. minor* diet (2.58 g/ fish) and the lowest with commercial diet (2.02 g/ fish) ($p < 0.001$). There were 100% survival after all treatments and it means there had been no adverse health effects. These results indicate that *L. minor* meal can be substituted up to 15% as a viable, sustainable and cost-effective substitute source of protein in Nile Tilapia aquaculture.

Keywords: Duckweed, feed utilization, protein, Nile tilapia, growth performance

Assessment of microplastic pollution in surface and groundwater in Pannala and Dankotuwa AGA divisions, Sri Lanka

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Microplastic pollution has emerged as a significant environmental concern due to its persistence and potential impacts on ecosystems and human health. While extensive research has been conducted in marine environments, limited information is available on microplastic contamination in inland freshwater and groundwater sources in Sri Lanka. This study aimed to assess the presence and distribution of microplastics in surface and groundwater sources in Pannala and Dankotuwa AGA divisions. A total of 87 water samples were collected from seven different sources, including tube wells, open wells, deep wells, tap water, ponds, rivers and rainwater. Samples were filtered, digested using 30% hydrogen peroxide, and analysed under a stereomicroscope for identification and quantification of microplastics within the size range of 100 µm to 5 mm. Microplastics were detected in all sampled water sources, with concentrations ranging from 0.02 to 1.32 particles per litre. Groundwater sources, particularly well water, exhibited higher contamination levels compared to surface water sources, suggesting possible infiltration from improperly managed plastic waste. The average microplastic abundance was slightly higher in Pannala (0.50 particles/L) than in Dankotuwa (0.44 particles/L), which may be influenced by differences in population density, land use patterns and waste management practices. Fibre and granule forms were identified as the dominant microplastic types across both study areas. Rainwater showed the lowest levels of contamination. The findings highlight the widespread occurrence of microplastics in inland drinking water sources and emphasise the need for improved waste management strategies to minimise environmental contamination and associated risks.

Keywords: Groundwater, microplastics, pollution, Sri Lanka, surface water

Acknowledgement: The authors acknowledge the support of the Department of Aquaculture and Fisheries, Wayamba University of Sri Lanka, and the assistance of field and laboratory staff, as well as local authorities in Pannala and Dankotuwa.

Harnessing lignolytic fungi for the decolorization of synthetic dyes: a mycoremediation approach

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Textile industrial wastewater causes significant environmental concern due to their complex molecular structure, high stability, and resistance to conventional treatment methods. This study aimed to isolate and identify environmental fungal strains for with potential for biodecolorization of synthetic dyes. Fungal isolates inhabiting decaying wood materials were isolated and pure cultures were maintained on Potato Dextrose Agar (PDA). Isolates were subjected to liquid dye decolorization assay using 25 mg/L of Methylene Blue (MB) as the model dye. Promising isolates were further optimized under different pH (5, 7, 9), shaking (0, 25, 50 rpm), initial dye concentrations (25, 50, 75 mg/L) and most commonly used commercial synthetic textile dyes (Jakazol Brilliant Blue (JBB), Solarus Red (SR), Jakazol Yellow (JY)). The dye decolorization was determined by measuring the absorbance at 665 nm using UV-Vis spectrophotometer at 12 h intervals. The Laccase enzyme activity was assessed using 2,2-azinobis (3-ethylbenzthiazoline-6-sulfonic acid) (ABTS) plate assays. All the experiments were conducted in triplicates with controls. In the present study, two isolates, out of 30, exhibited over 60% MB decolorization and were identified as *Rhizomucor* sp. and *Mucor irregularis*. *Rhizomucor* sp recorded 72.4 % of decolorization within 84 h at pH 5, 25 rpm and 25 mg/L dye concentration while *M. irregularis* recorded 72.61% of decolorization within 48 h at pH 7 in static conditions. Interestingly both species achieved complete removal (>99.5%) of JBB, SR and JY within 72 h. The variation in dye decolorization efficiency may be attributed to differences in dye chemical structures and environmental conditions. Both species were positive for laccase production suggesting the involvement of oxidative enzymes in dye degradation. The findings highlight their potential as eco-friendly and cost-effective agents for the treatment of dye-contaminated wastewater and provide a foundation for future research focusing on enzyme- based real-time wastewater treatments.

Keywords: Dye decolorization, textile wastewater, laccase, methylene blue dye, ABTS

Development of seaweed based cosmetic gels incorporating crude extraction to evaluate physicochemical, photoprotective, and antioxidant properties

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The growing demand for natural and sustainable cosmetics has increased interest in marine bioresources. However, limited studies have evaluated the cosmeceutical potential of locally abundant brown seaweeds in Sri Lanka, particularly in optimized topical formulations. Therefore, this study focused on the development and evaluation of seaweed-based cosmetic gels incorporating crude ethanol extracts of *Sargassum crassifolium* and *Sargassum wightii*. Five gel formulations, including a control, were prepared using two extract concentrations (5% and 15%) and evaluated for pH, spreadability, viscosity, UV absorption (290–320 nm), and antioxidant activity using the DPPH radical scavenging assay. The results indicated that all formulations maintained an ideal pH range, with no significant differences among treatments ($p=0.289$). However, significant variations were observed in spreadability and viscosity, with *S. wightii* formulations demonstrating better spreadability and lower viscosity ($p<0.05$). The high R-squared value (adjusted $R(2)=0.649$) indicated that approximately 65% of variance in spreadability was explained by the treatment groups. Photoprotective analysis revealed that the 15% *S. wightii* gel exhibited the highest sun protection factor (SPF), indicating superior UV-blocking ability. Antioxidant assays showed that all seaweed-based gels had significantly higher activity than the control, with *S. wightii* outperforming *S. crassifolium*, although results remained lower than the standard (ascorbic acid). Overall, the findings suggest that increasing concentration of seaweed extracts enhances the functional properties of cosmetic gels. Among the tested formulations, the 15% *S. wightii* gel demonstrated the most promising physicochemical stability, antioxidant capacity and photoprotective effects, making it a strong candidate for natural cosmeceutical applications.

Keywords: Antioxidant activities, cosmeceuticals, photoprotective activities, *Sargassum crassifolium*, *Sargassum wightii*.

A comparative study of colonial and present pearl oyster (*Pinctada spp*) species in the Gulf of Mannar using morphometric and molecular identification

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Pearl oyster fishery in the Gulf of Mannar collapsed during 1920s due to overexploitation. This study was conducted to investigate Sri Lankan Pearl fishery by studying the old (>100 years) and new shells to determine morphometric and molecular identities of present and past shells. Older shells (119) were collected from the shell mound at Silavathura. New shells entangled to fish nets in Mullikulam and dead shells found in the seabed in Arippu were collected. Hinge length and six morphometric parameters were measured on pallial line. Ratio of each parameter to hinge length was subjected to canonical discriminant analysis (CDA). Age was estimated through the acetate peel method by observing growth lines. DNA was extracted using an improved phenol-chloroform method and a commercial kit, amplified with universal primers, and verified by gel electrophoresis. Results revealed that the old shells exhibited a larger mean pallial length (41.059 ± 3.94) and width (34.429 ± 3.66) compared to new samples respectively ($21.48 \pm 5.91, 17.56 \pm 5.13$, $p < 0.05$). Morphometric analysis through CDA showed significant difference between colonial and present shells ($p < 0.05$) creating two distinguish clusters between old and new shells. Pallial length and width were identified as the most important variables for grouping in first function of CDA. No significant differences were observed among new samples collected from two locations ($p > 0.05$). Age determination indicated that colonial oysters ranged from eight to twelve years, and the age of new shells ranged from zero to six years. Molecular analysis successfully extracted DNA from both old and new shells. PCR amplification produced clear bands ~800 bp, confirming successful amplification of the target gene confirming successful DNA extraction from both old and recent shells. Therefore, colonial and present pearl oyster shells show clear morphometric differences, with older oysters comparatively larger and mature. Molecular findings further confirm the applicability of DNA-based methods for comparative identification of historical and contemporary populations.

Keywords: Discriminant analysis, gulf of Mannar, molecular identification, morphometry, *Pinctada spp*.

Spatio-temporal analysis of mangrove cover change in the Jaffna lagoon using GIS and community-based validation approaches

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Mangrove forests along coastlines play an important role in supporting ecosystems and local economies. They provide key services such as regulating climate, supporting fisheries, protecting biodiversity and stabilizing coastlines from erosion. However, these forests are facing rapid decline worldwide due to human actions such as development and the impacts of changing weather patterns. In the Northern Province of Sri Lanka, particularly around the Jaffna Lagoon, past work has mapped mangroves using tools such as GIS and satellite imagery, but few efforts have included the views of local people and monitored changes over time. This research takes a closer look at how mangrove cover in the Jaffna Lagoon shifted from 2013 to 2025. This study combined computer mapping with input from surrounding communities to get a complete picture. This work primarily involved Sentinel-2 satellite imagery at a resolution of 10 meters. The steps included preparing the images, calculating NDVI to identify vegetation, running supervised classifications through the random forest method and then checking for changes, all in ArcGIS software. To ensure reliability, they used confusion matrices and measured overall accuracy. The findings show that over the years, some areas regrew through natural regeneration, while others shrank due to the expansion of fish farms and new housing. Communities validated these results nearly 95%, maps accurately represent real situation. Local residents confirmed these trends in surveys, noting declines in mangrove forests and emphasizing their value for fishing income, wave barriers and daily needs. This mix of technical analysis and community insights reveals a clear overview of the health of the area's mangroves. Overall, the study emphasizes the need of a smart planning to save these forests. It calls for better coastal laws and continued protection to keep the mangroves of the Jaffna lagoon sustainably thriving, helping nature and the people around the lagoon.

Keywords: GIS, Jaffna, mangroves, NDVI, satellite

Comparative evaluation of wet reduction methods for efficient oil extraction from processing discards of Yellowfin Tuna

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The generation of large volumes of processing discards in the tuna industry presents both an environmental challenge and an opportunity for value recovery. This study focuses on the comparative evaluation of oil extraction methods for recovering lipids from by-products of Yellowfin tuna (*Thunnus albacares*), including head, skin, bones, viscera, and eyeball. The primary objective was to identify an efficient, cost-effective, and time-saving extraction technique suitable for industrial application. Two wet reduction methods were assessed: steaming and autoclaving, and compared with the standard reference methods of oil yield determination; Bligh and Dyer (B&D), and Soxhlet extraction. Experimental conditions were optimised by varying extraction times for each method. Oil yields were quantified and statistically analysed using ANOVA to evaluate the significance of differences among methods, extraction durations, and sample types. The results demonstrated that Soxhlet extraction was less effective compared to B&D method. The B&D method showed no significant difference in oil yield across extraction times ($p=0.126$), indicating that a shorter duration of 10 minutes is sufficient for efficient lipid recovery. Similarly, wet reduction methods exhibited no significant time-dependent differences ($p=0.054$), with 30 minutes identified as the optimal steaming duration. Autoclaving produced slightly higher mean yields compared to steaming; however, the difference was not statistically significant ($p=0.279$). Among all by-products, the eyeball consistently yielded the highest oil content ($p<0.05$), though its practical application is limited due to low availability and processing difficulty. Overall, wet reduction methods produced yields comparable to the B&D reference method while offering advantages in operational simplicity and energy efficiency. These findings highlight the potential of using wet reduction methods for oil extraction with time and energy savings, thereby promoting sustainable utilisation of tuna processing waste.

Keywords: Fish oil extraction, oil yield, sustainable utilisation, tuna by-products

Comparative evaluation of cell disruption methods for lipid recovery and fatty acid profiles of selected marine microalgae

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Beneath the remarkable lipid-rich potential of marine microalgae lies a formidable barrier, their complex and resilient cell walls. While these microorganisms hold immense promise for food, nutraceutical, aquaculture, and biofuel applications, efficient lipid extraction remains contingent upon effective cell disruption, a pivotal step in downstream processing. Therefore, this study aimed to evaluate the effect of different cell disruption methods on lipid yield and fatty acid profiles of selected microalgae species. Four pure cultures of microalgae, namely *Chlorella vulgaris*, *Nannochloropsis oculata*, *Chaetoceros calcitrans* and *Thalassiosira pseudonana*, were cultivated in F/2 media and harvested by centrifugation. To evaluate the impact of cell disruption, wet biomass was subjected to three different methods, microwave treatment, autoclaving, and osmotic shock, alongside untreated controls. Lipids were extracted using the Bligh and Dyer method, then trans-esterified into fatty acid methyl esters (FAMES) via the BF₃ method prior to fatty acid profile analysis by GC-MS. The results showed that lipid yield varied significantly depending on both species and cell disruption method ($p < 0.05$). The highest lipid yields were reported for microwave treatment for *C. vulgaris* and *N. oculata*, autoclaving for *C. calcitrans* and osmotic shock for *T. pseudonana*, indicating the effect of cell wall characteristics on cell disruption efficiency. Moreover, fatty acid profile of *N. oculata* without cell disruption demonstrated a higher proportion of polyunsaturated fatty acids (PUFA) (59.02%) compared to saturated fatty acids, indicating its potential utilization in PUFA nutraceuticals. These results confirm that lipid extraction efficiency is species-dependent and that optimal recovery requires careful selection of cell disruption methods, though further evaluation of resulting fatty acid profiles across species is needed to determine the most effective approach.

Keywords: Cell disruption, fatty acid profile, marine microalgae, lipid extraction, polyunsaturated fatty acids

Development, quality characterization, and in-vitro antidiabetic potential of a no-added-sugar pineapple jam enriched with (*Stichopus naso*) Sea Cucumber powder

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The rising prevalence of type 2 diabetes highlights the need for functional foods that offer inherent antidiabetic benefits beyond conventional sugar reduction. *Stichopus naso*, a low-value sea cucumber species, remains underutilised in functional food development despite its rich bioactive profile. This study aimed to develop a novel no-added-sugar pineapple jam enriched with *S. naso* powder and to evaluate its nutritional composition, antioxidant capacity, sensory acceptability, microbiological safety, and in-vitro antidiabetic potential. Three tenderisation methods — salt, citric acid, lime juice, and alcohol treatment — were compared, with salt–citric acid identified as the most effective. Five jam formulations incorporating *S. naso* powder at concentrations of 3.87% (T1), 7.73% (T2), 11.60% (T3), 15.47% (T4), and 19.35% (T5) were developed; T1, T2, and T3 were selected for proximate, sensory, microbiological, and antidiabetic analyses based on preliminary screening. Proximate analysis of *S. naso* powder revealed high crude protein ($77.82 \pm 0.24\%$) and low crude fat ($1.2 \pm 0.02\%$), with an antioxidant IC₅₀ of 428.22 ppm. Crude protein content in the jam formulations increased significantly from T1 ($4.49 \pm 0.02\%$) to T3 ($11.78 \pm 0.06\%$, ANOVA, $p < 0.05$). In vitro α -amylase inhibition increased with sea cucumber percentage, with T3 showing the highest activity ($48.3 \pm 7.6\%$). While T3 demonstrated the most favourable nutritional and antidiabetic profile, T1 was the most acceptable in sensory evaluation, with higher inclusion rates producing a flavour profile less aligned with local consumer preferences. These findings support the valorisation of *S. naso* powder as a bioactive functional ingredient in no-added-sugar jam formulations with promising antidiabetic properties and suggest that optimisation of inclusion rates and flavour-masking strategies warrants further investigation.

Keywords: α -Amylase inhibition, antidiabetic activity, functional food, no-added-sugar jam, *Stichopus naso*

Acknowledgement: The authors gratefully acknowledge Suganth International (Pvt) Ltd.

Relationships between ichthyoplankton and zooplankton communities across natural, degraded and restored mangroves with an analysis of habitat complexity

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Mangrove ecosystems are essential feeding and breeding grounds for fishes including ichthyoplankton. This study aimed to evaluate mangrove habitat condition using remote sensing and the relationships between habitat condition and zooplankton communities on ichthyoplankton across natural, degraded, and restored mangroves. Four mangrove zones in the North Western Province of Sri Lanka namely, Gangewadiya (natural/matured), Waikkala (degraded), Anawilundawa and Pubudugama (restored) were selected. Remote sensing analysis was performed using Sentinel-2 satellite data with 14 multispectral indices in Google Earth Engine. Field sampling of ichthyoplankton and zooplankton was conducted across 12 sub-sites in four zones using plankton nets with mesh sizes of 500 µm and 200 µm, respectively. Fish eggs and larvae were sorted and counted, and zooplankton were categorised and counted. Remote sensing results revealed 70.4% and 6% healthy mangrove in Gangewadiya and Pubudugama. Waikkala had 62.9% degraded while Pubudugama and Anawilundawa had 57.5% and 99.4% nursery mangroves respectively. Five main zooplankton groups (copepods, crustaceans, jellyfish, annelids, chaetognaths) were identified. Amongst them, copepods were the most abundant and a significantly higher density (381.56 ind./m³) was estimated in Anawilundawa compared to other zones ($p < 0.05$). The highest ichthyoplankton density (83.95 ind./100m³) was reported from Anawilundawa which is under restoration compared to densities at Pubudugama (4.96 ind./100m³), Gangewadiya (13.27 ind./100m³) and Waikkala (1.5 ind./100m³) ($p < 0.05$). A positive relationship between zooplankton and ichthyoplankton populations was also identified ($p < 0.05$, $\rho = 0.585$). Results confirm the effectiveness of multi-index remote sensing analysis and the dynamics of ichthyoplankton and zooplankton in mangroves.

Keywords: Fish larvae, google earth engine, mangrove health, spectral indices

Polychaetes as shrimp broodstock feed in Sri Lanka: species identification and assessment on presumptive *Vibrio* contamination.

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Polychaetes are widely used as a live feed source in shrimp hatcheries. However, they can act as pathogen carriers. In Sri Lanka, studies on polychaetes use in shrimp hatcheries and their microbial risk are not well documented. The present study aims to identify two local polychaetes used in shrimp hatcheries and their presumptive *Vibrio* contamination compared to the imported polychaetes species. In addition, antimicrobial resistance of the *Vibrio* isolates was also assessed. Species identification was done based on morphology by using taxonomic keys. Polychaetes were fixed in 4% formaldehyde and observed under stereo microscope. Live polychaetes were collected from collectors and importers, washed, crushed, suspended in sterilized distilled water, centrifuged and supernatants were plated on thiosulfate-citrate-bile salts-sucrose (TCBS) agar, incubated at 30 °C for 24 h in an incubator. Following incubation, bacteria colonies were counted and morphology was recorded. Isolated bacteria colonies were subjected to the antimicrobial susceptibility testing by using standard methodologies. Erythromycin 1, 1.5 and 2 ppm doses and oxy-tetracycline 3, 4, and 5ppm doses were used for the testing. Two local species were identified as *Marphysa quatrefages* and *Leiochrides* sp. based on the morphological features. The imported polychaete species was confirmed as *Nereis virens*. Presumptive *Vibrio* count was significantly ($p < 0.05$) higher as 3.72 log CFU/ml in *Nereis virens* compared to the local *Marphysa quatrefages* (1.11 log CFU/ml) but not vary from local *Leiochrides* sp. (1.45 log CFU/ml). Antimicrobial susceptibility testing revealed that *Vibrio* isolates obtained from both local and imported polychaete species were resistance to both antibiotics at all the tested concentrations. This study successfully identified two local polychaete species used in shrimp hatcheries and highlights the potential risk of *Vibrio* pathogen transmission through polychaetes, especially the imported species as it shown highest presumptive *Vibrio* contamination compared to the local polychaetes species.

Keywords: Antimicrobial, polychaetes, shrimp, *Vibrio*, species identification

Acknowledgement: This study was funded by Wayamba University Research Grant

Performance evaluation of eco-friendly clay-based bioballs as a biofiltration medium for ammonia reduction in freshwater ornamental aquaria

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Ammonia accumulation is a major challenge in freshwater ornamental aquaria, negatively affecting fish health, growth, and survival. This study evaluated the performance of eco-friendly clay-based bioballs as a biofiltration medium for ammonia reduction in freshwater aquaria. Three treatments were tested with three replicates: Control treatment (CT; no filtration media), Bioball treatment (BT), and Gravel treatment (GT). *Poecilia reticulata* males (Moscow blue guppies) with a body weight of 0.25 ± 0.01 g were introduced into glass tanks ($39.2 \times 21.5 \times 25$ cm³) at a stocking density of 11 fish per square foot. All treatments were maintained under identical conditions, continuous aeration, with 1/3 of water exchange every three days, and use of equal volumes of filtration media. Water quality, growth parameters of fish, feed consumption (FCR), water colour, and fish body colour (using CR-10 Plus colour reader) were evaluated. Results indicated that BT significantly reduced ($p < 0.05$) ammonia concentrations, maintaining near-zero levels throughout the experimental period. Nitrite, soluble phosphate, conductivity, and total dissolved solids (TDS), total suspended solids (TSS), total solids (TS) were significantly lower ($p < 0.05$) in BT compared to CT and GT. In contrast, nitrate concentration and total bacterial count (TBC) of water were significantly higher ($p < 0.05$) in BT, compared to others. Growth parameters, including final length, weight, weight gain, length gain, specific growth rate, and survival rate, were significantly higher ($p < 0.05$) in BT, while FCR (1.33 ± 0.02) was significantly lower. Water colour showed significant increase ($p < 0.05$) lightness (L^*) and reduced ΔE , while fish body colour exhibited significant decrease ($p < 0.05$) lightness and increased blue colouration ($-b^*$), Hue, and Chroma in BT compared to others. In conclusion, BT demonstrated higher efficiency in ammonia reduction than the control and GT, while also improving other water quality parameters and fish performance, suggesting that BT is a sustainable biofiltration medium for use in ornamental aquaria.

Keywords: Ammonia reduction, biofiltration, clay-based bioballs, guppy fish, water quality

Vertical distribution and characteristics of soil microplastics in the Accelerated Natural Regeneration of Mangroves (ANRM) site at Anawilundawa, Sri Lanka

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Microplastic (MP) pollution is an emerging concern due to its persistence and ecological impacts. Mangroves are particularly vulnerable because of their dense roots, high sediment retention, and proximity to human activities. However, information on vertical MPs distribution in Sri Lankan mangroves are limited. This study assessed the abundance, vertical distribution, and morphology of MPs in soils from restored, degraded, and natural environments at the ANRM site in Anawilundawa, Sri Lanka, using samples collected in triplicate at four depth intervals (0-15, 15-30, 30-50, and 50-100 cm) across 10 locations. MPs were extracted using density separation (NaCl), organic matter digestion (10% KOH and 30% H₂O₂). Particles were identified and quantified using a stereomicroscope. Soil physicochemical properties; pH, bulk density, salinity, electrical conductivity (EC), temperature and soil colour were recorded following standard procedures. The highest MP proportion was recorded in the 0-15 cm layer (39.68 ± 19.0 particles/dm³), while the lowest occurred at 50-100 cm (25.18 ± 13.36 particles/dm³), revealing a significant decline with increasing depth. MP abundance differed significantly among sampling locations ($p < 0.001$), with canal-associated restored areas showing the highest contamination (36.0 ± 16.8 particles/dm³) followed by other environments. Fibers were the dominant morphotype (96.7%), followed by films, fragments, foams, and pellets. Blue fibers constituted the highest proportion (39.6%) among other fiber colours. The results indicate that mangrove soils at Anawilundawa function as sinks for MPs, with surface accumulation and evidence of vertical transport into deeper soil layers. These findings highlight the influence of hydrodynamic processes, particularly canal water flow, on MP distribution and emphasizes the need for improved waste management.

Keywords: Mangrove ecosystem, microplastic contamination, soil pollution, vertical distribution, wetland conservation

Acknowledgement: Ocean Country Partnership Programme (OCCP), and Wildlife and Nature Protection Society

Assessment of salt optimization and microplastic load in two selected dried fish species: *Amblygaster* sp. and *Rastrelliger* sp.

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Dried fish is a widely consumed traditional food in Sri Lanka, valued for its high protein content and extended shelf life. However, concerns regarding both product quality and food safety particularly optimal salt levels and microplastic contamination remain insufficiently studied. Therefore, this study was designed with two integrated components: microplastic assessment and salt optimization using two fish species (*Amblygaster* sp. and *Rastrelliger* sp.). For microplastic analysis, dried fish samples of *Amblygaster* sp. and *Rastrelliger* sp. were collected from Negombo, Chilaw, and Kalmunai. For salt optimization, raw fish samples were collected from local markets and processed with varying salt concentrations (5%, 8%, 10%, and 12%). Microplastic analysis was conducted using chemical digestion and microscopic identification, while salt optimization involved curing, drying, and evaluation of physicochemical and sensory attributes. The results revealed the presence of microplastics in all dried fish samples, with fibers identified as the dominant type and blue colored particles being the most abundant. An uneven increase in foam particles was observed in Kalmunai samples, possibly due to styrofoam degradation. With regard to processing, moisture content decreased significantly with increasing salt concentration ($p < 0.05$), whereas pH and bulk density showed no significant variation ($p > 0.05$). Sensory evaluation revealed that 10% and 12% salt concentrations had the highest consumer acceptability. In conclusion, dried fish represents a potential pathway for microplastics to enter the human food chain. A 10% salt concentration is recommended as it provides comparable quality to higher salt levels while reducing excessive salt intake and associated health risks. Collectively, this study provides valuable insights for improving dried fish processing practices and establishes baseline data for future monitoring and risk assessment in the Sri Lankan context.

Keywords: *Amblygaster* sp., microplastics, *Rastrelliger* sp., salt optimization, sensory evaluation

Food preferences and selective feeding behaviour of *Cirrhinus mrigala*, *Cyprinus carpio*, and *Labeo rohita* during fry-to-fingerling cage rearing

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Early feeding behavior strongly influences fish growth, survival, and performance in aquaculture systems. During the fry-to-fingerling transition, fish develop selective feeding mechanisms and a weaning stage marks a dietary shift. This study investigated the food preference and selective feeding behavior of *Cirrhinus mrigala*, *Cyprinus carpio* and *Labeo rohita* in semi-intensive fry to fingerling cage culture systems in Nanneriya, Kadawala, and Inginimitiya reservoirs in Sri Lanka. Fingerling and reservoir water samples were collected at ten days intervals using scoop nets and 50µm plankton net. Total length, body weight, and gut length were recorded. Gut contents and planktons in water samples were identified and counted using a Sedgewick–Rafter counting chamber. Phytoplankton diversity was assessed through Shannon–Wiener Diversity Index, dietary overlap was evaluated using Pianka’s Food Niche Overlap Index, and food selectivity was determined using Ivlev’s Electivity Index. Shannon–Wiener index of water samples ranged from 1.62 to 2.67 in Nanneriya, 2.63 to 3.06 in Kadawala and 1.62 to 2.68 in Inginimitiya, Relative gut length increased progressively in all samples, with a marked rise at the weaning points. *C. mrigala* showed 2.94 to 3.65 increment while *C. capio* and *L. rohita* showing 0.89 to 1.00 and 2.63 to 5.01 increase. Pianka’s food niche overlap index between sapling intervals at weaning dropped sharply (0.51, 0.52, and 0.29 respectively for species) confirming a significant dietary shift. Ivlev’s Electivity Index revealed the species-specific selectivity. *C. mrigala* showed limited pre-weaning selectivity, broadening markedly towards green algae and cyanobacteria after weaning. *C. capio* consistently selected diatoms and cyanobacteria reporting changes in species and adding Chlorophyceae after weaning. *L. rohita* preferred diatoms and green algae, broadening to blue-green algae after weaning. These results demonstrated marked changes in food selectivity at weaning, providing valuable guidance for optimizing phytoplankton-based fingerling rearing systems.

Keywords: Feeding selectivity, gut content analysis, plankton, weaning.

A transparent, UV-resistant and biodegradable chitosan-collagen composite film for sustainable food packaging applications

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Growing concerns over environmental pollution and the underutilization of seafood processing waste have created a strong need for sustainable and resource-efficient solutions. Six types of films were developed by dissolving chitosan and collagen in acetic acid at three different pH levels (pH 1, pH 2, pH 3), and as chitosan-only and chitosan-collagen composite films. Chitosan extracted from giant freshwater prawn (*Macrobrachium rosenbergii*) shell waste and collagen extracted from Yellowfin tuna (*Thunnus albacares*) skin waste were used. Similar six types of films were developed by replacing prawn chitosan with commercial chitosan. Prepared films were characterised as food packaging films using physical properties: film thickness; optical property; moisture content; swelling power; water vapour permeability; solubility; tensile strength; and chemical properties: antioxidant activity. Further, thermal properties: degradability in hot water; and thermo-gravimetric properties were measured. Moreover, biodegradability of these films was tested in soil. The crystallinity was analysed using XRD spectroscopy. The chemical structure was analysed by using FTIR spectroscopy. Surface morphology was analysed using scanning electron microscopy (SEM). The developed films exhibit comparable thickness and transparency to commercial clingwrap and polythene, with enhanced tensile strength. Collagen incorporation improved UV absorption without affecting transparency, and chitosan-only films showed higher antioxidant activity. Further, films also demonstrated better water resistance, thermal stability up to 300 °C, and biodegradability in soil in less than days. These results indicate the potential use of these films as a safer and sustainable alternative for food packaging applications.

Keywords: Chitosan, collagen, food packaging, processing waste, transparent

Acknowledgement: This work was financially supported by the Australian Centre for International Agricultural Research (ACIAR) Grant, FIS/2018/157.

Evaluation of post-harvest losses of marine fisheries at the fish landing sites in Northern Province Sri Lanka

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Post-harvest losses (PHLs) in marine fisheries threaten food security, economic stability, and resource sustainability in developing coastal nations. However, conventional assessments focus primarily on biomass and economic losses, overlooking the nutritional consequences of fish discards, a critical gap with direct implications for public health. This study introduces a novel multi-dimensional framework integrating biomass, economic, and nutritional loss assessments, applied across nine major fish landing sites in Northern Province, Sri Lanka, over an 18-month period (July 2024 to December 2025). Secondary data on total catch, utilization patterns, discards, and market prices were analyzed to estimate biomass and economic losses. Nutritional losses were quantified by coupling biomass loss data with species-specific proximate composition (moisture, crude protein, fat, ash) determined using standard AOAC methods. One-way ANOVA with Bonferroni post-hoc correction was employed to assess variations among species and locations. Of the total sampled catch of 2,443,772 kg, 533,418 kg (21.83%) was lost. Significant interspecies variation ($p < 0.001$) was observed: small pelagic species exhibited high physical losses, whereas high-value species such as crabs contributed disproportionately to economic losses. Nutritional loss assessment revealed estimated protein loss of 537,630 kg and fat loss of 117,352 kg, equivalent to the annual protein requirements of approximately 45,000 individuals. Spatial analysis identified Point Pedro and Mullaitivu Town as high-loss hotspots ($p < 0.05$). These findings demonstrate that PHLs extend beyond economic inefficiency to encompass substantial nutritional depletion. By integrating nutritional metrics, this study provides an evidence-based framework for prioritizing interventions tailored to site- and species-specific loss profiles. cold-chain infrastructure at high-loss locations, targeted handling protocols for high-value species, value-addition strategies for underutilized small pelagic, and nutrition-sensitive loss reduction that prioritizes protein-rich species. This integrated approach offers a replicable model for bridging fisheries management with public health nutrition in data-limited settings.

Keywords: Food security, marine fisheries, nutritional loss, post-harvest losses

A systematic review and meta-analysis of marine microalgal composition and their applications in food and nutraceuticals

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Marine microalgae are increasingly recognized as a sustainable and valuable source of bioactive compounds and nutrients, with significant potential for food and nutraceutical applications. However, existing literature on their biochemical composition and industrial utilization remains scattered across different studies and regions. Accordingly, this study aimed to provide a comprehensive understanding about marine microalgal composition and their applications in food and nutraceutical industries through an integrated systematic literature review and meta-analysis. Peer-reviewed studies published from 2015 to 2025 were retrieved from PubMed and Google Scholar, followed by screening and analysis using Covidence, Python and RStudio. The systematic review revealed that species such as *Phaeodactylum tricornutum*, *Nannochloropsis oculata*, *Dunaliella salina* and *Porphyridium cruentum* are frequently utilized in both food and nutraceutical applications. These species are mainly associated with pigments, protein and omega-3 fatty acids extraction, which are widely incorporated into functional foods and nutritional supplements. Global research trend indicated that most studies are concentrated in Europe, India and Australia, reflecting higher research activity in these regions. Meta-analysis, results demonstrated that marine microalgae are nutritionally rich, with pooled mean values of 29.91%, 15.59%, and 21.25% for protein, lipid and carbohydrate content respectively on dry weight basis. However, a high degree of heterogeneity was observed among studies, mainly due to differences in cultivation conditions, culture media, analytical methods and extraction techniques. Species selected for food and nutraceutical applications align closely with those possessing superior biochemical profiles, highlighting nutritional and bioactive composition as key drivers of species choice. These findings serve as a valuable reference for researchers and product developers.

Keywords: Bioactive compounds, food, marine microalgae, meta-analysis, nutraceuticals

Rapid fines assessment in sediments related to vegetation status at Anawilundawa, an accelerated natural regeneration of mangrove site, Sri Lanka

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Sediments are a simple yet powerful diagnostic tool to determine mangrove health because they govern establishment, species succession, and propagation. Over 80% of the mangrove sediments are suspended sediments, defined by their ‘fines’ content (particles < 63 µm). The ratio between total fines and total sediment is the ‘fines percentage’. This study aims to apply the method in Silburn et al (2018) to obtain and compare the fines percentage in mangrove sediments at Anawilundawa Accelerated Natural Regeneration site, Sri Lanka, across three vegetation strata (natural, restored, and degraded). A stratified random core sampling for mangrove sediments was conducted across three depth intervals (0-10, 10-20, and 20-30 cm) in land, the main channels, and subchannels. Samples were prepared using channel water and settled for 24 hours. Two images were taken as the front and back and analysed using R Studio to calculate the fines percentage. Across all depths, a Kruskal-Wallis test confirmed that at least one strata distribution differs significantly ($H = 14.38, p = 0.013$): which manifested within the restored strata (mean fines percentage of 51.46 ± 22.27), in contrast to the natural (67.35 ± 13.94) and degraded (61.10 ± 19.02). At the 0-10 cm layer, restored land had significantly lower fines percentage (48.17 ± 21.16) than both natural ($62.31 \pm 11.50; p = 0.003$) and degraded land ($63.12 \pm 23.13; p = 0.003$). Land within a five-year-old straight-palmate restoration plot had significantly lower fines percentage (30.55 ± 15.09) than a three-year-old contoured-palmate restoration plot (54.27 ± 14.81). Restored sub-canals ($60.6 \pm 20.4\%$) were statistically indistinguishable from natural mangroves ($p = 0.425$). Both natural and restored strata showed increasing fines with depth. Further, results hint at possible sediment loss in land under restoration, which may impact seedling establishment and block channels. Periodic monitoring and adaptive re-engineering are recommended. The study confirms the applicability of Silburn's method as a low-overhead method to assess fine sediments in mangroves.

Keywords: Degraded, image analysis, restored, suspended load

Acknowledgement: This study was funded by Wild Life and Nature Protection Society under the financial support of the Embassy of France

8th April 2026, Faculty of Livestock, Fisheries & Nutrition, Wayamba University of Sri Lanka

Assessment of phenology and post-harvest optimization of *Solanum trilobatum* L. flowers for a functional herbal tea

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Solanum trilobatum L. is an herbaceous plant commonly used in traditional medicine, widely distributed in coastal areas of India, Sri Lanka, Indo-China, to Peninsula Malaysia. There are limited scientific data on propagation, flower phenology, post-harvest practices, and value-added products. This study evaluated the propagation techniques, characterized flower phenology, optimized drying methods, and developed a functional herbal tea using dried flowers. Propagation experiments were conducted using seeds pre-treated with drying, abrasion, and soaking. Stem cuttings treated with indole-3-butyric acid 0.3%, *Aloe vera* leaf gel, and a control were also propagated. Flower phenology was observed from bud formation to flower withering, using tagged flowers. Overnight observations were made to determine the time of blooming. For the drying of flowers, two temperatures (40 °C and 50 °C) were adopted until constant weight. After measuring the total phenolic content (TPC), total flavonoid content (TFC), and total antioxidant capacity (TAC), professional tea tasters at Dilmah Ceylon Tea Company developed the blends. Results confirmed a significantly faster growth from seeds compared to stem cuttings. A total of 14 different stages and 11 days, 19 hours, and 30 minutes up to flower withering were established. Two blooming scenarios, one that starts after 4.00 a.m. (slow blooming) and another that happens within less than 10 minutes at sunrise, were recorded. Anthers' growth facilitated both cross-pollination and eventually self-pollination. TPC (44.8 ± 3.89 mg/g), TFC (87.2 ± 8.47 mg/g), and TAC (36.1 ± 1.38 mg/g) values were not different between 40 °C and 50 °C treatments. The best tea blend was 1% *S. trilobatum* flowers, 5 % Cinnamon, 5 % Ginger, 89% Green tea (OPA), as per the professional tea tasters' choice, considering medicinal properties. Overall, the findings highlight the potential of *S. trilobatum* as an underutilized non-timber forest product for sustainable cultivation and commercialization as a functional herbal tea.

Keywords: Antioxidant activity, drying optimization, herbal tea formulation

Acknowledgement: This study was funded by the Wildlife and Nature Protection Society with the financial support received from the Embassy of France.

A comparative analysis of proximate composition and amino acid profile of selected polychaete species used as live feed in Sri Lankan shrimp hatcheries

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Polychaetes are marine segmented annelids widely used as a valuable live feed in shrimp brood stock due to their higher protein, lipids, amino acids, and fatty acids profile, known to support gonadal maturation and reproductive performance. This study evaluated the proximate composition and amino acids profile of three polychaete species: two local species, *Marphysa quatrefages*, *Leiochrides* sp., and one imported species, *Nereis virens*. Proximate composition was analyzed according to the standard methodologies. Amino acid profiles were analyzed using High-Performance Liquid Chromatography. Statistical analysis was performed using one-way ANOVA at ($p < 0.05$). *N. virens* exhibited significantly higher protein (63.41%) and fiber (15.17%) with fat (8.3%), ash (8.21%) and carbohydrate (4.91%). *M. quatrefages* had protein (59.21%), fat (8.06%), ash (11.39%) and carbohydrate (18.01%). *Leiochrides* sp. had protein (53.52%), fat (6.10%), ash (17.85%) and carbohydrate (13.37%). All three species were showing higher protein percentages than the recommended protein level (45-55%) in shrimp brood stock diets. *N. virens* and *M. quatrefages* had similar fat percentages. The protein and fat percentages of *Leiochrides* sp. was significantly lower compared to *N. virens* and *M. quatrefages*. According to the amino acid profile of tested three polychetes, *M. quatrefages* showed highest percentage of glycine (18.04%), tryptophan (6.61%), and lysine (35.02%). *Leiochrides* sp. demonstrated highest percentage of serine (24.93%) and proline (27.31%). *N. virens* showed slightly higher aspartic acid (6.43%) and asparagine (8.94%) percentages. Overall, though the protein percentage is significantly different in three tested polychetes, all three polychetes protein percentages were above the recommended protein percentage for shrimp brood stocks. Tryptophan and lysine, two key amino acids essential for shrimp breeding were highest in local *M. quatrefages*. Based on the key findings of the present study, local polychetes species, specially the *M. quatrefages* can be used as nutrient-rich live feed for shrimp brood stocks in Sri Lanka if produced under specific pathogen-free conditions.

Keywords: Amino acid, lysine, polychaetes, proximate, tryptophan

Acknowledgement: This study is funded by Wayamba University Research Grant.

8th April 2026, Faculty of Livestock, Fisheries & Nutrition, Wayamba University of Sri Lanka

Application of clay-based filter for production of microplastic free table salt

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The widespread occurrence of microplastics (MPs) in commercial table salts presents a growing food safety concern due to their persistence, bioavailability and potential long-term risk to human health. Sea salt is one direct source of MPs through food consumption. This study assessed the effectiveness of a clay-based filtration system in removing MPs from salt and seawater used in salt production. Brine and table salt samples collected from different brands and production locations. They were first analyzed to estimate the baseline MPs contamination levels. Brine and salt samples were filtered through a clay-based filter to remove MPs in all samples. MPs free salts were subsequently produced in the laboratory by crystallizing the filtered brine through controlled heating. The initial salt samples contained high microplastic loads (708.89 ± 219.71 particles/1kg). Following the filtration through clay-based filter, both filtered brine and newly produced salt demonstrated 100% decline in MPs counts, with median values of 0 particles. Removal efficiency ranged from 99.10% to 99.77% across all brands (mean= $99.50 \pm 0.20\%$). As data were non-normal, non-parametric statistical tests were employed. The Wilcoxon signed-rank test confirmed a highly significant reduction in microplastics after filtration when compared with initial levels ($p < 0.05$). Newly crystallized salt also exhibited significantly lower contamination than original samples ($p < 0.05$). Microplastic abundance differed significantly across production locations ($p < 0.05$), indicating environmental and processing influences on baseline load. Despite these variations, the clay filter consistently performed with high efficiency in all cases. These findings demonstrate that a clay-based filtration method can effectively and economically remove MPs from brine prior to salt crystallization. The technique offers a practical, low-cost and environmentally friendly solution for enhancing salt purity and improving consumer safety. Adoption of such filtration systems within the local salt industry can play an important role in reducing dietary microplastic exposure and supporting cleaner production practices.

Keywords: Brine filtration, clay filter, food Safety, microplastic removal, table salt

Shrimp industry dynamics in the Northwestern province: current status assessment, cyclone Ditwah impacts and comparative culture practices

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Shrimp aquaculture plays a vital role in global seafood production and rural livelihoods, particularly in developing coastal regions. In Sri Lanka, the Northwestern Province is the primary hub for shrimp farming, predominantly centered on *Litopenaeus vannamei* owing to its high productivity and adaptability. However, recent cyclone disruptions and a lack of comparative studies on culture systems have left critical gaps in understanding farm performance. This study evaluated shrimp farms in the region by analyzing their operational, socio-economic, and production characteristics, with a focus on comparing earthen and plastic-lined pond systems. Data from 30 farms were collected through structured interviews, including cyclone impact assessments. A field comparison of three earthen and three plastic-lined ponds was conducted to measure key performance indicators: survival rate, growth, feed conversion efficiency, productivity, and water quality, with results analyzed using ANOVA and regression methods. Eighty percent of farms surveyed incurred significant economic losses due to cyclone damage, predominantly affecting stock and feed inventories. Plastic-lined ponds demonstrated significantly superior performance, recording higher survival rates (87.3% vs. 61.3%), improved FCR (1.08 vs. 1.63), and greater productivity (5,016 kg/ha vs. 2,999 kg/ha). Water quality parameters, particularly pH and *Vibrio* concentrations, showed significant associations with production outcomes ($p < 0.05$). Socio-economic analysis revealed strong dependence on shrimp aquaculture alongside limited adoption of precision technologies such as automated feeding systems and water quality sensors. Farm size, scale, and technology adoption significantly influenced farmer satisfaction with institutional support ($p < 0.05$). These findings confirm the superior resilience and production efficiency of plastic-lined pond systems. The results offer evidence-based guidance for farm management optimization, climate adaptation strategies, and policy frameworks aimed at the sustainable development of shrimp aquaculture in Sri Lanka.

Keywords: Shrimp farming, plastic-lined ponds, *Litopenaeus vannamei*, culture systems

Acknowledgement: The authors gratefully acknowledge the shrimp farmers of Northwestern Province.

Comparative study of DNA extraction methods and drying treatments for PCR-based identification of two selected processed fish species

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Seafood authentication is essential due to increasing cases of species mislabelling in processed fish products. DNA-based techniques such as polymerase chain reaction (PCR) enable accurate species identification. Their success depends on the quality of extracted DNA, which can be affected by processing methods. Therefore, this study evaluated the effects of DNA extraction methods and drying treatments on DNA quality and PCR-based identification of two processed fish species, *Sardinella* spp. and *Rastrelliger* spp. Fresh and dried samples (sun-dried, salt-dried and oven-dried) were subjected to three extraction methods: a commercial kit (Wizard® Genomic DNA Purification Kit), phenol–chloroform and cetyltrimethylammonium bromide (CTAB) method. DNA concentration and purity were measured using a Nanodrop spectrophotometer, followed by PCR amplification using cytochrome c oxidase subunit I (CO1, 745 bp) and internal transcribed spacer (ITS, 312 bp) primers. Statistical analysis revealed that DNA concentration in fresh samples was significantly affected by species ($p=0.008$) and extraction method ($p=0.006$). DNA purity was also significantly influenced by species and extraction method ($p<0.001$). The CTAB method consistently produced the highest DNA concentration and superior purity in both species. Drying treatments reduced DNA concentration, although not all effects were statistically significant across methods. Under phenol–chloroform extraction, drying treatments significantly affected DNA concentration and purity ($p<0.001$), with salt-dried samples showing higher values. PCR amplification results indicated that the ITS primer produced clear and consistent bands in processed samples, whereas the CO1 primer, was mainly effective in fresh samples, indicating degradation of longer DNA fragments during processing. These findings demonstrate that CTAB extraction and short DNA targets are most suitable for reliable PCR-based identification of processed fish species.

Keywords: DNA extraction, drying treatments, PCR identification, *Rastrelliger* spp., *Sardinella* spp.

Biological aspects, food & feeding, and community perception of the invasive redline Snakehead (*Channa micropeltes*) in Deduru oya reservoir

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Redline snakehead (*Channa micropeltes*) has established a naturally recruiting population in Deduru Oya Reservoir in Sri Lanka creating a possible threat to biodiversity and culture-based fisheries. Present study intended to generate baseline information regarding this fish species under local condition. Fish samples (n=50) were sourced from anglers. The total length and weight were recorded. Fish were dissected and weight of the gonad, viscera, liver were separately recorded. Gut length, gut fullness and food items in the gut were recorded. Dorsal mussel samples were subjected to $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ isotope analysis. Length and weight relationship, condition factor, relative gut length, gonadosomatic index (GSI), vicerosomatic index (VSI), and hepatosomatic (HSI) index were estimated. A questionnaire survey was conducted to study the community awareness to understand the perception about this species. Total length ranged from 55-90cm while a majority (31%) represented 65-70cm size class. Length and weight relationship for male ($R^2=0.82$) and female ($R^2=0.81$) was significant ($p<0.05$). Males fish exhibited a negative allometric growth while females showed positive allometric growth. Fulton condition factor suggested a healthy population of male (0.85 ± 0.12) and female (0.91 ± 0.18). Almost all fish were in immature stage and GSI for females was estimated as 0.132 ± 0.838 . The HSI and VSI were 0.63 ± 0.2 and 10.17 ± 10.5 respectively. Relative gut length of 0.456 ± 0.177 confirmed the carnivorous feeding habit while stable isotope analysis ($\delta^{13}\text{C} = -31.5$; $\delta^{15}\text{N} = 12.62$) confirmed its feeding habit. Prey species in gut content were identified as *Rasbora* sp., *Puntius* sp., *Amblypharyngodon* sp., *Ompok* sp. and a frog. About 38% of the community members are unaware that this species is invasive, yet they are well aware of the impact. Among respondents, 12% recognize this fish as a positive effect and another 12% recognize this fish has both negative and positive effects. The study highlights the need for vigilance regarding this species and studying the reproduction.

Keywords: *Channa micropeltes*, community perception, invasive species, stable isotope analysis

Genetic diversity and population structure of wild giant freshwater prawn in Sri Lanka: Insights from mitochondrial COI sequencing

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The giant freshwater prawn, *Macrobrachium rosenbergii*, supports aquaculture and rural livelihoods across Asia. In Sri Lanka, wild reservoir populations are uniquely shaped by decades of government-led stocking, wherein millions of hatchery-reared postlarvae, originating from a limited genetic base, are released annually to enhance production. Despite these extensive stocking efforts, distinct morphotypes have been observed among reservoir populations, raising questions about the genetic consequences of this anthropogenic intervention and whether phenotypic variation reflects underlying genetic differentiation. This study provides the first molecular characterization of genetic diversity and population structure in wild *M. rosenbergii* from Sri Lankan reservoirs using mitochondrial COI sequencing. Analysis of a 481 bp fragment from 15 individuals revealed 474 conserved sites and only seven variable sites, reflecting low nucleotide diversity ($\pi = 0.003$). Nevertheless, six distinct haplotypes were identified with moderately high haplotype diversity ($Hd = 0.675$), consistent with recent population expansion or a founder effect. Phylogenetic reconstruction placed all Sri Lankan haplotypes within a distinct monophyletic clade, separate from global populations. Haplotype network analysis revealed shared haplotypes across reservoirs alongside private haplotypes restricted to specific localities, implying limited gene flow and incipient structuring. Low nucleotide diversity aligns with a founder effect from decades of stocking using genetically similar broodstock. However, the presence of private haplotypes suggests that localized genetic signatures persist, possibly due to relic populations or reservoir-specific selection. These findings indicate that observed morphotypic variation may have a genetic basis, yet this variation exists within a framework heavily influenced by anthropogenic stocking. Genetically informed management, including broodstock diversification and reservoir-specific conservation units, is essential to balance production goals with the preservation of this valuable genetic resource.

Keywords: Founder effect, genetic diversity, *Macrobrachium rosenbergii*, mitochondrial DNA (mtDNA COI), morphotypes

Acknowledgements: This work was financially supported by the Australian Centre for International Agricultural Research (ACIAR) Grant, FIS/2018/157

Department of Livestock and Avian Sciences

Major drawback points of small-scale dairy farming in Pannala, Kuliyaipitiya, and Dummalasooriya veterinary regions of Kurunegala district, Sri Lanka

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Sri Lanka continues to experience a substantial milk supply gap, with local production meeting only approximately 40% of total demand. The Kurunegala district contributes about 12.3% to national milk production and has the highest proportion of small-scale farmers share of (herd size <10 animals), accounting for 13.4% of the national total. Therefore, identifying the major constraints affecting small-scale dairy farmers in this district is crucial for improving productivity and supporting national milk supply. This study aimed to identify the key drawback points affecting small-scale dairy farmers in the Pannala, Kuliyaipitiya and Dummalasooriya veterinary regions of the Kurunegala District, Sri Lanka. A descriptive cross-sectional survey was conducted using a structured questionnaire administered to 89 small-scale dairy farmers. The results indicated that feed-related constraints were the most prominent. High feed cost was reported by 96.6% of farmers, while 44.9% had not received feed-related guidance. Furthermore, 65.2% of farmers had not cultivated fodder, and 84.3% did not prepare feed on-farm, indicating low feed self-reliance. The findings also suggest that on-farm feed preparation is influenced by multiple farm-management factors rather than extension support alone, with fodder cultivation showing a clear relationship with on-farm feed preparation. In addition, major infrastructure constraints included lack of cooling facilities (91.0%) and limited adoption of improved milk-handling practices. Market-related constraints were primarily low farm-gate milk prices (98.9%) and delayed payments (86.5%). High veterinary cost (93.3%) and the limited use of preventive udder-health practices, with only 7.9% of farmers used the California Mastitis Test, further constrained productivity. Overall, small-scale dairy farmers in the selected veterinary regions face multiple interconnected constraints that limit profitability and milk production. Addressing feed costs, improving fodder cultivation and feed self-reliance, and strengthening veterinary, market, and infrastructure support are essential to enhance smallholder dairy production and reduce the national milk deficit in Sri Lanka.

Keywords: Dairy constraints, Kurunegala district, milk production, small-scale dairy farming

Development and evaluation of physicochemical, compositional and sensory properties of fermented frozen dessert enriched with chickpea flour

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This study focused on developing a fermented frozen dessert enriched with chickpea flour, designed to be low-calorie, low-fat, and low-sugar, similar to healthy frozen yoghurt products. Three formulations with fermented milk and chickpea flour ratios were optimized: R1 (90:10), R2 (95:5), and R3 (85:15). The study evaluated physicochemical, nutritional, functional, textural, color, and sensory attributes, including pH, titratable acidity, total soluble solids (TSS), moisture, ash, crude protein, crude fat, crude fiber, carbohydrate, energy content, total phenolic content, and sensory characteristics. Data were analyzed using parametric one-way ANOVA with Tukey's post hoc test at a 5% significance level ($p \leq 0.05$). Sensory evaluation was performed by using a 9-point hedonic scale, JAR scale, CATA scale, and overall liking, with 30 untrained panelists, and analyzed using XL STAT software. Among the formulations, R2 demonstrated superior sensory properties and favorable physicochemical characteristics: pH 5.23 ± 0.010 , titratable acidity $0.67\% \pm 0.005$, and TSS $34.45\% \pm 0.517$. Nutritional composition included moisture $65.86\% \pm 0.221$, ash $1.28\% \pm 0.050$, crude protein $9.72\% \pm 0.212$, crude fat $6.90\% \pm 0.100$, crude fiber $1.53\% \pm 0.085$, carbohydrate $14.71\% \pm 0.516$, and energy $110 \text{ kcal}/100\text{g}$. Functional evaluation indicated appreciable total phenolic content ($0.81 \pm 0.066 \text{ mg GAE/g}$). The results suggest that chickpea flour enriched fermented frozen dessert exhibits promising physicochemical, nutritional, and sensory qualities comparable to conventional frozen yoghurt, while offering potential health benefits. With further optimization, including microbial safety, shelf-life assessment, and health risk evaluation, this product holds strong potential as a marketable, natural, low-sugar, low-fat, and low-calorie frozen dessert alternative for health-conscious consumers.

Keywords: Chickpea, fermented frozen dessert, physicochemical properties, sensory evaluation

Evaluation of performance and efficiency of small-scale self-mixing layer farmers in the Kurunegala district, Sri Lanka

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Small-scale poultry farming remains the dominant subsector in Sri Lanka, supporting livelihoods with minimal labour, local feed resources, and marginal lands. Many small and medium poultry farmers now operate self-mixing feed units to reduce costs and manage the feed crisis, contributing nearly a quarter of national animal feed output. Evaluating the performance and efficiency of these small-scale self-mixing layer farms is therefore essential for improving productivity and sustainability. This study assessed production performance and efficiency of such farms in the Kurunegala district. A purposive sampling approach was used to select 35 small-scale, feed self-mixing layer farmers, and data on production performance and feed intake were collected through face-to-face interviews using a structured questionnaire. Production and performance indicators such as Hen Day Egg Production (HDEP%), egg mass, feed intake, feed conversion ratio (FCR) and average egg weight were evaluated. Data from the questionnaire and proximate analysis were analysed using SPSS. Among 35 farmers, most (15) maintained 1000-2500 birds, with a mean flock size of 2121.43 ± 794.96 . Mean HDEP was $83.50 \pm 9.30\%$, egg mass 52.31 ± 5.76 g/hen/day, egg weight 62.71 ± 2.77 g, and FCR 1.96 ± 0.06 , while 97.1% reported profitability. Feed intake showed a strong positive correlation with egg mass ($\rho = 0.914$, $p < 0.001$), whereas FCR showed no significant relationship with egg mass or total egg production ($p > 0.05$). Ages at sexual maturity (16-20 weeks), production period (52-56 weeks), peak production (~16 weeks), and culling (72-76 weeks) were consistent with reported values. A key limitation was the lack of long-term farm records for full-flock evaluation. Overall, these findings suggest that self-mixing commercial layer farms can achieve and sustain commercially acceptable production and profitability when feed intake is properly managed.

Keywords: Egg mass, layer farming, production efficiency, self-mixing, small-scale

***In vitro* evaluation of cinnamon-derived materials on hindgut fermentation and gut microbiota in pre-weaned dairy calves**

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The preweaning period represents a critical developmental stage in dairy calves, during which the hindgut serves as the primary site of microbial fermentation due to the functional immaturity of the rumen. Disturbances in early gut microbiota are strongly associated with neonatal diarrhoea, a major cause of morbidity and mortality in young calves worldwide. Increasing concerns regarding antimicrobial resistance have driven the search for safe, antibiotic-free alternatives that support gut health and microbial stability during this vulnerable stage. Cinnamon, rich in bioactive compounds such as cinnamaldehyde and eugenol, has gained attention as a potential phytogenic feed additive. This study evaluated the *in vitro* effects of eight cinnamon-derived materials, including bark oil, leaf oil, cinnamon goda, and powdered forms such as leaf powder, Sri Gemunu bark powder, Sri Vijaya bark powder, common variety bark powder, and scrape powder on fermentation parameters and selected microbial populations. Faecal inoculum was collected from pre-weaned dairy calves at one, two, and three weeks of age, and fermentation was conducted under anaerobic conditions for 24 hours. Powdered substrates resulted in significantly greater ($p < 0.05$) reductions in pH and increased gas production, indicating enhanced fermentation activity. These treatments also showed significantly higher ($p < 0.05$) population of *Lactobacillus* spp. and lower populations of *Escherichia coli*. In contrast, cinnamon essential oils showed either no effect or significantly negative ($p < 0.05$) influence on fermentation activity and microbial populations across all age groups. The responses varied with calf age, highlighting the influence of hindgut microbial development on treatment effects. Overall, cinnamon-derived materials, particularly processing by-products, show promise as natural feed additives for improving hindgut fermentation and microbial balance in pre-weaned calves.

Keywords: Cinnamon by-products, dairy calves, hindgut fermentation, microbial populations, phytogenic additives

Investigation into colistin resistance in *Salmonella* and *Escherichia coli* from poultry: A foodborne public health concern

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Colistin is a crucial last-resort antimicrobial used in human medicine to treat infections caused by multidrug-resistant Gram-negative bacteria. Its extensive use in poultry production has led to the emergence of colistin-resistant foodborne pathogens, particularly *Escherichia coli* and *Salmonella*. The discovery of plasmid-mediated mobilized colistin-resistance (*mcr*) genes has raised global concerns due to their potential for horizontal gene transfer. Although multiple *mcr* variants (*mcr-1* to *mcr-10*) have been reported, this study focused on detecting *mcr-1* and *mcr-3* detection. Given the limited data in Sri Lanka, this study investigated phenotypic and genotypic colistin-resistance in *E. coli* and *Salmonella* isolated from poultry. A total of 31 *E. coli* and 100 *Salmonella* isolates recovered from carcass wash, neck skin, and caecal contents were analyzed. Colistin susceptibility was determined by agar dilution to establish minimum inhibitory concentration (MIC) values according to the European Committee on Antimicrobial Susceptibility Testing guidelines. Resistance genes were detected by polymerase chain reaction (PCR). The overall MIC values for all isolates ranged from 0.125 µg/mL to 256 µg/mL. All *E. coli* isolates were susceptible, whereas 56% of *Salmonella* isolates from same production environment showed phenotypic colistin-resistance. This disparity highlights significant species-specific differences in colistin-resistance patterns. PCR revealed a 32% prevalence of *mcr-1* gene among *Salmonella* isolates. Conversely, no *mcr-3* gene carriage was observed. Significant difference ($p=0.001$) between the overall genotypic and phenotypic resistance was observed. Phenotypic resistance occurred independently of *mcr-1* status ($p=0.1$). While *mcr-1* contributes to colistin-resistance, it is not the sole driver. This discrepancy suggests the involvement of additional, alternative resistance mechanisms. Overall, the results highlight the importance of integrating phenotypic and molecular approaches and emphasize the need for continuous surveillance and prudent antimicrobial stewardship in poultry. Future research should explore additional *mcr* variants and alternative resistance mechanisms to better understand the epidemiology and transmission dynamics of colistin-resistance.

Keywords: Colistin resistance, *Escherichia coli*, *mcr* genes, poultry, *Salmonella*

Estimation of aboveground forage biomass in coconut monocropping and intercropping systems using multispectral drone imagery

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Accurate estimation of aboveground forage biomass is essential for forage management in crop–livestock integration under perennial cropping systems. This study was conducted at the Coconut Research Institute, Makandura Research Centre, Sri Lanka, to evaluate aboveground forage biomass under three coconut-based cropping system categories: monocropping, low-density intercropping (cocoa and star fruit), and high-density intercropping (coffee and pepper). Forage was categorised as natural, mixed, or improved. Multispectral UAV imagery was used to derive the Normalized Difference Vegetation Index (NDVI), and all statistical analyses were conducted using RStudio statistical software, employing two-way ANOVA and regression analysis to evaluate treatment effects and relationships among variables. Two-way ANOVA revealed significant effects of cropping system, forage category, and their interaction on forage biomass ($p < 0.05$): monocropping produced the highest mean biomass (4758.5 ± 24.0 kg/ha), whereas high-density (coconut+coffee) intercropping produced the lowest (591.4 ± 24.0 kg/ha). Improved forage yielded significantly higher biomass (3782.7 ± 18.6 kg/ha) than mixed (1994.5 ± 18.6 kg/ha) and natural (1600.5 ± 18.6 kg/ha) forage. Interaction effects showed maximum biomass under monocropping with improved forage (7510.7 ± 41.6 kg/ha) and minimum under high-density intercropping (coconut+coffee) with natural forage (403.2 ± 41.6 kg/ha). Regression analysis demonstrated a strong positive linear relationship between NDVI and biomass (y) ($R^2 = 0.8-0.9$), with the highest correlation demonstrated in monocropping with mixed forage ($R^2 = 0.9$, $y = 5240 * NDVI + 2039$). Model validation in one-sample t-test confirmed no significant differences between measured and estimated biomass ($p > 0.05$), supporting model reliability under experimental conditions except for high-density intercropping with improved forage. Overall, these results indicate that UAV-derived NDVI is a potential tool for forage biomass estimation. However, the models have to be developed and validated for different coconut age groups and other intercrop combinations in other soil and climatic variations.

Keywords: Forage biomass, multispectral drone imagery, normalized difference vegetation index

8th April 2026, Faculty of Livestock, Fisheries & Nutrition, Wayamba University of Sri Lanka

Effect of dietary cobalt supplementation on production performance of low-producing dairy cows in Sri Lanka

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Cobalt is an essential trace mineral required for the synthesis of vitamin B₁₂ by rumen microorganisms, which plays a vital role in metabolic functions in dairy cattle. This study was conducted to evaluate the effect of dietary cobalt supplementation on the production performance of low-producing dairy cows in Sri Lanka. A total of eighteen low-producing dairy cows in the early and mid-lactation periods were selected based on similar initial milk yield and randomly allocated into three experimental groups, with six cows in each group, following a completely randomized design (CRD). Feed samples were analysed for cobalt (Co) content using inductively coupled plasma mass spectrometry (ICP-MS), and the additional cobalt requirement was calculated accordingly. The feeding trial consisted of three treatments: Control (no cobalt supplementation), Treatment 1 (0.2 mg Co/kg DM), and Treatment 2 (0.4 mg Co/kg DM). Cobalt supplementation was administered by mixing the required amount into 200 g of maize powder per cow. The study included a 3-week adaptation period followed by a 1-week sample collection period. Data collected included milk yield, milk quality parameters (fat, protein, lactose, solid-not-fat), conductivity, density, pH, and salt), body weight, and body condition score (BCS). Milk samples were analysed using an ultrasonic milk analyser, and BCS was assessed using the Ferguson Body Condition Scoring system. The results indicated no statistically significant differences ($p>0.05$) among treatment groups for milk yield, milk quality parameters, body weight, or BCS. Therefore, cobalt supplementation did not significantly influence production performance in low-producing dairy cows during the study period. Further studies with longer feeding durations and larger sample sizes can be suggested to better evaluate its potential effects.

Keywords: Cobalt mineral, dairy cows, production performance

Acknowledgement: This research was conducted with the support of the National Livestock Development Board (NLDB), Sri Lanka.

Effect of stabilizers on nutritional, textural, and sensory properties of Chickpea (*Cicer arietinum*) fortified cheese hybrid

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The growing demand for nutritionally enhanced and sustainable dairy products has driven the development of plant dairy hybrid foods. Chickpea (*Cicer arietinum*), a protein-rich legume, can improve the nutritional and functional properties of dairy products, while stabilizers are incorporated to enhance stability, texture, and overall acceptability. This study evaluated the effects of stabilizers (carrageenan and xanthan gum) on the nutritional, textural, and sensory properties of chickpea-fortified cheese hybrids. Three formulations were prepared with different stabilizer combinations: CT-1 (0.5% carrageenan), CXT-2 (0.7% carrageenan + 0.3% xanthan gum), and CXT-3 (0.4% carrageenan + 0.3% xanthan gum). Proximate composition, texture profile, and the colour of the three formulations were analysed. Sensory evaluation was conducted with 30 untrained panelists using a nine-point hedonic scale to assess color, flavor, texture, and overall acceptability. Fourier Transform Infrared (FTIR) spectroscopy was performed on the sensory-preferred sample to analyze structural and functional group modifications. Data were statistically analyzed using IBM SPSS 26 and XLSTAT software, with significance determined at $p < 0.05$. Results showed that CXT-2 achieved the highest overall acceptability among the formulations. Proximate composition did not differ significantly among treatments ($p > 0.05$). Texture profile parameters varied significantly across treatments, while color attributes remained statistically similar. FTIR analysis of CXT-2 confirmed structural modifications in functional groups, indicating protein polysaccharide interactions that improved matrix stability. These findings demonstrate that stabilizer incorporation significantly influences the structural, textural, and sensory properties of chickpea-fortified cheese hybrids. The CXT-2 formulation was identified as the most preferred treatment, exhibiting superior quality characteristics and consumer acceptability, highlighting its potential for developing nutritionally enhanced plant dairy hybrid products.

Keywords: Cheese hybrid, chickpea, proximate composition, stabilizers, texture profile

Acknowledgement: Financial support for this study was provided by the Wayamba University Research Grant (SRHDC/URG/2024/13).

Optimization, characterization, and shelf-life evaluation of whey smoothies and set yoghurt

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In the context of a rapidly expanding functional food market, this study focused on the development of two novel whey-based dairy products: whey smoothies and whey yogurt. The objectives were to optimize formulations, assess physicochemical and sensory characteristics, and evaluate refrigerated shelf-life stability. Optimized formulations achieved high sensory scores (>8.7) across all attributes on a 9-point hedonic scale assessed by 10 trained panelists. Full-fat passion fruit- and mango-flavored whey smoothies and non-fat vanilla-flavored set yogurts were prepared to explore the potential of whey protein isolate (WPI) in improving nutritional quality. For whey yogurts, texture, microstructure, rheological properties, and sensory characteristics were analyzed. Incorporation of WPI significantly increased water-holding capacity by up to 50% compared to the non-fat control. Three smoothie formulations were prepared with varying whey-to-fruit ratios (Sample 1: 60:20 mL, Sample 2: 65:15 mL, Sample 3: 70:10 mL). During 25 days of refrigerated storage, smoothie samples showed increases in acidity (0.27 ± 0.02 – $0.64 \pm 0.03\%$), total soluble solids (17.15 ± 0.01 – 18.20 ± 0.01 °Brix), moisture (74.50 ± 0.02 – $87.02 \pm 0.03\%$), protein (5.67 ± 0.02 – $7.58 \pm 0.01\%$), fat (0.97 ± 0.01 – $1.39 \pm 0.04\%$), and carbohydrates (18.01 ± 0.02 – $23.45 \pm 0.02\%$). Sedimentation remained minimal (~1%). Sensory evaluation indicated significant differences among formulations in color, odor, taste, and overall acceptability. The passion fruit-flavored whey smoothie contained 0.47% of crude protein, 0.73% of titratable acidity, 82.03% of moisture, 17.97% of total soluble sugar, and the pH of 3.82 at 25°C. These findings suggest that the development of whey-based smoothies and set yogurts are a promising strategy for the utilization of whey protein isolate in functional foods, and flavor enrichment with fruits such as passion fruit can further enhance nutritional and sensory quality.

Keywords: Functional dairy products, physicochemical and sensory properties, set yogurt, whey protein isolate, whey smoothie

Evaluating nutritional and growth parameters of *Sorghum bicolor* as a forage at different harvesting intervals in intermediate zone of Sri Lanka

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High quality forages are essential for improving ruminant nutrition and productivity. Identifying the best growth stage for harvesting is important since nutritional composition of forages varies significantly with the maturity stages. Sorghum is a potential forage crop grown in Sri Lanka; however, its nutritional variations across the growth stages have not been fully studied. Therefore, the objective of this study was to evaluate the nutritional and growth parameters of *Sorghum bicolor* at different harvesting intervals in low country intermediate zone in Sri Lanka. The plants were arranged in the randomized complete block design and data were collected from three replicate plants for each harvesting stage: vegetative (1), early growth (2), half blooming (3), dough (4) and maturity (5) at 30, 45, 75, 90 and 120 days after sowing (DAS) respectively. Growth parameters (number of leaves per plant, plant height) were measured weekly. At each harvesting interval, forage samples were analysed for dry matter, crude protein, crude fibre, crude fat, ash, moisture, acid detergent fibre (ADF), neutral detergent fibre (NDF), hemicellulose, and gross energy as per to the AOAC methods. Crude protein content was statistically similar in stages 2 and 3 and lower compared to stage 1. Dry matter, crude fiber, and gross energy content were also statistically similar in stages 2 and 3 however, lower compared to stage 5. ADF and NDF contents were lowest at stage 1 followed by stage 2 and 3. The highest ash content was in stage 1 compared to other stages. Considering observed crude protein, fiber, dry matter, and lower ADF and NDF values both harvesting stage 2 (early growth) and 3 (half bloom) can be suggested for optimum forage quality parameters for sorghum.

Keywords: Biomass yield, forage sorghum, harvesting time, proximate composition, ruminant nutrition

Effect of stabilizers on physicochemical, structural and sensory properties of Lentils (*Lens culinaris*) fortified hybrid cheese

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Lentils (*Lens culinaris*), a rich source of protein and dietary fiber, offer potential for fortifying processed cheese while enhancing nutritional value. This study evaluated the effects of stabilizer type and concentration on the physicochemical, structural, and sensory properties of lentil-fortified processed cheese. Three formulations were prepared with varying stabilizer combinations: Treatment 1 (0.5% carrageenan), Treatment 2 (0.7% carrageenan + 0.3% xanthan gum), and Treatment 3 (0.4% carrageenan + 0.3% xanthan gum). Physicochemical properties, including protein, fiber, and ash contents, were determined using standard methods, while textural characteristics were assessed via Texture Profile Analysis. Sensory evaluation was conducted with 30 untrained panelists using a nine-point hedonic scale to assess firmness, flavor, and overall acceptability. The most preferred formulation was further analyzed using Fourier Transform Infrared (FTIR) spectroscopy to assess protein structural modifications. Data were analyzed by one-way ANOVA at $p < 0.05$. Results demonstrated that stabilizer type and concentration significantly influenced textural and sensory attributes. Texture profile analysis correlated with sensory perception, with Treatment 2 exhibiting the highest hardness (2.99 ± 0.17 N) and receiving the highest panel scores for firmness. Protein, fiber, and ash contents remained consistent across treatments ($p > 0.05$). FTIR analysis of Treatment 2 revealed characteristic absorption bands associated with protein secondary structures, including a β -sheet-related peak at 1642 cm^{-1} and an amide II band at 1536 cm^{-1} , indicating structural stability. All formulations retained yellow color, with no significant differences among treatments. Overall, the combination of 0.7% carrageenan and 0.3% xanthan gum was identified as the most suitable stabilizer system for lentil-fortified processed cheese, delivering optimal textural, structural, and sensory qualities while maintaining nutritional integrity and consumer acceptability.

Keywords: Hybrid cheese, lentil, stabiliser, sensory, texture

Acknowledgement: Financial support for this study was provided by the Wayamba University Research Grant (SRHDC/URG/2024/13).

Role of stabilizing agents in the textural, microstructural, and sensory properties of Horse Gram (*Macrotyloma uniflorum*)-fortified hybrid Cheese

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This study focused on the development of functional dairy products enriched with plant-based ingredients to enhance nutritional value and quality attributes. Horse gram (*Macrotyloma uniflorum*), a nutrient-rich underutilized legume, was incorporated into hybrid cheese; however, its inclusion can adversely affect texture and microstructure, necessitating the use of stabilizing agents to maintain product quality and consumer acceptability. Hybrid cheese samples were prepared by partially replacing cheese with 30% horse gram pulp and incorporating different stabilizer systems. Three formulations were evaluated: T1 (0.5 % carrageenan), T2 (0.7 % carrageenan + 0.3% xanthan gum), and T3 (0.4 % carrageenan + 0.3% xanthan gum), with all treatments containing 0.6% phosphate. Samples were analyzed for proximate composition, texture, color, microstructure, and sensory attributes using a 9-point hedonic scale, Just-About-Right, Check-All-That-Apply, and overall liking tests with 30 untrained panelists. Protein structural changes were assessed using Fourier Transform Infrared spectroscopy (FTIR). T2 exhibited the highest ($p<0.05$) hardness (3.26 ± 0.02) and superior sensory acceptability compared to T1 and T3. A reduction in carrageenan content resulted in decreased hardness at a constant xanthan gum level, confirming its role in gel network formation. T3 recorded the highest ($p<0.05$) moisture ($65.34\pm 1.19\%$) and fat ($20.84\pm 0.15\%$), while T2 showed the highest ($p<0.05$) protein content ($11.63\pm 1.20\%$). No significant differences ($p>0.05$) were observed in energy and fat values. Microstructural analysis revealed a more uniform and compact matrix in T2. FTIR spectra confirmed protein structural stability, with Amide I bands detected near 1642 cm^{-1} , indicating preserved secondary structure. Overall, T2 demonstrated optimal physicochemical and sensory properties, highlighting its potential in developing nutritionally enhanced hybrid cheese products.

Keywords: Hybrid cheese, horse gram (*Macrotyloma uniflorum*), stabilizers, textural and sensory properties

Acknowledgement: Financial support for this study was provided by the Wayamba University Research Grant (SRHDC/URG/2024/13).

Stage-dependent growth and nutritional parameters of Maize (*Zea mays* L.) as a fodder in the intermediate zone of Sri Lanka

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Maize is a key forage species having high nutritional value, palatability, and biomass. However, to achieve these nutritional values and biomass at optimum levels, identifying the best harvesting stage is vital. Thus, this study aimed to evaluate forage quality and growth parameters of locally improved maize variety ‘*Ruwan*’ harvested at 30, 45, 60, 75, and 90 days after sowing (DAS). The study was carried out in a randomized complete block design with triplicates at a field site at Wayamba University of Sri Lanka, Makandura (IL1a). Plant height and number of leaves were measured at weekly intervals, where plant dry matter, leaf area, fresh forage yield, and nutritional parameters were analyzed at the above harvest stages. The data were analyzed using Multivariate analysis in SPSS version 26. Dry matter content was significantly higher ($p<0.05$) at 75 and 90 DAS compared to 30 DAS, with no significant difference to 45 and 60 DAS. The crude protein contents were statistically similar in all the harvest stages except for 90 DAS ($p<0.05$). Ash was lower at 75 and 90 DAS compared to 30 DAS ($p<0.05$), with no significant difference among other stages. Crude fiber was significantly higher at 90 DAS ($p<0.05$) compared to 30, 45, and 60 DAS: Acid-detergent and neutral-detergent fiber were also statistically significant across harvest stages. Crude fat was lowest at 60 and 75 DAS compared to 30 and 90 DAS ($p<0.05$). Considering all these parameters, harvesting maize for fodder at 60 DAS (early silking stage) could optimize the nutritional quality and palatability with higher fresh biomass yield. Fresh biomass yield and other growth parameters achieved the highest values around 60 DAS. In conclusion, the variety ‘*Ruwan*’ can be harvested at the early silking stage (60 DAS) under the experimental growing conditions, to optimize both fresh biomass and optimum nutritional quality.

Keywords: Forage, growth stages, livestock feeding, maize, silage

Multispectral drone-based estimation of forage biomass under different coconut age categories

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The wide spacing in coconut plantations provides ample room for forage with restrictions due to light availability with the age. This study aimed to apply multispectral drone-derived Normalized Difference Vegetation Index (NDVI) to estimate biomass of different forage types under varying coconut age categories. Biomass samples were collected from improved, mixed and natural forages within coconut age groups of 0-5, 5-25 and over 25 years. The NDVI values were obtained from multispectral UAV imagery for all forage types and age groups. Measured biomass was analysed using a Two-way ANOVA for forage types, age categories and their interactions. Improved forage produced the highest mean biomass (6609 kg/ha) and was significantly greater than mixed (3903 kg/ha) and natural forage (3013 kg/ha) ($p < 0.05$). Among the age categories, 0-5 year plantations recorded the highest forage biomass (6057 kg/ha), while the 5-25 year category showed the lowest value (3222 kg/ha) ($p < 0.05$). Interaction analysis revealed that the combination of 0-5 years with improved forage gave the maximum biomass (8251 kg/ha), whereas 5-25 years with natural forage resulted in the lowest (1839 kg/ha), with most interactions showing significant differences ($p < 0.05$). Linear regression relationships between NDVI and biomass (y) estimation were strong, with R^2 values ranging from 0.69 to 0.92. The strongest predictive relationships were observed for improved forage in 5-25 years plantations ($R^2=0.9$, $y=1771.9 \times \text{NDVI} + 4593.2$) and those over 25 years ($R^2=0.9$, $y=5605.5 \times \text{NDVI} + 3985.8$). Model validations using one-sample t -tests revealed no significant differences between measured and estimated biomass ($p > 0.05$), except for natural forage grown in 0-5 age of coconut palms. This explains the model reliability under given growing conditions of the evaluated coconut plantations indicating that drone-derived NDVI is a potential tool for forage biomass estimation. Although NDVI effectively predicted biomass, results should be validated across a wider variety of forage species, soil types and climatic conditions.

Keywords: Biomass estimation, forage productivity, normalized difference vegetation index

Acknowledgement: All authors express their gratitude to the technical staff of the Agronomy Division of the Coconut Research Institute, Sri Lanka and Wayamba University of Sri Lanka.

8th April 2026, Faculty of Livestock, Fisheries & Nutrition, Wayamba University of Sri Lanka

Determination of milk quality changes during transportation from farm to chilling centre in Wattegama, Sri Lanka

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In Sri Lanka, where small-scale farmers dominate dairy production, maintaining raw milk quality during collection and transportation remains a major challenge. This study aimed to evaluate changes in raw milk quality parameters from individual farms (located in Kundasale, Wattegama, Pujapitiya, and Panvila) to bulking, and after bulking upon arrival at the chilling center in Wattegama. Physicochemical parameters of raw milk and keeping quality tests were conducted in triplicate. The bulking has caused significant variations in individual farmer pH 27%, fat 36% and solid non-fat (SNF) about 66%, compared to the bulk ($p<0.05$). Further, significant differences ($p<0.05$) were observed in Bambarella, Teldeniya, and Kabaragala routes, in fat, SNF, and water adulteration among bulked samples at collection point and upon received at the chilling center after transportation. The parameters affecting the price paid for farmers (fat & SNF) were significantly different ($p<0.05$) among all the individual samples and the final bulk sample at the chilling center. A farmer survey was conducted in the study area to assess the current management and hygienic practices in small-scale dairy farms which could impact milk quality. From the 81 surveyed farms 55% maintained a single dairy breed either Jersey, Friesian or crosses where the remaining farms kept mixed herds. Only 6% of the farms maintain a balanced feed formulation while rest of them were not. Milking was mainly carried out twice daily with an average milking interval of 10 hours. Average daily milk yield/cow was 7.4 ± 2.8 L where average daily milk dispatch was 18 ± 14.9 L/farm. Milk dispatch was mainly conducted in the morning (68%) compared to evening. Critical hygienic gaps identified among surveyed farmers included inadequate hand washing, poor foremilk removal, absence of teat sanitation, limited mastitis screening, and mixing of frozen-thawed evening milk with fresh milk, which may increase the risk of milk contamination.

Keywords: Bulking, milk quality, physicochemical parameters, small-scale farms

Isolation and evaluation of efficient probiotic starter culture from traditional Sri Lankan buffalo curd

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Traditional buffalo curd has a special place among fermented dairy products, especially in Sri Lanka, because of its distinctive texture, flavour, and nutritional properties. The formation, taste, and consistency of curd largely depend on the activity of the starter cultures that perform fermentation of milk sugar, leading to the curdling of milk proteins forming curd. The traditional curd production in Sri Lanka is carried out using naturally occurring starter cultures present in already curdled milk, and the composition of starter cultures varies from region to region, resulting in curd with slightly different taste and aroma characteristics. Although the identity of the participating organisms is largely understudied, the curdling process is known to be carried out by lactic acid bacteria (LAB), of which most members occur as a part of human intestinal microbiome and have probiotic properties. This study was conducted to isolate and evaluate efficient probiotic starter culture from traditional buffalo milk curd collected from major curd producing regions in Sri Lanka. Lactic acid bacteria were isolated, purified, and identified using morphological, biochemical, and molecular approaches. Probiotic potential was assessed through salt tolerance tests, while fermentation efficiency was evaluated based on acidification behaviour, physicochemical properties, and texture profile development during storage. Parameters including pH, fat, protein, ash, moisture content, total soluble solids, microbial load, and textural attributes were analyzed. Data were statistically analyzed using IMB SPSS Statistics 26 software at a 95% confidence level. Among the tested samples, the LAB isolate from the Kurunegala region was identified as *Lactobacillus delbrueckii*, and it showed superior probiotic performance and curd forming efficiency, highlighting their potential application as optimal starter cultures for sustainable buffalo curd production in Sri Lanka.

Keywords: Buffalo milk curd, curdling, lactic acid bacteria, probiotic starter cultures

Impact of farmers' knowledge on supplementary feeding practices over milk productivity in Kandy district, Sri Lanka

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Dairy farming is vital for the rural economy, yet milk production remains low due to sub optimal feeding practices. This study examined the impact of farmers' knowledge on supplementary feeding practices over milk yield across 60 farms selected by stratified random sampling from 10 veterinary ranges in Kandy district. Data were collected through face-to-face interviews using structured questionnaires and analyzed using descriptive statistics, non parametric tests, and multiple regression. Farmers had moderate knowledge ($6.2 \pm 2.18/10$), with 38% low (2–5), 30% medium (6–7), and 32% high (8–10) knowledge groups. Attitudes were slightly positive ($3.22 \pm 0.43/5$), with 92% willing to adopt new technologies. Knowledge was positively correlated with attitudes ($\rho=0.538$, $p<0.001$). Knowledgeable farmers fed more concentrate ($\rho=0.47$, $p<0.001$), high knowledge farmers feeding 4.3 ± 3.1 kg/day compared to 1.6 ± 1.1 kg/day for low knowledge farmers. All farmers used mineral supplements. Precise measurement was practiced by 74% of high-knowledge and 32% of low knowledge farmers ($p<0.05$). Water consumption was 33.4 ± 16.5 L/day for high knowledge farmers and 15.4 ± 7.3 L/day for low knowledge farmers ($p<0.001$). Knowledge and concentrate also differed significantly by farm size (both $p<0.01$), with small farms having the lowest knowledge (5.47) and concentrate (2.02 kg/day). Knowledge directly correlated with milk yield ($\rho= 0.376$, $p<0.01$). and concentrate amount correlated with the milk yield ($\rho=0.28$, $p<0.05$). Precise measurements produced 11.8 ± 3.7 L/day and 9.9 ± 4.4 L/day for estimators ($p<0.05$). Silage use was practiced by only 18% of farmers. Multiple regression explained 23.3% of milk yield variation ($p<0.01$), with concentrate amount as the strongest predictor. The findings highlight the need for enhanced farmer training on concentrate feeding, precise measurement, water management, and fodder conservation to improve milk production in Kandy district.

Keywords: Dairy farming, farmers' knowledge, feeding practices, Kandy, milk yield

Acknowledgement: The survey was supported by the Central Provincial Director of Department of Animal Production and Health, veterinary surgeons, and field officers in Kandy district.

Effect of natural acidic marinades on the microbial safety and sensory quality of chicken breast meat

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The increasing demand for natural food preservation strategies has driven interest in plant-based acidic marinades for improving meat safety and quality. Four natural acidic marinades, lemon juice, apple cider vinegar (ACV), coconut vinegar, and tamarind extract, were evaluated for their effects on the microbial and sensory quality of chicken breast meat. Standardized samples were marinated at 4 °C for 3, 6, and 24 h. Microbial parameters, including Total Plate Count (TPC), Lactic Acid Bacteria (LAB), *Enterobacteriaceae*, and Yeast and Mould counts, were analysed. Sensory evaluation was performed by a trained panel using a 9-point hedonic scale. Results indicated that both marinade type and marination time significantly influenced microbial reduction ($p < 0.05$), with a significant interaction effect between the two factors. Lemon juice and ACV were identified as the most effective treatments for reducing TPC. Lemon juice demonstrated consistent antimicrobial activity across all marination intervals, with a log reduction of 0.895 ± 0.086 log CFU/g. Similarly, ACV exhibited the greatest initial reduction in TPC at 3 h, with 1.145 ± 0.149 log CFU/g, and further showed strong inhibitory effects against LAB, achieving a maximum reduction of 1.365 ± 0.021 log CFU/g at 24 h. In contrast, coconut vinegar and tamarind extract exhibited significantly lower antimicrobial efficacy against TPC ($p < 0.05$). Notably, the highest reduction in LAB was generally observed at 3 h, reaching 0.614 ± 0.010 log CFU/g, after which a decline was evident at longer marination durations, likely due to microbial stress adaptation. Sensory evaluation revealed that all marinades improved quality compared to the control. Tamarind extract at 24 h received the highest scores for tenderness (7.7), flavour (7.5), and overall acceptability (7.7). In conclusion, lemon juice and ACV are effective natural options for reducing microbial load in chicken meat, while tamarind extract shows strong potential for enhancing sensory quality in marinated chicken products

Keywords: Chicken meat, marination, microbial quality, natural acidic marinades, sensory evaluation

Reduction of salt in processed meat products: Evaluation of physicochemical, functional, and sensory properties using pork nuggets as a model system

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Increase dietary sodium intake is associated with hypertension and cardiovascular diseases, making salt reduction essential in processed meat products. However, sodium chloride (NaCl) plays a critical role in these products by contributing to flavour, texture, water-holding capacity, and overall product quality. Therefore, achieving NaCl reduction while maintaining product quality represents a significant challenge in meat processing. This study investigated the impact of graded NaCl reduction relative to a control formulation (25%, 50%, 75%, and 100% reduction, with 100% representing a salt-free treatment) on the physicochemical, functional, and sensory properties of pork nuggets, employed as a model system for processed meat products. NaCl reduction significantly ($p < 0.05$) influenced product characteristics, as evidenced by a decrease in pH from 6.76 ± 0.02 in the control formulation to 6.52 ± 0.01 in the 100% reduction treatment. Texture profile analysis revealed a significant reduction in hardness ($5.97 \pm 0.94 - 2.77 \pm 0.39\text{N}$), chewiness ($4.26 \pm 0.68 - 2.42 \pm 0.22\text{N}$), cohesiveness ($0.74 \pm 0.04 - 0.61 \pm 0.01\text{N}$), and gumminess ($4.65 \pm 0.81 - 2.14 \pm 0.41\text{N}$) with decreasing salt levels. Similarly, functional properties such as emulsion stability ($98.53 \pm 0.07\% - 87.32 \pm 0.78\%$), and water-holding capacity ($88.22 \pm 0.61\% - 75.39 \pm 1.32\%$) were significantly reduced ($p < 0.05$) due to reduction of salt levels. Graded NaCl reduction led to lower cooking yields across all reduced-salt treatments compared to the control formulation, Reducing NaCl significantly decreased taste, Juiciness, and texture scores ($p < 0.05$), while colour and aroma remained unaffected ($p > 0.05$). Sensory evaluation indicated that pork nuggets with a 25% NaCl reduction achieved the highest overall acceptability (8.2), surpassing that of the control formulation (7.4). Among the tested parameters, the control formulation exhibited the optimal physicochemical and functional characteristics. Overall, the findings demonstrate that 25% reduction of NaCl can be achieved in pork nuggets without compromising consumer acceptability.

Keywords: Consumer acceptability, physicochemical properties, pork nuggets, sensory quality, sodium chloride

Developing an automation WhatsApp agent for digital livestock farm data management with near-field communication-enabled collars

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The majority of Sri Lankan livestock farms rely on manual and inconsistent record-keeping procedures, which frequently lead to ineffective farm-level decision-making. The digital tools available for managing data are limited in rural farming communities because many of them are expensive, monolingual, or require a high level of technical expertise. A baseline survey was carried out with farmers representing Northern and Northwestern province, where approximately 90% of farmers have access to a smartphone with WhatsApp. Nearly 70% of farmers do not maintain any form of formal livestock records. Therefore, a low-cost, multilingual, message-driven livestock data management framework ‘HerdTap’ was developed to equip livestock farmers for livestock data recording with better accessibility, traceability, and accuracy. The system integrated a near-field communication (NFC)-enabled collar with an automation agent built on the open-source workflow platform n8n, a WhatsApp-based farmer interface, and Google Sheets as a cloud datastore. Data were recorded strictly through predefined keywords. The system was equipped with a universal field-level duplicate-detection mechanism which rejects improper or incomplete entries automatically. WhatsApp-based querying of stored master register (birth, purchase, vaccination, milk yield, disease, insemination, pregnancy, drying-off, sales, and feed formulation modules) was enabled which also generates alerts for vaccination, heat detection, pregnancy diagnosis after artificial insemination and diseases. System evaluation demonstrated an overall mean operational accuracy exceeding 93%. Field validation, search retrieval, and alert modules achieved 100% accuracy. User perception was tested in the benchmark survey under five categories, where a maximum score of five (1- strongly disagree, 5- strongly agree) was given each. According to the results, mean scores were over 3 for usability (3.63), efficiency (3.60), usefulness (3.67), adoption (3.67), and data quality (3.73), indicating positive acceptance. Collectively, ‘HerdTap’ demonstrated technical robustness, strong user acceptance, and practical feasibility for digital livestock data management in local farming systems.

Keywords: Multilingual agrotechnology, precision livestock farming, record keeping

Mechanical, physicochemical, and sensory characterisation of chickpea-based meat analogue nuggets enriched with a rennet-induced milk protein matrix

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This study aimed to develop chickpea-based meat analogue nuggets enriched with a rennet-induced milk protein matrix to enhance nutritional value while maintaining desirable mechanical and sensory properties. Three formulations were optimized: R1 (15:20), R2 (20:25), and R3 (25:30). Products were evaluated for physicochemical, nutritional, mechanical, color, and sensory attributes, including pH, moisture, ash, crude protein, crude fat, crude fiber, carbohydrate, energy value, and cooking loss. Data were analyzed using one-way ANOVA with Tukey's post hoc test at a 5% significance level ($p < 0.05$). Sensory evaluation was conducted using a 9-point hedonic scale, Just-About-Right (JAR) scale, Check-All-That-Apply (CATA), and overall liking with 30 untrained panelists, analyzed using XLSTAT software. Proximate analysis showed moisture $40.38 \pm 2.10\%$ to $41.72 \pm 2.10\%$, ash $1.87 \pm 0.29\%$ to $2.11 \pm 0.23\%$, crude protein $9.33 \pm 0.38\%$ to $9.61 \pm 0.16\%$, crude fat $3.93 \pm 0.38\%$ to $4.62 \pm 1.89\%$, and crude fiber $\sim 5.5 \pm 0.09\%$ across formulations. Fried R1 showed significantly higher hardness (7.98 ± 0.46 N), gumminess (5.18 ± 0.12), and chewiness (5.41 ± 0.12) than R2 (4.96 ± 0.43 N) and R3 (4.62 ± 0.72 N), while unfried hardness increased from R1 (2.56 ± 0.12 N) to R3 (3.62 ± 0.04 N). Frying decreased L^* (47.47 ± 0.61) while increasing a^* (11.50 ± 0.44) and b^* (20.17 ± 0.79) in R2. R2 achieved the highest sensory scores for color (8.07 ± 0.78), uniformity (8.23 ± 0.73), roasted aroma (8.20 ± 0.85), and umami (8.23 ± 0.77). JAR analysis confirmed optimal saltiness (83.3%), crispiness (76.7%), and juiciness (80.0%), while CATA associated R2 with golden-brown appearance, pleasant aroma, meaty flavor, and mild taste. Overall, R2 exhibited the most balanced properties, suggesting its potential as a nutritionally enhanced, consumer-acceptable hybrid meat analogue product.

Keywords: Chickpea, meat analogue, milk protein matrix, physicochemical properties, sensory evaluation

Quality evaluation of roadside forage silage as an alternative feed resource for dairy cattle

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Forage shortage, particularly during the dry season, remains a major limitation to smallholder dairy productivity in Sri Lanka. Conservation of abundant roadside forages, which are freely available during the rainy season, offers a potential solution for this issue. A previous laboratory-scale study demonstrated that roadside forages can be effectively converted into quality silage with the incorporation of ripe pineapple peels at a minimum inclusion rate of 4%. The present study aimed to validate this approach under farm conditions. Approximately 1500 kg of roadside forage silage was prepared by mixing chopped roadside forage with 5% ripe chopped pineapple peel using the barrel ensiling method and fermentation dynamics and silage quality were analyzed at 21, 28, 35, and 42 days of storage after ensiling. Palatability was assessed using a two-pan free-choice test comparing the prepared silage with commercial maize silage. A significant decline ($p<0.05$) in dry matter, along with increases ($p<0.05$) in crude fiber, ash, and titratable acidity was observed over the storage period, reflecting progressive microbial fermentation and substrate utilization. Crude protein content remained unchanged ($p>0.05$), indicating effective protein preservation during ensiling. The observed reduction in pH ($p<0.05$) confirms efficient fermentation and the establishment of stable anaerobic conditions essential for silage preservation. Notably, palatability results showed no significant differences ($p>0.05$) in intake or preference between roadside forage silage and commercial maize silage, indicating comparable acceptability. Overall, these findings provide field-based evidence that roadside forage can be effectively converted into nutritionally adequate and palatable silage. This approach offers a scalable and cost-effective strategy to mitigate seasonal feed shortages, enhance feed resource utilization, and strengthen smallholder dairy production systems.

Keywords: Dairy cattle, fermentation characteristics, pineapple peel, roadside forage silage, smallholder dairy systems

Acknowledgement: This study was funded by Wayamba University Research Grant number SRHDC/URG/2024/08.

Impact of stabilizers on the physicochemical, sensory, and structural properties of hybrid cheese fortified with mung bean (*Vigna radiata*)

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The increasing demand for nutritious and sustainable foods has driven the development of plant-based dairy hybrid products. This study focused on the formulation and evaluation of a mung bean (*Vigna radiata*)-based hybrid cheese incorporating different stabilizer levels. Three formulations were developed by partially replacing milk in Gouda cheese with mung bean protein and incorporating stabilizer blends: T1 (0.5% carrageenan), T2 (0.7% carrageenan + 0.3% xanthan gum), and T3 (0.4% carrageenan + 0.3% xanthan gum). All samples were evaluated for physicochemical and sensory properties. Physicochemical parameters, including crude protein, crude fibre, fat, and ash, showed no significant differences among treatments ($p > 0.05$). Sensory evaluation was conducted using a 9-point hedonic scale with 30 untrained panelists and analysed with XLSTAT software. Just-About-Right (JAR) and Check All That Apply (CATA) analyses were performed to assess specific sensory attributes. T2 achieved the highest hedonic scores for overall appearance, colour, and flavour. CATA analysis indicated that T2 was associated with favourable attributes, including a pleasant aroma, moist surface, and creamy mouthfeel, whereas T1 and T3 displayed less desirable attributes. The most preferred formulation, T2, was further analysed using Fourier Transform Infrared (FTIR) spectroscopy. Characteristic amide I at 1646 cm^{-1} corresponding to random coil protein structures and amide II band at 1536 cm^{-1} bands were observed, indicating stable protein–stabilizer interactions. These findings suggest that a stabilizer blend of 0.7% carrageenan and 0.3% xanthan gum is optimal for mung bean-based hybrid cheese, providing desirable textural and sensory properties without compromising nutritional composition. Further studies on shelf life and microbial stability are recommended to support commercialization of this plant-based cheese alternative.

Keywords: Carrageenan, FTIR spectroscopy, Hybrid cheese, mung bean, texture properties, xanthan gum

Acknowledgement: Financial support for this study was provided by the Wayamba University Research Grant (SRHDC/URG/2024/13).

Validation of a novel low-solvent extraction and clean-up method for quantitative screening of aflatoxin M1 in bovine milk

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Aflatoxin M1 (AFM1), a carcinogenic metabolite of aflatoxin B1 (AFB1), contaminates milk from dairy cattle fed AFB1-contaminated feed. Globally, strict maximum residue limits (MRLs) have been established (EU: 0.05/0.025 µg/kg; Codex/FDA/Sri Lanka: 0.5 µg/kg) to ensure food safety. In this study, a novel two-step analytical approach involving freeze-drying followed by low-volume solvent extraction was developed and validated for the quantitative screening of AFM1 in milk. Fresh raw milk samples were collected from 30 randomly selected cattle farms in Sri Lanka. The screening target concentration (STC) was set at 0.2 MRL (0.1 ppb). Blank samples were spiked at 0.1 MRL (n = 7) and 0.2 MRL (n = 7) to evaluate method performance. A seven-point calibration curve was prepared over the range of 0.00–0.05 ppb. Raw milk samples were frozen at –25°C, freeze-dried for 6 hours, and extracted using 2 mL of methanol:acetonitrile (2:3, v/v), followed by refrigerated centrifugation. Chromatographic analysis was performed using gradient liquid chromatography with 1% formic acid in water and acetonitrile as mobile phases, coupled with positive electrospray ionisation (+ESI) in multiple reaction monitoring (MRM) mode. The total run time was 13 minutes, with an injection volume of 10 µL. The method demonstrated good linearity with a regression coefficient (R²) of 0.9938. Within-laboratory repeatability (%RSD) and intermediate precision were 10.2% and 10.7%, respectively, while recovery at 0.2 MRL was 105%. The detection capability (CC_β) was determined to be 0.12 ppb. Among the 30 samples analysed, five samples tested positive for AFM1 and were further confirmed using an immunoaffinity column (IAC) clean-up followed by LC-MS/MS. The developed method provides a reliable and efficient approach for the quantitative screening of AFM1 in liquid bovine milk, supporting food safety monitoring and regulatory compliance.

Keywords: Aflatoxin M1, bovine milk, extraction, LC/MS-MS, validation

Acknowledgement: This study was funded by the Treasury of Sri Lanka under Research Grant No. TG 21/207.

Aflatoxin levels in broiler feed in Sri Lanka and their association with moisture content of feed and maize as an ingredient

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Aflatoxin is a secondary mycotoxin produced by *Aspergillus* species, posing significant risks to poultry performance. This study evaluated aflatoxin levels in broiler feed and maize as a feed ingredient across different climatic zones in Sri Lanka. The correlation between aflatoxin levels and moisture content was analysed to determine whether contamination is influenced by its moisture content. Aflatoxin levels were measured using the Enzyme Linked Immunosorbent Assay (ELISA), and results were compared using one-way ANOVA in SPSS version 26. Descriptive statistics were applied to compare values against permissible standard 20 ppb. Moisture content was determined by oven-drying. Pearson's correlation was used to assess the relationship between aflatoxin and moisture content. Mean aflatoxin levels did not differ significantly among feed types irrespective of climatic zone: starter (17.32±1.93 ppb), booster (14.54±1.83 ppb), and finisher (13.60±1.45 ppb) ($p>0.05$). However, when climatic zone was considered, finisher feed showed the lowest aflatoxin level in the wet zone ($p<0.05$). In the dry zone (n=33), 63.6% of broiler feed samples were within the permissible limit, while 36.4% exceeded the limit. In the intermediate zone (n=109), 72.5% of samples were acceptable, 27.5% exceeded the standard, and the highest maximum aflatoxin level of 88.30 ppb was recorded. The wet zone (n=90) showed the highest compliance, with 84.4% of samples accepted. Maize samples did not show significant differences in aflatoxin levels between zones; however, more than 50% of samples in dry and intermediate zones exceeded the standard. Correlation between aflatoxin and moisture content was not significant for both feed (n=27) and maize samples (n=19, $p>0.05$). Aflatoxin contamination in broiler feed and maize in Sri Lanka varies across climatic zones, with notable exceedance of safety limits. Although moisture content showed no significant correlation, other contributing factors such as water activity and storage temperature combinations need to be studied with extended sample sizes.

Keywords: *Aspergillus*, ELISA, feed safety, mycotoxin contamination

Acknowledgement: Authors wish to acknowledge HayVet laboratory, Kuliyaipitiya for providing secondary data for the analysis and proving feed samples for laboratory analysis.

Greenhouse gas emission profile of dairy farms among different production scales in Sabaragamuwa province, Sri Lanka

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Dairy farming contributes to Greenhouse gas (GHG) emissions mainly through enteric fermentation and manure management, which influence global climate change. This study evaluated the GHG emission profiles of lactating dairy cows across different production scales in the Sabaragamuwa Province of Sri Lanka. A total of 24 dairy farms representing small-, medium-, and large-scale production systems were selected by using Stratified random sampling. Farm-level data were collected through field observations, structured questionnaires, and laboratory analysis was conducted on feed and manure samples. Methane (CH₄) emissions from enteric fermentation and manure management, together with nitrous oxide (N₂O) emissions from manure handling, were estimated using the Tier 2 methodology recommended by the Intergovernmental Panel on Climate Change. Emissions were converted into carbon dioxide equivalents (CO₂-eq) to determine the total contribution to global warming. The results indicated that the mean total GHG emission from lactating dairy cattle was 3061.89 kg CO₂-eq per head per year. Enteric methane was the dominant contributor, accounting for 85.81% of total emissions (2627.53 kg CO₂-eq per head per year), followed by N₂O (10.04%) and manure methane (4.15%). Total GHG emissions did not differ significantly among farm scales ($p>0.05$), although emission intensity varied significantly among production systems ($p<0.05$), and small-scale farms showed the highest emission intensity. Milk yield showed a significant positive correlation with enteric methane emission. Composting was identified as an effective manure management practice that reduces GHG emissions compared to conventional storage systems. Regression analysis explained 84% of emission variation, with dry matter intake as the main driver. These findings highlight the importance of improving feed efficiency, enhancing milk productivity, and adopting improved manure management practices to reduce GHG emissions and support sustainable dairy farming.

Keywords: Dairy farming, emission intensity, enteric methane, greenhouse gas emissions, Sabaragamuwa province

Acknowledgement: The study was conducted with the support of the Provincial Director of Animal Production and Health and veterinary officers in the Sabaragamuwa Province.

Factors influencing consumer preferences for chicken meat types in Kurunegala district, Sri Lanka: A multinomial and factor analysis approach

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Consumer preferences for chicken meat types are shaped by a combination of product attributes and purchasing behaviors. This study aimed to examine the factors influencing consumer preferences for broiler, indigenous, and spent-layer chicken in the Kurunegala District of Sri Lanka. A cross-sectional survey was conducted using a structured questionnaire administered to 278 respondents. Descriptive statistics indicated that broiler chicken was the most preferred type (78.8%), followed by indigenous (15.1%) and spent-layer chicken (6.1%). To identify the underlying dimensions of consumer perception, Exploratory Factor Analysis (EFA) was performed. The analysis revealed three principal components: intrinsic quality attributes (freshness, color, smell, and texture), health and production perception, and nutritional-related attributes, which together accounted for 59.77% of the total variance. The reliability of the scale was confirmed with a high Cronbach's alpha value ($\alpha = 0.910$) demonstrating strong internal consistency. Multinomial logistic regression analysis revealed that the overall model was statistically significant ($\chi^2 = 37.59, p < 0.001$), suggesting that the selected independent variables significantly contributed to explaining variations in consumer preferences. Among the predictors, purchasing place and intrinsic quality perception were found to have a significant influence on chicken type preference, whereas socio-demographic variables, including age, gender, education level, and monthly income, were not statistically significant. Consumers who purchased chicken from butcher shops were more likely to prefer indigenous and spent-layer chicken compared to broiler chicken. The findings indicate that consumer preferences for chicken meat in the study area are predominantly determined by factors related to market accessibility and perceived product quality, rather than by socio-demographic characteristics.

Keywords: Chicken types, consumer behavior, factor analysis, multinomial logistic regression

Isolation and performance evaluation of indigenous Lipolytic bacteria from dairy processing wastewater in Sri Lanka

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Dairy processing wastewater contains high concentrations of fats, oils and grease (O&G), lactose-derived organic matter, and suspended solids, resulting in elevated O&G, biological oxygen demand (BOD₅) and total dissolved solids (TDS), which impair the efficiency of conventional treatment systems. This study aimed to isolate and evaluate indigenous lipolytic bacteria from dairy processing wastewater in Sri Lanka and assess their suitability for bioaugmentation of lipid-rich effluents. Wastewater samples were collected from two dairy processing plants, and ten lipolytic isolates were identified based on tributyrin hydrolysis. Gravimetric analysis of O&G removal after 40 h of incubation identified three efficient degraders. Isolate D₆ achieved 80.08 ± 0.76% O&G removal, followed by D₁ (77.02 ± 0.15%) and D₁₀ (76.43 ± 0.44%). These isolates were further evaluated individually and as an equal ratio consortium in sterilised wastewater under aerobic conditions over 24, 72, and 120 h. Significant reductions ($p < 0.05$) in BOD₅, free fatty acids (FFA) and TDS were observed in all inoculated treatments compared with the control. D₆ showed the greatest reduction in BOD₅ (67.21 ± 1.42%), while D₁₀ recorded the highest TDS reduction (54.73 ± 2.49%). Free fatty acid profiles confirmed triglyceride hydrolysis followed by fatty acid assimilation, indicating effective lipid metabolism. Although the consortium maintained stable degradation without inhibitory interactions, its performance was slightly lower than that of the most efficient individual isolates, suggesting possible metabolic competition among strains under equal strain proportions. Overall, the findings demonstrate that selected indigenous lipolytic bacteria effectively reduce lipid and organic pollutant loads in dairy processing wastewater and represent a promising bioaugmentation strategy for treating lipid-rich dairy effluents.

Keywords: Bioaugmentation, dairy processing wastewater, lipid degradation, microbial consortium, wastewater treatment

Acknowledgement: This study was funded by Global Industrial Solution (Pvt) Ltd, Gamunupura, 1st Ln, Kaduwela, Sri Lanka.

Evaluation of the Biodegradation Efficiency of Isolated Lipolytic Bacteria in Meat Processing Wastewater in Sri Lanka

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Meat processing wastewater contains high concentrations of fats, oils, grease, proteins, and other organic matter, which contribute to elevated biological oxygen demand (BOD) and chemical oxygen demand (COD), and can cause environmental pollution. This study aimed to isolate and evaluate indigenous lipolytic bacteria from meat processing wastewater in Sri Lanka and assess their potential for bioaugmentation in wastewater treatment. Wastewater samples were collected from two meat processing plants, and sixteen bacterial isolates were obtained using the pour plate method. Among them, eight isolates exhibited extracellular lipase activity on tributyrin agar. Based on oil and grease removal efficiency after 40 h of incubation, three isolates (MSP1, MSP2, and MSP5) showing the highest degradation potential were selected for further investigation. Bioaugmentation experiments were conducted using each isolate individually and as an equal ratio consortium to monitor changes in free fatty acids (FFA), biological oxygen demand (BOD), and total dissolved solids (TDS) under aerobic conditions at 24, 72, and 120 h. All selected isolates significantly reduced oil and grease compared with the control ($p < 0.05$), with MSP5 ($90.07 \pm 0.31\%$), MSP2 ($87.83 \pm 0.10\%$), and MSP1 ($85.91 \pm 0.06\%$) showing the highest removal efficiencies. Significant reductions in BOD, TDS, and significant variations of FFA% were observed in all inoculated treatments ($p < 0.05$), with MSP5 showing the best overall performance. Although the microbial consortium demonstrated stable substrate utilization, its efficiency was slightly lower than that of individual isolates, likely due to metabolic competition among strains. These findings indicate that indigenous lipolytic bacteria can effectively reduce lipid and organic pollutant loads in meat processing wastewater, and optimization of microbial combinations may further enhance sustainable and cost-effective wastewater treatment strategies.

Keywords: Bioaugmentation, lipolytic bacteria, meat processing wastewater, microbial consortium

Effect of dietary cobalt supplementation on whole tract nutrient digestibility of low producing dairy cows in Sri Lanka

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Minerals are important components for optimal growth, physiological function, and productivity in dairy cattle. Cobalt is known as an essential trace element that improves whole tract digestibility in dairy cattle by promoting rumen microbial activity and fiber fermentation through vitamin B₁₂ synthesis. This study aimed to evaluate the effect of dietary Cobalt supplementation on whole-tract nutrient digestibility in low-producing dairy cows in Sri Lanka, in accordance with the revised NASEM (2021) guidelines. A total of 18 Jersey - Sahiwal dairy cows were randomly assigned to three different treatment groups: a control group (no added Co), treatment 01 (0.2mg Co/kg dry matter) and treatment 02 (0.4mg Co/kg dry matter). The feeding trial was conducted for four weeks, including a 3-week adaptation phase followed by a 1-week sample collection period. The digestibility of dry matter, organic matter, and crude protein was evaluated using acid insoluble ash (AIA) as an internal marker. The effects on feeding intensity and feeding time were evaluated over four weeks feeding trial. Data were analyzed using one-way ANOVA. The results revealed that the dry matter digestibility, organic matter digestibility, and crude protein digestibility did not show significant differences among the groups ($p>0.05$). However, feeding behavior parameters showed significant differences ($p<0.05$), with both Treatment 1 and Treatment 2 groups exhibiting higher feeding time and feeding intensity compared to the control group. In conclusion, cobalt supplementation did not significantly influence whole-tract nutrient digestibility but did positively modify feeding behavior by increasing feeding time and intensity, suggesting a role in enhancing feeding activity independent of digestibility under the conditions of this study. Further studies with larger sample sizes and longer feeding duration are recommended to better understand the effects of cobalt supplementation on nutrient digestibility.

Keywords: Cobalt supplementation, dairy cattle, digestibility, nutrient absorption, whole tract

Acknowledgement: The research was conducted with the support of the National Livestock Development Board (NLDB), Sri Lanka.

Knowledge, attitudes, and practices of smallholder dairy farmers on antibiotic use and milk safety in Kurunegala district, Sri Lanka

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Improper antibiotic use in dairy farming is a major concern due to its association with antimicrobial resistance and antibiotic residues in milk, posing risks to food safety and public health. As the Kurunegala District is a key smallholder dairy production area in Sri Lanka, understanding farmers' knowledge, attitudes, and practices (KAP) regarding antibiotic use is essential for improving milk quality. Therefore, this study aimed to assess the KAP of smallholder dairy farmers related to antibiotic use and milk safety. A descriptive cross-sectional survey was conducted using a structured questionnaire administered to 100 dairy farmers in the veterinary divisions of Pannala, Kuliyaipitiya, Narammala, Bingiriya, and Dummalasooriya of Kurunegala District. Results revealed that 43% of farmers had low knowledge, 30% had intermediate knowledge, and 27% had high knowledge regarding antibiotic use. While 59% demonstrated moderate attitudes, the majority followed inadequate antibiotic use practices. Although 86% of farmers were aware of antibiotic withdrawal periods, risky behaviours persisted, with 44% selling milk from treated cows and 59% not practicing separate milking during treatment. Additionally, 68% of farmers had not received training on proper antibiotic use or milk hygiene. Correlation analysis revealed a strong positive relationship between knowledge and safe antibiotic use practices ($\rho = 0.722$, $p < 0.001$). Education and training showed significantly positive associations with KAP variables. In contrast, veterinary visits showed only a weak association with safe antibiotic use practices, suggesting the need to strengthen the effectiveness and outreach of veterinary advisory services. Overall, the findings highlight that farmer knowledge and training are key determinants of responsible antibiotic use practices. Targeted awareness programs, improved veterinary advisory services, and capacity-building interventions are essential to enhance milk safety in smallholder dairy systems.

Keywords: Antibiotic use, knowledge-attitude-practice, Kurunegala district, milk safety, smallholder dairy farmers

Potential of Ash Gourd (*Benincasa hispida*) as a natural meat tenderizer: Effects on beef quality

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Tenderness is a critical determinant of beef quality, yet inherent toughness often limits consumer acceptance. Ash gourd (*Benincasa hispida*), a natural source of proteolytic enzymes, offers potential as an effective meat tenderizing agent. This study evaluated the effects of ash gourd extract on beef hardness, pH, cooking loss, colour, and sensory attributes using extract concentrations of 0, 25, 50, 75, and 100% applied for 1 and 4 hours. Hardness decreased significantly with increasing extract concentration ($p < 0.001$) and marination time ($p = 0.007$). Meat pH was significantly decreased, and the cooking loss was significantly increased with extract concentration ($p < 0.001$) and marination time ($p < 0.05$). Colour parameters showed differential responses, with lightness and redness influenced only by extract concentration ($p < 0.001$) and yellowness affected only by marination time ($p < 0.05$). Sensory evaluation conducted with 30 untrained panelists demonstrated significant ($p < 0.001$) improvements in tenderness and overall acceptability, whereas juiciness, colour, and taste were not significantly ($p > 0.05$) affected, confirming that extract application enhances palatability without compromising other attributes. Pairwise comparisons further indicated that samples treated with 75% and 100% extract for 4 hours were significantly more tender and acceptable than other treatments, while no significant differences were observed between these two concentrations, suggesting a threshold beyond which additional extract does not yield perceptible benefits. Overall, ash gourd extract effectively enhances both instrumental tenderness and sensory tenderness of beef, with 75–100% extract applied for 4 hours identified as optimal conditions. These findings indicate that ash gourd extract has potential as a natural and locally available tenderizing agent and warrants further evaluation, including comparisons with existing tenderizers, before wider application in the meat industry.

Keywords: Ash gourd, beef, hardness, proteolytic enzymes, sensory attributes

Assessment of consumer knowledge, perception, and preference towards nutritionally fortified eggs in Kurunegala district, Sri Lanka

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In recent years, rising interest in functional foods has increased demand for nutritionally enriched eggs in Sri Lanka, including omega-3, folate, and vitamin D-enriched value-added animal products. Understanding consumer perception of these products is critical to enhancing their market penetration and optimizing their potential public health benefits. This study aimed to assess consumer knowledge, perception, purchasing behaviour and willingness to pay for nutritionally fortified eggs in the Kurunegala district. A preliminary market survey was conducted to identify the types of fortified eggs available. Subsequently, a cross-sectional descriptive study was carried out among 410 adult consumers selected through simple random sampling at supermarkets and other retail outlets in the Kurunegala District. Face-to-face interviews were conducted to collect data using a structured and pre-tested questionnaire. The findings revealed that, despite low consumer awareness (16%), willingness to purchase nutrient-enriched eggs was remarkably high (92%). Age, educational level, egg-purchasing location, and geographic residence were significantly associated with consumer awareness ($p < 0.05$). Income level had a significant effect on both consumers' willingness to purchase and their willingness to pay a premium price ($p < 0.05$). Over half of the respondents (57%) indicated a willingness to pay 10–20% above the price of regular eggs. Health concerns (51%) emerged as the primary motivator for purchase intention, whereas price (45%) was identified as the main barrier among those unwilling to purchase. Nevertheless, concerns regarding artificial processing were reported by 45% of respondents. Overall, the findings indicate that, despite limited awareness, consumer attitudes and willingness to purchase nutritionally fortified eggs are strongly positive, highlighting considerable market potential. Similar patterns reported in other regions of the world indicate favourable consumer responses to nutrient-enhanced egg products, suggesting that improved awareness and market accessibility could further enhance acceptance and promote healthier dietary choices in this population.

Keywords: Consumer awareness, fortified eggs, purchasing behaviour

Effect of mechanically separated chicken meat on quality and shelf life of semi dried chicken jerky

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The utilization of cost-effective raw materials, particularly mechanically separated chicken meat (MSCM), has gained considerable attention in meat processing due to increasing production costs and sustainability concerns. This study evaluated the effects of different levels of MSCM incorporation on the quality characteristics and short-term storage stability of semi-dried chicken jerky. Lean chicken meat was replaced with MSCM at 0%, 5%, 10%, and 20%, and products were prepared under controlled drying conditions. Day-0 quality parameters, including processing yield, proximate composition, pH, colour, texture profile, rehydration capacity, and sensory attributes, were evaluated, and changes were monitored over three weeks to assess storage stability. Data were analyzed using one-way ANOVA and two-way repeated measures ANOVA at a significance level of $p < 0.05$. Processing yield increased significantly with increasing MSCM levels, reaching $45.33 \pm 1.53\%$ at 20% compared to $38.67 \pm 3.06\%$ in the control ($p < 0.05$). Fat content increased from $4.37 \pm 0.75\%$ to $9.42 \pm 0.58\%$ ($p < 0.001$), and moisture content at day-0 increased from $29.74 \pm 2.35\%$ to $37.80 \pm 2.80\%$ ($p < 0.05$), while ash content showed a slight, non-significant increase ($p > 0.05$). Initial pH increased slightly with MSCM incorporation (5.81 ± 0.02 to 5.89 ± 0.01 ; $p < 0.05$) and further increased during storage by approximately 0.4–0.5 units ($p < 0.001$). Texture parameters were not significantly affected at day-0; however, hardness decreased significantly during storage (10.08 – 4.73 N; $p < 0.001$). Color was mainly influenced by storage time, with L^* values ranging from 40.53 to 45.40 and a^* value range from 3.67 to 9.70. Rehydration capacity decreased with increasing MSCM levels (0.26 – 0.14 g/g; $p < 0.01$) and remained stable during storage. Sensory evaluation using a 9-point hedonic scale showed improved overall acceptability, increasing from 6.0 in the control to 7.4 at 20% MSCM ($p < 0.001$). Overall, MSCM incorporation improved processing yield and sensory attributes while maintaining acceptable physicochemical stability during short-term storage within the studied range. The study was limited to short-term refrigerated storage and did not assess long-term shelf-life and microbial stability.

Keywords: Mechanically separated chicken meat, processing yield, semi-dried chicken jerky, sensory quality, storage stability

Cooling material integrated tube in milk canister for on-farm milk temperature control

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Milk cooling remains a critical challenge for smallholder dairy farmers in tropical regions, where raw milk is often transported to chilling centers without prior cooling, leading to rapid microbial deterioration and compromises quality. This study aimed to develop and evaluate a low-cost on-farm milk cooling system. A standard 10 L milk canister was modified by incorporating a stainless-steel tube to hold coolant solutions (1 L), along with an insulating cover to minimize heat transfer. Twelve different coolant types and their combinations were evaluated for their ability to reduce and maintain milk temperature. A salt–water mixture demonstrated the best performance, reducing milk temperature from 29 °C to 8 °C within one hour and maintaining it for over 2 hours at an ambient temperature of 26 °C, representative of the intermediate zone in Sri Lanka. At higher (28 °C) and lower (23 °C) ambient temperatures, the same coolant reduced milk temperature to 12.5 °C and 6 °C, respectively, within one hour and maintained these levels for over 2 hours. Milk with an initial total viable count of 1.8×10^5 CFU/ml was stored in both control (unmodified) and treatment (modified) canisters. After 2 hours at 26 °C of ambient temperatures, treatment showed significantly lower ($p < 0.05$) microbial count (3.0×10^5 CFU/ml) compared to the control (4.7×10^5 CFU/ml). The results indicate that the modified canister system provides a practical and low-cost approach for on-farm milk cooling, with potential to improve milk quality during transportation in smallholder dairy systems.

Keywords: Low-cost cooling system, milk cooling, milk quality, post-harvest milk handling, smallholder dairy farming

Effect of sous-vide time temperature combinations on physicochemical, textural and sensory attributes of chicken breast meat

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This study investigated the impact of various sous-vide time-temperature combinations on the physicochemical, textural, and sensory quality of chicken breast meat. A total of eight treatments (S1–S8), ranging from 60 °C to 70 °C for durations of 60 to 120 minutes. Physicochemical analysis revealed that both temperature and time significantly influenced moisture retention and weight loss across all treatments ($p < 0.05$). Cooking loss exhibited a clear upward trend as thermal intensity increased, peaking at $14.28 \pm 1.91\%$ in treatment S8 (70 °C for 120 min), which was significantly higher than the loss observed in the other treatments. Conversely, water-holding capacity was best preserved at lower temperatures, with treatment S7 (70 °C/100 min) and S4 (60 °C/120 min) showing high retention levels. The pH of the meat significantly decreased with higher temperatures, dropping from 7.15 ± 0.12 in the control to 4.83 ± 0.16 in S8 (70 °C/120 min). Color analysis indicated that lightness (L) generally increased with cooking, reflecting protein denaturation, while redness (a) and yellowness (b) showed minor fluctuations across treatments. Textural Profile Analysis (TPA) demonstrated that hardness was significantly affected by the sous-vide parameters. Treatments S1 (60 °C /60 min) and S7 exhibited the lowest hardness values, while the S2 and S6 (70 °C/80 min) were the firmest. Moisture content was highest in treatment S4 at $77.30 \pm 2.10\%$, compared to other treatments. Sensory evaluation showed that all sous-vide treatments were significantly different in all attributes, including color, aroma, juiciness, tenderness, and flavor ($p < 0.05$). Treatment S3 (60 °C / 100 min) was the most balanced and preferred option, consistently scoring highest in tenderness, juiciness, and overall acceptability.

Keywords: Chicken breast, physicochemical properties, sensory evaluation, sous-vide, texture profile analysis

Effects of roadside forage silage intake on milk yield and composition of crossbred dairy cows

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Seasonal forage scarcity is a major constraint affecting smallholder dairy farmers in Sri Lanka. Roadside forage, an underutilized yet readily available resource, particularly during the rainy season, could serve as a viable solution to forage shortages if effectively preserved. Previous laboratory scale study had demonstrated that roadside forage can be successfully converted into quality silage through the addition of ripe pineapple peels. Therefore, the present study evaluated the potential of roadside forage silage to sustain milk yield and performance in lactating dairy cows. Approximately 1500 kg of roadside forage silage was prepared by mixing chopped roadside forage with 5% ripe chopped pineapple peel using the barrel ensiling method. Six second parity crossbred dairy cows in mid-lactation were subjected to a 42-day cross over feeding trial. The treatment diet consisted of replacing 50% of the forage component in the regular farm diet with roadside forage silage and offered as a total mixed ration with other concentrate components. Milk yield was recorded daily, while milk compositional parameters including fat, solids-non-fat, and protein percentages were measured at three-day intervals using Indifoss milk analyzer. Feed intake was significantly lower ($p < 0.05$) during the treatment period compared to the control period. However, no significant differences ($p > 0.05$) were observed in milk yield or in any of the measured milk composition parameters between the two dietary treatments. These findings indicate that roadside forage silage can be incorporated into dairy diets without adversely affecting milk production or composition. Therefore, the conservation of roadside forage as silage during periods of abundance represents a practical and cost-effective strategy to mitigate seasonal feed shortages in smallholder dairy systems in Sri Lanka. Further studies with longer feeding durations are recommended to validate these results.

Keywords: Dairy cows, milk yield, pineapple peel, roadside forage, silage

Acknowledgement: This study was funded by Wayamba University Research Grant number SRHDC/URG/2024/08.

Influence of enzymatic coagulation and stabilizer systems on cashew nut (*Anacardium occidentale*) milk for cheese analogue production

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The increasing demand for plant-based dairy alternatives has driven the development of structured, protein-rich cheese analogues with desirable textural and sensory properties. This study focused on the formulation and optimization of a cashew milk-based cheese analogue by evaluating the effects of coagulating enzymes and stabilizer systems on curd formation and final product quality. Initially, the physicochemical behavior of raw and fermented cashew milk was assessed, revealing that fermentation alone was insufficient to induce effective curd formation. A comparative study was conducted to evaluate the impact of rennet and microbial transglutaminase (MTGase) on curd matrix development. Texture Profile Analysis demonstrated that MTGase (0.110 ± 0.01 N) generated a significantly stronger protein network than rennet (0.083 ± 0.00 N, $p < 0.05$). Optimization of MTGase concentration (0.75%, 1.0%, 1.25%) indicated that curd firmness increased with enzyme content up to 1.0% (1.103 ± 0.02 N), beyond which no significant improvement was observed. To overcome structural weaknesses, carrageenan (0.5–1.0%) was incorporated as a stabilizer, and corn flour (1–2%) was used as a structuring agent. Combined systems significantly enhanced matrix integrity and hardness (0.833 ± 0.07 N, 1.323 ± 0.04 N, 1.283 ± 0.10 N), highlighting their critical role in structuring plant-based cheese. Sensory evaluation using a 9-point hedonic scale, Just-About-Right (JAR), Check-All-That-Apply (CATA), and Liking Scores confirmed that the optimized formulations achieved balanced textural attributes and high consumer acceptability. These findings demonstrate that an integrated approach combining MTGase-induced protein cross-linking with optimized stabilizer and structuring agent incorporation is essential for producing structurally stable and sensorially acceptable cashew cheese analogues. This study provides a scalable foundation for the development of export-ready plant-based cheese alternatives with improved functionality and market potential.

Keywords: Cashew milk, cheese analogue, microbial transglutaminase (MTGase), stabilizers, texture and sensory properties

Acknowledgement: This study was funded by the Treasury of Sri Lanka under Research Grant No. TG 24/238.

8th April 2026, Faculty of Livestock, Fisheries & Nutrition, Wayamba University of Sri Lanka

Role of stabilizing agents in the physicochemical, structural and sensory properties of cowpea (*Vigna unguiculata*) fortified hybrid cheese

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This study investigated the effect of stabilizers on the physicochemical, textural, structural and sensory properties of cowpea-enriched hybrid cheese. Three formulations were developed using varying stabilizer combinations: T1 (0.5% carrageenan), T2 (0.7% carrageenan + 0.3% xanthan gum), and T3 (0.4% carrageenan + 0.3% xanthan gum), each incorporated with 0.5% phosphates. Proximate analysis revealed that incorporation of cowpea significantly enhanced the nutritional profile, with protein and dietary fiber contents increasing to 12–14% and 2–3%, respectively, while maintaining moisture (34–38%), fat (22–23%), and ash (3–4%) within acceptable ranges. Color measurements showed significant differences ($p < 0.05$) among treatments, with lightness (L^*) ranging from 67.83 ± 0.64 to 70.43 ± 2.50 . T2 exhibited the highest L^* , redness (2.20 ± 0.27), and yellowness (13.78 ± 0.85) values, indicating greater color intensity. Textural analysis demonstrated significant variation ($p < 0.05$), where T2 recorded the highest hardness (3.41 ± 0.05) and chewiness (2.38 ± 0.15), reflecting improved structural integrity. In contrast, T3 showed the lowest hardness (2.15 ± 0.06) and gumminess (1.18 ± 0.07), while T1 displayed intermediate properties. Cohesiveness ranged from 0.57 ± 0.03 to 0.70 ± 0.05 , with no significant differences ($p > 0.05$). Sensory evaluation, including hedonic, CATA, and JAR analyses, indicated that T2 achieved the highest overall acceptability due to its superior texture and mouthfeel, whereas T3 was the least preferred. FTIR analysis confirmed the presence of characteristic O–H, C–H, and amide I and II functional groups, indicating successful integration of plant protein and lipid matrices. Overall, T2 demonstrated optimal physicochemical and sensory properties, highlighting its potential for developing nutritionally enhanced and consumer-acceptable hybrid cheese products.

Keywords: Cowpea-enriched hybrid cheese, sensory evaluation, stabilizer systems, textural and microstructural properties

Acknowledgement: Financial support for this study was provided by the Wayamba University Research Grant (SRHDC/URG/2024/13).

Survival patterns and major causes of culling in dairy cows at government livestock farms in the Kurunegala district of Sri Lanka

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Dairy farming is a vital component of Sri Lanka's livestock sector, contributing substantially to national milk production and rural livelihoods, particularly in the North-Western Province. Enhancing dairy cow survival is a key factor in achieving economically sustainable dairy production. However, under Sri Lankan conditions, survival patterns and determinants of culling remain poorly understood. Therefore, this study was conducted to assess the survival patterns and major causes of culling in dairy cows reared in National Livestock Development Board (NLDB) farms in Kurunegala District of Sri Lanka. Records of 767 dairy cows born between 2013 and 2023 were collected from the animal history cards across the 7 farms (farm A-G). Kaplan-Meier survival analysis was conducted using SAS with herd life and productive life considered as the time-to-event variables. Breed (Sahiwal, Jersey, and crossbred) and farms were included as stratification factors, and cows alive at the time of data collection were considered as right-censored observations. Survival differences among farms were significant for both herd-life and productive life ($p < 0.05$). Cows reared at farm G demonstrated the highest longevity, with a median herd life of 12.28 years and a median productive life of 9.15 years, while cows at farm D farm showed lowest median herd life (7.60 years) and a median productive life (3.74 years). Significant breed differences were observed for herd life, but not for productive life. However crossbred cows consistently exhibited the highest median herd life (9.31 years) and productive life (5.80 years) compared to the other breeds considered. The primary causes of culling were reproductive disorders (72.24%) and milk production related factors (12.24%). These findings reveal substantial variation in dairy cow survival across the farms and the need for farm-specific management interventions to improve cow longevity and productive efficiency in Sri Lankan government dairy farms.

Keywords: Dairy cows, herd life, productive life, survival analysis

Department of Food Science and Technology

Evaluation of the potential use of *Cyclea peltata* leaf extract as a natural fat replacer in cupcake formulations.

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Fat plays a significant role in baked food products; however, high intake is associated with medical conditions. Fat replacers were explored due to growing health concerns. This study evaluated the potential of *Cyclea peltata* leaf extract as a fat replacer in cupcakes. Leaf extract was obtained by hot aqueous extraction and analyzed for proximate composition, pH, viscosity, colour (L*, a*, b*), and functional properties, including water- and oil-holding capacity and emulsification. Five cupcake samples were prepared with 0%, 15%, 20%, 25%, and 30% fat replacements. Sensory evaluation identified 15% as the optimum level, and 30% as the highest acceptable level, exceeding the control. The composition of the leaf extract was water (98.52 ± 0.38%), with low fat (0.25 ± 0.21%), protein (0.14 ± 0.05%), carbohydrate (1.17 ± 0.09%), and ash (0.16 ± 0.10%). Mean pH was 4.68 ± 0.01, viscosity 17,391 ± 3,402 mPa·s, and color values L* 19.93 ± 0.12, a* 2.60 ± 0.08, b* 7.48 ± 0.13. In 0%, 15%, 30% cupcakes, fat content and caloric value were significantly reduced ($p < 0.05$), while hardness, gumminess, and volume were affected. Protein content and cohesiveness showed no significant differences. Cooking loss was significantly higher in 30% fat replacement. Shelf life was not significantly affected, with all samples remaining stable for 4 days. Crumb color ΔE values were 0, 9.96 ± 0.39, and 10.01 ± 0.37 for control, 15%, and 30%, respectively, while surface color ΔE values were 0, 2.97 ± 0.10, and 4.22 ± 0.15, indicating significant differences among the samples. These findings demonstrate that *Cyclea peltata* leaf extract can serve as an effective fat replacer in cupcakes.

Keywords: Fat replacement levels, functional properties, hot aqueous extraction, overall acceptability, sensory analysis

Effect of germination on nutritional and techno-functional changes in foxtail millet (*Setaria italica*) flour for instant porridge applications

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This study investigated the effect of germination on the nutritional and techno-functional properties of foxtail millet and porridges prepared from it. Foxtail millet grains were germinated for 24, 48, and 72 h, with ungerminated grains as the control. Dried and grounded samples were analyzed for proximate composition, physico-chemical properties (pH, total soluble solids, total titratable acidity), total phenolic content, total flavonoid content, DPPH radical scavenging activity, tannin, phytic acid, in vitro protein digestibility, α -amylase and amyloglucosidase inhibition, and techno-functional properties including water and oil absorption, swelling power, foaming capacity and stability, oil and water holding capacity, emulsifying capacity, solubility, bulk density, and viscosity. Porridges were prepared from control, 48 h, and 72 h germinated flours and evaluated for enzyme inhibition, tannin, phytic acid, protein bioavailability, and techno functional properties (water absorption and solubility indices, dispersibility, viscosity). Germination influenced all measured parameters. pH decreased while total titratable acidity and total soluble solids increased. Protein and ash contents increased, with reduced fat and carbohydrate. Total phenolic content increased from 6.39 to 8.33 mg GAE/g, total flavonoids and DPPH activity improved, while tannin and phytic acid significantly ($p < 0.05$) decreased at 24–48 h. Protein digestibility improved from 68.73% to 88.17% at 24 h, and α -amylase and amyloglucosidase inhibition were highest at 72 h (86.54% and 41.17%). Germination enhanced techno-functional properties including foaming and emulsifying capacity, and oil holding capacity, with slight viscosity, bulk density and swelling power reduction. In porridges, 72 h germinated flour showed the highest protein bioavailability, improved enzyme inhibition, reduced tannin and phytic acid, and better water absorption and solubility indices, while viscosity decreased at 48 h. Overall, germination for 48–72 h enhanced nutritional quality, antioxidant potential, and functional properties of foxtail millet, supporting its use for enriched flour and instant porridge products.

Keywords: Bioactive compounds, foxtail millet, germination, techno-functional properties.

Development of biodegradable composite coating film enriched with lotus leaf and coconut husk powders for shelf-life extension of fresh produce

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Postharvest deterioration of fresh vegetables is primarily associated with moisture loss, oxidative stress and microbial spoilage, resulting in significant economic losses. Green bell pepper (*Capsicum annuum* L.) is highly perishable under ambient storage due to rapid transpiration and decay development. This study aimed to develop a biodegradable composite coating based on corn starch, citrus pectin and beeswax enriched with lotus leaf and coconut husk powders to enhance the shelf life and quality stability of green bell pepper. Bioactivity evaluation revealed that lotus leaf extract possessed significantly higher total phenolic content (132.29 ± 2.11 mg gallic acid equivalents per gram) compared to coconut husk extract (59.26 ± 1.84 mg catechin equivalents per gram) ($p < 0.05$). Similarly, lotus leaf extract demonstrated stronger radical scavenging activity ($43.7 \pm 1.52\%$) than coconut husk extract ($10.9 \pm 0.87\%$). Five coating formulations were prepared and applied to bell peppers stored under ambient conditions for ten days. Weight loss increased in all samples during storage; however, coated treatments showed significantly lower losses than the uncoated control ($p < 0.05$). The formulation containing 10 mg lotus leaf powder and 10 mg coconut husk powder exhibited the lowest weight loss ($8.93 \pm 0.64\%$) at day 10 compared to $20.2 \pm 1.13\%$ in the control. This treatment also delayed shriveling, reduced decay incidence and maintained superior visual quality. Additionally, coated samples demonstrated improved colour retention, moderated increase in pH and total soluble solids, and higher retention of titratable acidity during storage. Film characterization indicated increased thickness and tensile strength with plant powder incorporation, suggesting enhanced structural integrity and barrier performance. Overall, the developed composite coating film effectively mitigated major deterioration pathways and shows strong potential as an environmentally sustainable postharvest preservation strategy for green bell pepper.

Keywords: Biodegradable coating, *Capsicum annuum*, coconut husk powder, lotus leaf powder, postharvest preservation

Development and evaluation of agar-based active biodegradable packaging film incorporating onion peel extract (*Allium cepa* L.)

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The increasing generation of agro-industrial waste and the extensive use of non-biodegradable plastic packaging presents major environmental challenges. Onion peel, a common vegetable by-product, is rich in bioactive compounds with antioxidant and antimicrobial properties and offers strong potential for value-added utilisation. This study aimed to develop agar–starch-based biodegradable films incorporated with onion peel extract and evaluate their suitability as an active packaging material. Onion peel extract was prepared using 70% ethanol and analysed for total phenolic content (TPC), total flavonoid content (TFC), antioxidant activity (DPPH assay), and minimum inhibitory concentration (MIC) against *Staphylococcus aureus* and *Escherichia coli*. Biodegradable films were fabricated with different extract concentrations (0.5%, 1%, and 2%) and characterized for physical (thickness, moisture content, water solubility, optical density, color), mechanical (tensile strength), structural (FTIR, SEM, XRD), biodegradability, and antimicrobial (disk diffusion) properties. The films were applied to strawberries stored at 4 °C for six days, and quality parameters including weight loss, pH, total soluble solids (TSS), and firmness were evaluated. The onion peel extract showed high TPC (144.52 ± 0.56 mg GAE/g) and antioxidant capacity ($75.89 \pm 0.57\%$), with strong antibacterial activity against *S. aureus* (MIC 6.25 mg/mL). Film thickness and tensile strength increased with extract concentration, and the 2% film exhibited the highest tensile strength (25.42 ± 1.21 MPa) and lowest water solubility ($27.33 \pm 0.04\%$). SEM images revealed slight surface roughness, while FTIR and XRD confirmed strong polymer–extract interactions. Antimicrobial activity increased with extract level, with inhibition zones against *S. aureus* reaching 8.12 ± 0.05 mm in the 2% film. Application results demonstrated that the 2% film effectively preserved strawberry quality and delayed spoilage compared to unpackaged strawberries. Films containing 2% onion peel extract were most effective in preserving fruit quality and showed strong potential as eco-friendly active packaging materials that extend shelf life while promoting sustainable waste utilisation.

Keywords: Antioxidant activity, Biopolymer interaction, Shelf-life extension, Sustainable waste utilization

Evaluating the impact of auditory stimuli on modulating the human taste perception

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Excessive consumption of sugar and salt is a major public health concern in Sri Lanka, leading to the prevalence of non-communicable diseases such as diabetes and hypertension. Conventional product reformulation strategies often compromise consumer acceptance due to perceived losses in taste quality. Recent advances in multisensory science evident that a phenomenon known as sonic seasoning can modulate taste perception. This study investigated the effect of background sound on the perception and recognition thresholds of selected taste modalities of beverages commonly consumed in Sri Lanka, including tea, soup, fresh milk and carbonated soft drinks. Sensory evaluation was conducted with 30-40 semi-trained panelists under controlled laboratory conditions using silence and taste-congruent auditory stimuli. Perceived intensity was measured using a seven-point scale and recognition thresholds were determined using ascending concentration series and Best Estimated Threshold (BET) methodology under the same auditory conditions. Auditory stimuli significantly enhanced taste sensitivity by lowering recognition thresholds across modalities. Recognition thresholds showed a decreasing pattern, where sweetness was reported as 3.58 g/L of silence to 2.79 g/L of music, while saltiness was reported as 0.56 g/L to 0.42 g/L, respectively. Bitterness thresholds also decreased from 0.0059 g/L to 0.00354 g/L under silence to low-pitch auditory conditions. Statistical analysis confirmed significant differences between silence and sound conditions with large effect sizes. Application to Sri Lankan common foods demonstrated similar auditory modulation effects. Background sound significantly increased perceived sweetness in fresh milk (2.60 to 3.20) and carbonated soft drinks (4.73 to 5.53), while tea showed a non-significant increase. Salt-associated soundscapes significantly enhanced perceived saltiness in commercial Sri Lankan soup formulations. Overall, these findings demonstrate that auditory stimuli can modulate both supra-threshold intensity and sensory sensitivity, highlighting the potential of sonic seasoning as a non-invasive strategy to maintain sensory satisfaction while reducing sugar and salt content, supporting healthier dietary practices.

Keywords: Cross-modal perception, non-communicable diseases, sonic seasoning, taste perception

8th April 2026, Faculty of Livestock, Fisheries & Nutrition, Wayamba University of Sri Lanka

Development and quality evaluation of mushroom-based meat analogue using chickpea and corn flour as binders

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Plant-based meat analogues are gaining global attention as sustainable alternatives to conventional meat. Mushrooms, particularly Button (*Agaricus bisporus*) and Oyster (*Pleurotus ostreatus*), are promising raw materials due to their protein, fiber, bioactive compounds, and functional properties. In Sri Lanka, Button mushroom stems are often discarded as waste, despite their high protein and fiber content. This study developed meat analogues using Button mushroom stems and Oyster mushrooms with chickpea and corn flour binders at ratios of 70:30, 65:35, and 60:40. Proximate composition, microbiological stability, sensory attributes, water-holding capacity, texture profile, and cooking properties were analyzed. Results showed that chickpea-based formulations, particularly Button Mushroom - Chickpea 70:30, exhibited superior nutritional profiles with higher protein (10.06% wet basis), fiber (up to 8.62%), and mineral content (ash 1.79%), while corn-based blends had higher moisture but lower protein retention. Sensory trials confirmed its highest consumer acceptability (mean = 9.00), while functional analysis demonstrated enhanced water-holding capacity (1.20 g/g) and reduced cooking loss in chickpea-based formulations, supporting textural stability. The findings demonstrate that valorizing Button mushroom stems can reduce food waste while producing nutritionally balanced, sensory appealing, and commercially viable meat analogues, contributing to sustainable food innovation in Sri Lanka.

Keywords: Button mushroom, environmental impact, food waste, oyster mushroom, plant-based meat analogue

Extraction, characterization, and valorization of dietary fiber from ambul banana (*Musa acuminata*) inflorescence through *in vitro* evaluation

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Banana inflorescence, comprising the flower and bracts of Ambul banana (*Musa acuminata*), is an underutilized agro-industrial by-product despite its richness in dietary fiber and associated bioactive compounds. While dietary fibers from banana peels and pseudostems have been widely investigated, systematic information on the comparative influence of plant part and extraction method on the functional, adsorption, and structural characteristics of dietary fibers from banana inflorescence remains limited. In this context, the functional and hypolipidemic properties of different dietary fiber fractions and their associated polyphenolic content require further *in vitro* evaluation. Therefore, this study aimed to extract soluble and insoluble dietary fiber fractions from Ambul banana inflorescence and evaluate their functional, adsorption, and structural properties for potential use in functional food systems. Soluble and insoluble dietary fibers were extracted using water and alkali treatments, followed by evaluation of fiber yield, functional properties, cholesterol adsorption capacity, polyphenolic content, and structural characteristics using FTIR and XRD analyses. Alkali extraction produced a significantly higher soluble dietary fiber yield, with the maximum value observed in flower-derived fiber ($15.20 \pm 0.09\%$), whereas water extraction resulted in greater recovery of insoluble and total dietary fiber fractions. Among the functional properties evaluated, insoluble dietary fiber fractions showed superior performance, with bract-derived insoluble fiber exhibiting the highest water holding capacity (5.65 ± 0.07 g/g). Insoluble fibers also demonstrated greater cholesterol adsorption capacity compared to soluble fractions. FTIR analysis confirmed the polysaccharide-rich composition of all dietary fiber fractions, while XRD analysis indicated structural differences, with relatively higher amorphous characteristics observed in insoluble fibers. Overall, the findings demonstrate that dietary fibers derived from Ambul banana inflorescence possess desirable functional and adsorption properties, highlighting their potential as value-added ingredients in functional food formulations and supporting further physiological evaluation.

Keywords: Banana inflorescence, dietary fiber extraction, functional properties

Optimization and quantification of ultrasound-assisted extraction of flavonols as kaempferol equivalents from *Sesbania grandiflora* leaves

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Kaempferol is an important flavonol with confirmed antioxidant, anti-inflammatory, anticancer, and neuroprotective activities. This makes it an important bioactive compound in nutraceutical and functional food studies. *Sesbania grandiflora* is an edible and medicinal plant used in Sri Lanka. It is a rich source of flavonoids and phenolic compounds. However, limited quantitative data and the absence of optimized extraction protocols have restricted its effective utilization as a targeted kaempferol source. This study aimed to optimize ultrasound-assisted hydro-ethanolic extraction and quantify total flavonol content expressed as kaempferol equivalents (KE, mg/g dry weight) in red and white varieties of *S. grandiflora* leaves. Dried leaf powder was extracted using 70% (v/v) ethanol, and the effects of extraction time (15–60 min), temperature (35–45 °C), and solid-to-solvent ratio (1:15–1:25 w/v) were systematically evaluated. Quantification was performed at 365 nm using UV–Visible spectrophotometry based on a kaempferol calibration curve ($y = 0.0313x + 0.0438$; $R^2=0.9936$), demonstrating excellent linearity and analytical reliability. Two-way ANOVA revealed that extraction conditions significantly influenced flavonol yield ($p<0.05$), while leaf variety and interaction effects were not significant ($p>0.05$). Optimal extraction was achieved at 30 min, 40 °C, and a 1:20 (w/v) solid-to-solvent ratio. Under these conditions, total flavonol content reached 35.73 ± 2.02 mg KE/g DW in the red variety and 35.43 ± 2.46 mg KE/g DW in the white variety and the reported values may include minor contributions from structurally related flavonols and co-extracted phenolic compounds with similar absorption characteristics. Relative standard deviation values were below 7%, confirming acceptable precision and reproducibility. Ultrasound-assisted extraction enhanced mass transfer and cell disruption, improving flavonol recovery while minimizing thermal degradation. The method provides a reliable, reproducible, and cost-effective approach for flavonol estimation and supports the use of *S. grandiflora* leaves in nutraceutical and functional food applications.

Keywords: Flavonol, kaempferol, *Sesbania grandiflora*, ultrasound-assisted extraction

Sustainable yoghurt packaging: *Areca catechu* sheath as a biodegradable alternative to plastic

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Conventional plastic yoghurt packaging contributes significantly to environmental pollution due to its non-biodegradable nature. Also, heat exposure during processing increases risk of microplastic migration. So, this study aimed to evaluate the potential of *Areca catechu* leaf sheath as a safe and sustainable alternative for yoghurt cup production. *A. catechu* fibres extracted through an alkali treatment were incorporated into a biocomposite formulation containing corn starch and natural additives, moulded, beeswax-coated and UV-sterilised prior to use. Yoghurt was prepared in biodegradable cups and polypropylene cups (control) and stored at 6 ± 1 °C for 21 days. Physicochemical, microbiological and sensory properties were evaluated at three-day intervals. Packaging performance was assessed through water vapor transmission rate (WVTR), water absorption, total migration, water loss under varying relative humidity, moisture Content, swelling test and biodegradability tests. Yoghurt stored in biodegradable cups showed slightly lower acid development, yet all quality parameters remained within acceptable limits throughout storage. However, no significant difference was observed in total plate count between packaging types ($p < 0.05$), confirming microbiological safety and structural stability. Texture parameters were significantly influenced by the packaging type ($p < 0.05$), with a significant interaction between packaging and storage time. The biodegradable cups exhibited a significantly higher WVTR (10.42 g/m²/day) compared with polypropylene (4.43 g/m²/day), indicating greater moisture permeability. However, a significant difference was observed in water absorption ($p < 0.05$). Total migration into 3% acetic acid food simulant remained within the European Union permissible limit of 10 mg/dm². Soil burial tests demonstrated rapid biodegradation, with $68.85 \pm 9.56\%$ weight loss within 21 days, while polypropylene showed no degradation. Respirometric analysis further confirmed active microbial mineralisation of the biodegradable material. Overall, these findings demonstrate that *A. catechu* leaf sheath-based cups are functionally suitable, food-safe and environmentally sustainable alternatives to conventional plastic yoghurt packaging.

Keywords: *Areca catechu*, biocomposite cup, biodegradable packaging, leaf sheath, yoghurt

Effect of finger millet (*Eleusine coracana*) enriched alginate encapsulation on viability and storage stability of *Lactobacillus rhamnosus* in probiotic sausage

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Probiotic incorporation in meat products has increased due to demand for functional, non-dairy foods; however, their survival in food remains a key limitation. This study evaluates the effectiveness of encapsulated *Lactobacillus rhamnosus* in three types of matrices: Alginate (A), alginate-millet (AM), alginate-millet with chitosan coating (AMC) under different stress conditions. Three underutilized millet varieties in Sri Lanka (*Finger millet*, *Proso millet*, *Kodo millet*) were analysed for their fibre content to determine the most effective prebiotic option for synbiotic microcapsules. The selected millet was incorporated into alginate matrices at three concentrations: 10%, 30%, 50% to determine the optimal ratio. The highest encapsulation efficiency provided AM formulation was coated with chitosan and these AMC microcapsules incorporated into sausage. Microcapsules were prepared by extrusion technique & dry beads were obtained through freeze drying. Encapsulation efficiency, size, moisture content of the beads were determined. Survivability of encapsulated and free probiotic cells compared within three different salinity levels 2%, 4%, 6%, acidity levels pH2, pH4, pH6, temperature levels -4°C, 40°C, 60°C and gastrointestinal condition. The storage stability of probiotic sausage was determined during 30 days at -18°C by total plate count, yeast/mould count, pH, titrable acidity and viable probiotic cell count. The data were analyzed with statistical tool SPSS at 95% confidence level. *Finger millet* was the best prebiotic option according to highest fibre content (4.10±0.17%). AM 10% exhibited the highest encapsulation efficiency 78.57±2.50% among wet beads while AMC showed the greatest efficiency 36.19±0.49% among dry bead formulations. Encapsulation efficiency considerably higher in wet beads than dry beads. AMC provided the highest protection against elevated osmotic, acidic, thermal and gastrointestinal condition. During storage AMC incorporated sausage exhibited probiotic levels above minimum therapeutic threshold ($\geq 10^6$ – 10^7 CFU/g) but the sausage incorporated with free cells exhibited significant viable loss. These findings demonstrate that millet enriched alginate microencapsulation with chitosan coating is an effective for delivering viable probiotics in cooked meat products.

Keywords: Alginate–millet encapsulation, chitosan coating, probiotic sausage, synbiotic

8th April 2026, Faculty of Livestock, Fisheries & Nutrition, Wayamba University of Sri Lanka

Development and quality assessment of sous vide processed chicken sausage enriched with *Hibiscus rosa sinensis* and *Cinnamomum zeylanicum*

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Processed meat products commonly rely on synthetic nitrites to improve colour, and shelf life. Increasing health concerns have created demand for natural alternatives and improved processing methods. Natural plant extracts combined with controlled cooking techniques can enhance processed meat product safety and quality. This study aimed to develop and evaluate chicken sausages enriched with *Hibiscus rosa sinensis* extract and cinnamon powder, and determined the impact of sous vide processing on overall product quality. Three treatments were evaluated: Control (0.008% curing salt and steam cooked), T₁C (1.0% cinnamon powder, 2.0% hibiscus extract and steam cooked), T₁S (1.0% cinnamon powder, 2.0% hibiscus extract and sous vide processed). The control exhibited significantly higher hardness (4.98±0.08 N), gumminess (3.63±0.10 N), and chewiness (3.93±0.11 N) compared to T₁C (4.52±0.94 N, 3.14±0.78 N, 3.39±0.85 N) and T₁S (3.38±0.05 N, 2.32±0.04 N, 2.51±0.04 N). T₁S showed comparatively good textural attributes, particularly during early storage. The control exhibited significantly higher lightness (64.29±0.38) and yellowness (18.80±0.35) compared to T₁C (59.93±0.64 L*, 17.68±0.22 b*) and T₁S (54.96±0.63 L*, 14.68±0.20 b*). Redness increased during storage in all treatments and was significantly higher in T₁C and T₁S than in the control during 28 days storage. TPC and yeast and mold count increased significantly during storage. However, T₁S maintained lower microbial counts at day 28 compared to the control and T₁C. Water holding capacity decreased significantly during storage in all treatments, where T₁S maintained significantly higher value (77.00±0.50%) on the day 28 of storage compared to the control (74.00±0.50%). DPPH inhibition was significantly higher in T₁S (56.29±0.76%) and T₁C (55.47±0.62%) than the control (15.34±0.50%), despite a decline during storage. Overall, the findings indicate that the hibiscus extract and cinnamon bark powder enriched chicken sausage under sous vide processing improves overall quality and storage stability compared to conventional techniques.

Keywords: Chicken sausage, *Cinnamomum zeylanicum*, *Hibiscus rosa sinensis*, sous vide processing

Investigating the role of selected additives in minimizing batch-to-batch variations in set-yoghurt and enhancing the stability during storage

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Yoghurt; a major product in processed dairy market, Sri Lanka; however, small-scale manufacturers frequently experience batch-to-batch and storage-related quality variations that reduce consumer acceptance due to inconsistencies in flavor, acidity, texture, and syneresis during refrigerated storage. This study investigated formulation-based strategies to enhance sensory, physicochemical stability of set yoghurt and minimize production variability. A preliminary survey revealed; approximately 80% of small-scale manufacturers face significant quality inconsistencies. Three raw milk batches from a selected resource company were analyzed for proximate and physicochemical properties. Stabilizers; pectin, carboxy methyl cellulose (CMC), and carrageenan were incorporated respectively at 0.3 percent and evaluated over 21 days of refrigerated storage for physicochemical (pH, total soluble solids-TSS, lactic acid %, syneresis %), textural, microbiological (total plate count), sensory, and diacetyl equivalent parameters. Best formulations were further optimized using varying concentrations of milk solids (1.5%, 3.0%, 4.5%), calcium chloride (0.01%, 0.03%, 0.05%). Raw milk composition remained within acceptable ranges: water (85–87%), protein (3.2–3.8%), fat (3.7–4.4%), ash (0.7–0.8%), lactose (4.8–4.9%), pH (6.4–6.8), lactic acid (0.13–0.20%), dry matter (11.5–13.5%), and specific gravity (1.027–1.034), with slight variation in TSS. Pectin (0.3%), CMC (0.3%) demonstrated superior stability compared to control. Optimized formulation containing 0.3% pectin, 1.5% milk solids, and 0.01% calcium chloride maintained pH 4.23, TSS 23.0, lactic acid 0.90% (bottom layer), hardness 0.57 N, cohesiveness 0.61 N, gumminess 0.35N, chewiness 0.37 N, syneresis 8.50%, total plate count 7.795 logCFU/g, and diacetyl equivalent 4.895 by day 21, with higher overall sensory acceptability compared to control and most preferred commercial yoghurt samples. The findings conclude: optimized formulation effectively reduced inconsistency within the yoghurt, controlled post-acidification, minimized syneresis, improved textural integrity, enhanced flavor stability, offering a practical solution to improve product consistency over storage for small-scale yoghurt manufacturers in Sri Lanka.

Keywords: Batch-to-batch variation, pectin, set yoghurt, small-scale, storage stability

Acknowledgement: Gratitude to Rich Milk Products, Dankotuwe for providing raw materials

8th April 2026, Faculty of Livestock, Fisheries & Nutrition, Wayamba University of Sri Lanka

Impact of ultra-high temperature processing on the functional properties of coconut water and the potential of pomegranate extract for property restoration

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Coconut water is widely valued for its refreshing qualities and high nutritional content. This study investigated nutrient and functional property losses in coconut water following ultra-high temperature (UHT) treatment and evaluated the potential of pomegranate extract to restore these losses. Coconut water samples collected from the stages of the industrial process (raw coconut water, stored under 4 °C, pasteurized, UHT-treated) were analysed for vitamin C, total phenolic content (TPC), and antioxidant activity. To replace any losses in functional properties, pomegranate (*Punica granatum L.*) extract was incorporated into coconut water at varying concentrations (5%, 15%, 25% and 45%), followed by autoclaving for 33 min. Enriched samples were evaluated for the same parameters, and a sensory evaluation was conducted to assess consumer acceptance of the pomegranate-enriched sample. Data were analysed using one-way ANOVA, and significant differences ($p < 0.05$) were observed among samples for vitamin C, TPC, and antioxidant activity. UHT-treated coconut water exhibited complete degradation of vitamin C (0 ppm), markedly reduced TPC (1.795 mg GAE/100 mL), and the lowest antioxidant activity, indicated by the highest IC₅₀ value (23.41 mg/mL). Following enrichment with pomegranate extract, the highest TPC was observed in the sample containing 45% pomegranate extract (16.607 mg GAE/100 mL), and the strongest antioxidant activity was demonstrated by the 25% enriched sample, as indicated by the lowest IC₅₀ value (1.453 mg/mL). Sensory evaluation revealed a clear preference for the pomegranate-enriched sample, with 15 out of 20 trained panellists ranking it higher in overall acceptance compared to the commercially available UHT-treated coconut water. These findings confirm that UHT processing significantly reduces the nutritional and functional properties of coconut water, and that incorporating pomegranate extract can effectively restore functional quality.

Keywords: Coconut water, nutrient restoration, nutrient degradation, pomegranate extract, ultra-high temperature processing

Acknowledgement: Sincere appreciation is extended to Mr. S. Amarasiri and Consolidated Business System (pvt) Ltd.

Effect of different foam-mat drying methods on quality attributes of Tom EJC mango powder

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High postharvest losses of Tom EJC mangoes in Sri Lanka highlight the need for effective, nutrient-preserving value addition strategies to stabilize markets and support farmer livelihoods. This study compared the effects of foam-mat hot air drying (FMDH), foam-mat microwave drying (FMMD), and foam-mat freeze drying (FMFD) on the physicochemical, bioactive, and sensory properties of mango powder. To maintain structural stability during dehydration, mango pulp was converted into a stable foam using 10% egg albumin as a foaming agent and a 15% stabilizer mixture of maltodextrin and gum Arabic. Statistical analysis showed significant differences ($P < 0.05$) among the drying methods for all quality parameters. FMFD was the most effective in preserving bioactive compounds, retaining the highest levels of vitamin C (72.78 ± 2.39 mg/100g), β -carotene (7.16 ± 0.17 mg/100g), and total phenolic content (83.54 ± 2.73 mg GAE/100 g), resulting in highest antioxidant activity ($91.92 \pm 1.34\%$). In comparison, FMDH and FMMD led to significant losses of these heat-sensitive compounds due to thermal and oxidative stress. From a physicochemical perspective, FMFD produced mango powder with the lowest moisture content ($4.01 \pm 0.06\%$) and superior solubility ($85.7 \pm 0.799\%$), facilitating rapid reconstitution. Although FMFD recorded the highest color and aroma scores, sensory evaluation showed no significant difference ($P > 0.05$) in overall consumer acceptability compared to FMDH, indicating that FMDH is a practical, cost-effective alternative. Overall, foam-mat freeze drying is recommended as the optimal technology for producing nutritionally rich, high-quality mango powder, while FMDH provides a viable option for large-scale commercial applications.

Keywords: Bioactive compounds, colour, organoleptic, quality attributes, value addition

Acknowledgement: Financial assistance was provided by the Australian Centre for International Agricultural Research (ACIAR), Grant No. CS/2020/193 is gratefully acknowledged.

Comparison of caffeine content in different tea grades and extraction and purification of caffeine for potential applications

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Caffeine is a naturally occurring bioactive alkaloid in tea, influences its functional and industrial value, and this study compared the caffeine content and extractable yield of six black tea grades (Orange Pekoe A (OPA), Flowery Broken Orange Pekoe (FBOP), Flowery Fannings-1 (FF-1), Dust-1, Broken Orange Pekoe 1A (BOP 1A), and Broken Mixed (BM)) for potential applications. Ten grams of oven-dried tea were brewed in distilled water, alkalised with sodium carbonate, and subjected to liquid-liquid extraction using dichloromethane. The organic layer was washed sequentially with 10% sodium hydroxide and saturated sodium chloride solutions, and the solvent was evaporated to obtain crude caffeine. Quantification was performed using UV-visible spectrophotometry at 272 nm, with a calibration curve in methanol ($R^2 = 0.99$). The mean caffeine content ranged from 33.86 ± 0.72 mg/10g in OPA to 59.20 ± 1.38 mg/10g in FBOP, with in-between values for Dust-1 (42.04 ± 2.05 mg/10g), BM (49.85 ± 1.58 mg/10g), FF-1 (51.59 ± 0.72 mg/10g), and BOP 1A (51.72 ± 1.95 mg/10g). One-way ANOVA indicated significant differences among tea grades ($p < 0.001$), with FBOP showing the highest and OPA the lowest caffeine content. To obtain 71.9 mg of caffeine, the typical content of a 250 mL energy drink, approximately 21.23 g of OPA, 12.14 g of FBOP, 13.94 g of FF-1, 17.10 g of Dust-1, 13.90 g of BOP 1A, or 14.42 g of BM would be required. These findings indicate that FBOP is most suitable for natural caffeine extraction in functional beverage development compared with other tea grades.

Keywords: Black tea, caffeine, dichloromethane extraction, tea grades, UV-visible spectroscopy

Acknowledgement: Gratitude is extended to Gold Buds Tea Factory for providing the tea samples necessary for this study. Appreciation is also given to Wayamba University of Sri Lanka for offering institutional support and laboratory facilities that enabled the successful completion of this research.

Development of freeze-dried lime (*Citrus aurantifolia*) juice powder and evaluation of its quality attributes

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Lime is a major agricultural citrus fruit in Sri Lanka. However, it is seasonal and suffers from large post-harvest losses during peak seasons. This study evaluated freeze-drying as a non-thermal preservation technique to produce shelf-stable lime juice powder, comparing it with fresh lime juice and conventionally dehydrated lime powder. Fresh mature limes were processed into fresh juice, freeze-dried juice powder and dehydrated powder, and the samples were analysed for physicochemical, nutritional, functional, microbiological and sensory attributes using standard analytical methods. Freeze-dried lime juice powder exhibited a higher moisture content ($8.27 \pm 0.12\%$), while maintaining pH (2.39 ± 0.07), titratable acidity ($7.82 \pm 0.13\%$), total soluble solids (6.63 ± 0.15 °Brix) and vitamin C content (0.33 ± 0.00 mg/100 mg) at levels statistically comparable to fresh lime juice. Colour measurements confirmed superior colour retention in freeze-dried powder. Bulk and tapped density values were lower in freeze-dried samples, reflecting a porous structure, whereas dehydrated powder showed higher solubility and product yield. Fresh lime juice exhibited a lower total phenolic content of 0.56 mg GAE/g, while freeze dried lime juice powder showed a significantly higher value of 1.57 mg GAE/g. Freeze-dried lime juice powder showed stronger antioxidant activity (IC₅₀ 38.36 µg/mL) compared to fresh juice (IC₅₀ 46.28 µg/mL). The microbial count was minimal in the freeze-dried powder, and no significant differences in selected sensory properties were detected between the freeze-dried powder and fresh juice ($p > 0.05$). Overall, freeze drying produced a lime juice powder that most closely resembled fresh lime juice in quality attributes while providing improved shelf stability, indicating its potential as a value-addition strategy to reduce post-harvest losses and enhance utilisation of seasonal lime production in Sri Lanka.

Keywords: Antioxidant activity, freeze drying, lime juice powder, post-harvest loss, vitamin C

Development and quality evaluation of a margarine formulated with blends of coconut (*Cocos nucifera*) oil, avocado (*Persea americana*) oil, and pumpkin (*Cucurbita maxima*) seed oil

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This study formulated and evaluated a margarine from locally available coconut oil (CO), avocado oil (AO), and pumpkin seed oil (PSO) to assess their potential for producing a healthier product. Three formulations were prepared using CO, AO, and PSO at different ratios: 80:10:10 (F1), 70:20:10 (F2), and 60:20:20 (F3). These products were then evaluated for acceptance. The most accepted formulation (F1) and a commercial coconut-based margarine (control) were analyzed for chemical properties (fatty acid profile, peroxide value (PV), free fatty acids (FFA), and proximate composition), physical properties (color, texture, slip melting point (SMP), and polymorphic form), and functional properties (total phenolic content). Microbiological safety (total plate count (TPC) and yeast and mold count (YMC)) and shelf life were also determined. The data were analyzed using the t-test and the Friedman test ($p < 0.05$). There was no significant difference ($p > 0.05$) between the developed and commercial margarines in total SFA, MUFA, and PUFA, but the developed margarine had significantly lower palmitic acid (15.52±0.56% vs. 19.87±0.64%), and slightly higher PUFA content (17.25±0.98% vs. 18.47±0.66%). The developed margarine had a higher total phenolic content (0.092 vs. 0.048 mgGAE/g) compared to the commercial margarine. The PV (8.79±0.46 meqO₂/kg) and FFA (0.21±0.006%) of developed margarine were within acceptable limits. The developed margarine had a desirable β' crystal form and texture, but its SMP (25.67°C) was lower than that of the commercial sample (31°C). Proximate composition showed 84.32±0.06% fat and 13.11±0.03% moisture, which were within the standards. Microbiological quality was acceptable (TPC < 1×10⁴ CFU/g; YMC < 1×10³ CFU/g), and the refrigerated shelf life was estimated as 15 weeks. Sensory evaluation showed no significant difference in overall acceptability between the developed and commercial margarines, though color and melting characteristics differed significantly ($p < 0.05$). Good quality, nutritious margarine can be produced from locally available oils, including coconut, avocado, and pumpkin seed oils.

Keywords: Fatty acid composition, microbiological quality, plant oil blend, sensory quality evaluation

8th April 2026, Faculty of Livestock, Fisheries & Nutrition, Wayamba University of Sri Lanka

Sri Lankan Pumpkin (*Cucurbita maxima*) Peel as a Source of Functional Dietary Fiber: Extraction, Physicochemical Characterization and In Vitro Prebiotic Evaluation

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Pumpkin peel, a major processing waste in Sri Lanka is considered a potential source of dietary fibre (DF). This study aimed to extract dietary fibre from the peel of three Sri Lankan pumpkin (*Cucurbita maxima*) varieties (Batana, Melboro, Rajah), characterise their physicochemical properties, evaluate their *in vitro* prebiotic potential, and develop a synbiotic yoghurt formulation to enhance probiotic viability. Dietary fibre was extracted from pumpkin peel using a modified ultrasound-assisted method and analysed for physicochemical properties. The *in vitro* prebiotic potential of pumpkin peel dietary fibre was evaluated using the probiotic strain *Lactobacillus rhamnosus*, with inulin as the reference standard. The selected fibre with the highest prebiotic activity was incorporated into probiotic yoghurt at 0.5%, 1%, 1.5% and the resulting formulations were evaluated. Analysis revealed that Rajah exhibited the highest total dietary fibre content ($56.60 \pm 0.63\%$). Batana insoluble dietary fibre (IDF) showed superior water holding capacity (WHC) ($20.74 \pm 0.23\text{g/g}$) and oil holding capacity (OHC) ($6.52 \pm 0.71\text{g/g}$), while soluble dietary fibre (SDF) recorded the highest water swelling capacity and water solubility index ($66.41 \pm 0.51\%$) ($p < 0.05$). *In vitro* evaluation showed that Batana SDF effectively promoted the growth of *Lactobacillus rhamnosus*, performing comparably to inulin. Accordingly, Batana fibre was incorporated as a prebiotic into probiotic yoghurt where the 1.5% formulation significantly enhanced WHC, viscosity, color (b^* value), and textural properties, while maintaining significantly higher *Lactobacillus* counts ($8.99 \pm 0.02 \log \text{CFU/g}$) compared to control ($7.60 \pm 0.03 \log \text{CFU/g}$) during 14 days of storage ($p < 0.05$). In conclusion, Sri Lankan pumpkin peel fibres, particularly Batana SDF and IDF, demonstrate strong prebiotic potential and functional applicability in the development of synbiotic yoghurt. Their incorporation enhances product quality and probiotic stability, highlighting pumpkin peel as a sustainable ingredient for value-added functional foods.

Keywords: Dietary fibre, prebiotic, pumpkin peel, Sri Lanka, yoghurt

Acknowledgement: We gratefully acknowledge Landmark Agro Seeds (Pvt.) Ltd., Pannala Road, Dankotuwa, Sri Lanka, for providing the pumpkin peel samples.

Effect of germination and fermentation on the functional, physical, and nutritional properties of Mung beans (*Vigna radiata*) for functional food applications

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Mung beans (*Vigna radiata*) are rich in nutrients and bioactive compounds such as phenols, flavonoids, and peptides. However, the presence of antinutritional factors reduces their nutrient bioavailability, and few studies have examined the effect of bioprocessing on them. This study examines the effects of germination, fermentation, and combined germination with varying fermentation periods on functional, physical, and nutritional properties of mung beans to enhance their use in functional food applications. Six treatment groups were prepared: raw mung beans, germinated mung beans (48 h), fermented mung beans (48 h), germinated mung beans (48 h) followed by fermentation for 48 h, 72 h, and 120 h. The phytate and tannin contents (anti-nutritional factors), total phenolic and flavonoid content, anti-inflammatory activity, α -amylase and amyloglucosidase inhibitory activities (anti-diabetic properties), Physical properties (water holding capacity (WHC), oil holding capacity (OHC), emulsifying activity (EA), emulsifying stability, water solubility index, foaming capacity, foaming stability), *in vitro* protein digestibility, and iron bioaccessibility were evaluated for all the samples. Fermentation reduces phytates and tannins (0.721 g/100 g) compared to germination, while improving the bioactive compounds, anti-inflammatory properties (24.84%), anti-diabetic properties, and iron bioaccessibility. Germination has higher physical properties and protein digestibility (63.33%) compared to fermentation. The combined germination and fermentation treatments have significantly higher ($p < 0.05$) phenolic and flavonoid contents, anti-inflammatory and anti-diabetic properties, *in vitro* protein digestibility, and iron bioaccessibility, while reducing the anti-nutritional factors. The WHC, OHC, and EA increased with combination treatment; however, they decreased with prolonged fermentation. The malted drink from germinated (48 h) and fermented (120 h) mung bean flour showed higher antidiabetic properties and protein bioavailability than the commercial product, though its physical properties require improvement. In conclusion, germination, fermentation, and combined germination and fermentation are effective strategies to improve the functional, physical, and nutritional properties of mung beans while reducing the anti-nutrient factors.

Keywords: Anti-nutrients, bioactives, fermentation, germination, mung beans

8th April 2026, Faculty of Livestock, Fisheries & Nutrition, Wayamba University of Sri Lanka

Development and evaluation of bio-based filter system using food and agricultural waste

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Large quantities of food and agricultural waste are generated worldwide. The accumulated waste are discarded without proper utilization, leading to environmental concerns. Conventional wastewater treatment systems are often expensive and impractical for household-level application, particularly in developing countries. This research aimed to develop a low-cost filter column as an alternative method to valorize waste materials. (egg shell, corn cobs, orange peels, rice husks and matured ridge gourds) by converting them into a functional filtration system. Two multi-layered filter columns were developed with different layer heights. Known concentration of synthetically developed domestic wastewater was allowed to pass through the filter columns at a lower and higher concentration level. Water quality experiments were conducted separately for Column 1(C1) and Column 2(C2) to evaluate the filtration performance. Both columns were packed with the same filter materials; however, the layer heights of corn cobs, rice husks, and orange peel activated charcoal varied between the two columns. Both developed filter columns improved the quality of wastewater. At the lower concentration level of wastewater, C1 showed complete removal of carbonates and bicarbonates (100%), significant reduction in oil and grease (90.66%) attributed to the increased amount of corn cobs used in the C1 while C2 achieved greater phosphate reduction (55.4%) than C1, with respect to the higher amount of orange peel activated charcoal. At the higher concentration level, C1 showed complete removal of carbonates (100%), significant reduction in total suspended solids (56.08%) and total solids (76.09%) than C2, while C2 achieved greater phosphate reduction (64%) than C1. Reductions in sulfate were not statistically significant ($p>0.05$) in either columns. Overall, C1 demonstrated better performance, showing acceptable results within permissible limits of irrigation water standards. Combination of food and agricultural waste can be converted into a low-cost filtration system for domestic wastewater treatment.

Keywords: Domestic effluents, filter system, waste valorization, water quality

Comparison of matcha developed from Sri Lankan up-country and low-country tea with authentic Japanese matcha

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Matcha is a finely ground green tea produced from shade-grown tea leaves (*Camellia sinensis* L.) and has gained significant global attention for its unique cultivation methods and distinctive phytochemical composition. Sri Lanka possesses suitable agroclimatic conditions for tea cultivation; however, the country largely depends on imported matcha, and limited scientific evidence is available on locally developed matcha. Therefore, this study aimed to develop matcha from Sri Lankan up-country and low-country tea leaves and to compare its physicochemical and bioactive properties with authentic Japanese matcha. Tender leaves were subjected to pre-harvest shading for four weeks, followed by steaming, drying, sorting, stone grinding, and sieving to obtain matcha powder. Physicochemical properties, including instrumental color measurement ($L^*a^*b^*$), water-holding capacity, water-solubility index, pH, foaming capacity, foam stability, and crude fiber content, were evaluated. Bioactive properties, including total phenolic content, total flavonoid content, total chlorophyll content, vitamin C content, antioxidant activity (DPPH assay), and total antioxidant capacity (phosphomolybdenum assay), were determined. *Japanese matcha exhibited significantly higher greenness (a^*) and chlorophyll content* compared to the Sri Lankan up-country and low-country samples ($p < 0.05$). Sri Lankan samples demonstrated significantly higher water-holding capacity, whereas Japanese matcha showed superior water-solubility index, foaming capacity, and foam stability ($p < 0.05$). Low country matcha recorded the highest total phenolic content (70.63 mg GAE/g of dry weight), total flavonoid content (81.10 mg CE/g of dry weight), vitamin C content (36.63 mg/g of dry weight), antioxidant activity (453.81 mg TE/g of dry weight), and total antioxidant capacity (357.14 mg AAE/g of dry weight). The findings indicate that Sri Lankan matcha has the potential for high-quality production using locally grown tea leaves, especially with further improved shading and optimized processing.

Keywords: Antioxidant capacity, bioactive compounds, matcha, physicochemical properties, Sri Lankan tea

Effect of Cowpea (*Vigna unguiculata* (L.) Walp.) protein and its hydrolysates on the *in vitro* digestibility and physicochemical properties of corn starch

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Clarifying the interactions between food components is critical in designing carbohydrate-based foods with reduced digestibility. Plant proteins are increasingly recognized as functional ingredients that can modify starch structure and digestion behaviour through physicochemical and biochemical interactions. This study investigated how cowpea protein and its enzymatic hydrolysates (20% protein/protein hydrolysates based on the weight of corn starch) alter the physicochemical and digestibility properties of gelatinized corn starch (control), evaluating for swelling power, viscosity, leached amylose, enzyme inhibition (α -amylase and amyloglucosidase) and *in vitro* starch digestibility, which was assessed by determining rapidly digestible starch (RDS), slowly digestible starch (SDS), and resistant starch (RS) fractions. Cowpea protein (CP) extracted at pH 9.0 was hydrolysed by pepsin (PepCP) and pepsin-pancreatin (PepPanCP) to obtain protein hydrolysates. Results showed that incorporation of protein/protein hydrolysates significantly increased viscosity and reduced swelling power and amylose leaching compared with the control, suggesting the formation of starch–protein interactions. Leached amylose content decreased significantly ($p < 0.05$), with the lowest value observed in the corn starch-PepPanCP system (Treatment 3), declining from $10.37 \pm 0.13\%$ in the control to $7.79 \pm 0.15\%$. The content of rapidly digestible starch in the corn starch-CP system (Treatment 1) decreased from $87.36 \pm 0.58\%$ to $80.81 \pm 0.80\%$, and RS increased from $6.48 \pm 0.64\%$ to $10.55 \pm 1.19\%$. Enzyme inhibition assays showed significant differences ($p < 0.05$), with PepPanCP exhibiting the highest amyloglucosidase inhibition ($18.03 \pm 0.70\%$), while PepCP and PepPanCP exhibited comparable α -amylase inhibition levels that were significantly higher than CP. However, overall inhibition at 10 mgmL^{-1} was moderate, indicating that reduced starch digestibility was primarily due to structural modifications rather than to strong direct enzyme inhibition. These findings suggest that cowpea protein (and its hydrolysates) reduce enzymatic accessibility to starch by forming a physical and/or biochemical barrier, thereby modulating predicted glycaemic behaviour.

Keywords: Cowpea protein, corn starch digestibility, hydrolysates, starch–protein interaction
8th April 2026, Faculty of Livestock, Fisheries & Nutrition, Wayamba University of Sri Lanka

Development of thermally stable, high protein chocolate using whey protein isolate and cocoa butter fractionation

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Chocolate has a potential for field and athletic applications due to its energy density and extended shelf life. Personnel in the military and sports nutrition sectors require convenient foods with high protein and low sugar levels to perform under demanding conditions. Thermal stability of chocolates is a limitation in variable environmental conditions. Therefore, this study aimed to develop a high-protein, low-sugar chocolate and to evaluate the influence of protein incorporation and cocoa butter fractionation on its thermal stability. Six chocolate formulations were developed with two protein levels (18% protein & 7% sugar; 25% protein & 0% sugar) using whey protein isolate, combined with three cocoa butter fractions (normal, high, and low melting point) obtained by centrifugation based fractionation (13,000 rpm, 30 min). Developed formulations were evaluated for heat resistance (penetrometer) and snap characteristics (at specific temperatures). Sensory properties were evaluated by a semi-trained panel (n=29). The effect of two protein levels on thermal stability was comparatively marginal ($p=0.056$) whereas the cocoa butter fractionation exhibited a significant effect on thermal stability ($p<0.05$). Samples containing fractionated butter did not change its initial melting characteristic at elevated temperatures (25°C to 28°C) depicted by snap test ($p>0.05$). Snap quality decreased with increasing temperature, in samples containing normal melting point butter fractions ($p<0.05$). Sensory evaluation indicated that 18% protein containing formulations were preferred for resistance to fingerprinting and even-melting inside the mouth ($p<0.05$). The 25% protein samples incorporated with high melting point butter showed improved surface gloss ($p<0.05$) during sensory characterization. Cocoa butter fractionation was identified as the dominant factor of governing heat resistance compared to protein levels in high-protein chocolate formulations. Therefore, optimizing the fat phase composition is important for developing thermally stable, high protein chocolates suitable for military and sports nutrition applications.

Keywords: Cocoa butter fractionation, field applications, high protein chocolate, thermal stability, whey protein isolate

Functional, structural, and digestibility characteristics of starch from Kekatiya (*Aponogeton crispus*) tubers

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The demand for alternative starch sources drives the characterization of under-utilized tubers. Information on the starch properties of Kekatiya (*Aponogeton crispus*) tubers remains limited. This study extracted and characterized starch from Kekatiya tubers to evaluate its structural, functional, and *in vitro* digestibility properties for potential food applications. Starch was isolated by wet milling and sedimentation, and yield was determined. Proximate composition was analyzed to assess starch purity, followed by structural, functional, and digestibility evaluations. Flour and starch yield were $32.14 \pm 2.48\%$ and $20.06 \pm 1.48\%$, respectively. Scanning electron microscopy revealed irregular, clustered granules with high surface area. Fourier-transform infrared spectroscopy confirmed characteristic hydroxyl ($-OH$) stretching (3280.02 cm^{-1}) and glycosidic ($C-O-C$) linkages ($1013.50 - 1150.68 \text{ cm}^{-1}$), while X-ray diffraction indicated A-type crystallinity. Functional analysis showed water and oil absorption capacities of 1.57 ± 0.04 and $0.73 \pm 0.04 \text{ g/g}$, a least gelation concentration of $\sim 6\%$, and high paste viscosity ($13,559.70 \pm 908.5 \text{ cP}$), indicating strong thickening ability. Amylose content was $17.7 \pm 1.5\%$. *In vitro* digestibility was dominated by rapidly digestible starch ($65.95 \pm 2.09\%$), followed by slowly digestible ($22.45 \pm 1.03\%$) and resistant starch ($11.59 \pm 1.24\%$). Swelling power increased with temperature, whereas paste clarity decreased during storage due to retrogradation. The functional performance of *A. crispus* starch suggests its suitability for thickening applications in food systems. The relatively low resistant starch content indicates the need for modification strategies to enhance applicability in health-oriented products. Overall, *A. crispus* starch demonstrates promising potential as an alternative tuber starch for food use.

Keywords: *Aponogeton crispus*, functional properties, structural properties, digestibility, tuber starch

Extraction and functional characterization of okra (*Abelmoschus esculentus*) mucilage as an edible coating in post-harvest chili (*Capsicum annuum*) preservation

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Okra (*Abelmoschus esculentus*) mucilage is a viscous, polysaccharide-rich liquid with proven nutritional and functional benefits. This study evaluated the physicochemical and functional properties of the mucilage extracted from three okra varieties (Haritha, MI-5 and F1 Hybrid) available in Sri Lanka and assessed its application as an edible coating for the post-harvest preservation of chilies. Following aqueous extraction, mucilage powder was evaluated for physical (density, pH, color), chemical (FTIR analysis, total phenolic (TPC), flavonoids and antioxidant activity) and functional properties (water absorption capacity (WAC), oil absorption capacity (OAC), anti-inflammatory and antimicrobial properties). The yield of the mucilage ranged 0.34- 0.75 g/100 g and the highest yield recorded by F1 hybrid variety. Physicochemical analysis of mucilage revealed pH values of 5.14- 6.70 with bulk and tapped densities, ranging from 0.47–0.61 g/mL and 0.54–0.80 g/mL respectively. Functional properties showed that MI-5 variety possessed the highest WAC (896.7±0.70%), while F1 Hybrid variety showed higher OAC (180.55±0.63%). Bioactive compounds identification revealed that MI-5 as the most effective variety by yielding the highest TPC (83.15±0.73 mg GAE/g), flavonoid content (13.55±0.65 mg CE/g) and DPPH radical scavenging activity (67.54±0.73%). Furthermore, MI-5 mucilage exhibited strong anti-inflammatory activity (74.17±0.74%) and antibacterial inhibition against *Staphylococcus aureus*. The edible coating prepared using two treatments T2 and T3 (1% and 1.5% w/v respectively) were applied on chilies and evaluated over storage period. The tested concentrations effectively preserved the qualitative attributes of the chilies and T2 was able to balance moisture retention and appearance, showing significantly lower ($p<0.05$) weight loss (4.33±0.11%). In contrast, T3 effectively preserved both textural firmness and color. Furthermore, mucilage extracted from MI-5 demonstrated good functional properties, indicating strong potential for use in various food systems. These results suggest that okra mucilage serves as a multi-functional biopolymer suitable for food preservation applications.

Keywords: Edible coating, functional, mucilage, okra, physiochemical, polysaccharides

Screening plant extracts for coating application to improve microbiological quality of black pepper (*Piper nigrum* L.)

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Black pepper is one of the widely used spices in the world and is prone to microbial contaminations, which lead to food quality and safety concerns. This study focused on investigating the anti-microbial properties of neem (*Azadirachta indica*) leaves, lime (*Citrus aurantiifolia*) leaves, and aloe vera (*Aloe vera* L.) peel extracts and developing an aloe vera gel-based coating incorporated with the strongest extract to improve microbiological quality of black pepper. Agar well diffusion assays were done to select the best extract. Aloe vera gel-based coating with the selected extract was applied to black pepper seeds in two ways: coating just before drying and coating just after drying. Treated and control samples were assessed for microbial quality and physicochemical properties. Total plate counts and yeast and mold counts were determined four times over six weeks at two-week intervals. MPN method for detection and enumeration of *Escherichia coli* and *Salmonella* detection test were performed. Moisture content, total ash content, color analysis and bulk density were determined physicochemical parameters. Neem leaf extract was selected for incorporation in the coating. Coating before drying was most efficient, causing 96.70% reduction of total plate count (4.70×10^4 CFU/g) compared to control (1.41×10^6 CFU/g) and 85% reduction of *E.coli* (3 MPN/g) compared to control (20 MPN/g). Yeast mold counts were not significantly reduced ($p>0.05$), with mean 3.28×10^5 CFU/g compared to control (1.70×10^5 CFU/g). All samples were *Salmonella* negative. Coating did not significantly affect ($p>0.05$) total ash (4.55%, 4.40%, 4.39%), bulk density (336.18, 395.19, 392.82 g/L), and color attributes. Coated-before-drying sample exceeded International Pepper Community recommended moisture content, indicating the need for optimized drying time. Overall, developed neem extract incorporated aloe vera gel-based coating demonstrated significant potential to enhance microbiological quality of black pepper without affecting key quality parameters.

Keywords: Black pepper, neem extract, aloe vera gel coating, microbiological quality

Utilization of dried bael flowers in alcoholic and non-alcoholic beverages: A comparative study on health-promoting potential

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Dried flowers of *Aegle marmelos* (L.) Corr., recognised for their phenolic-rich composition and reported inhibitory activity against low-density lipoprotein (LDL) cholesterol oxidation, represent a promising botanical source for functional beverage development targeting oxidative stress-related non-communicable diseases. This study aimed to develop alcoholic and non-alcoholic beverages from Bael flower extracts and to comparatively evaluate their physicochemical properties, retention of bioactive compounds, antioxidant efficacy, microbiological safety, and sensory acceptability. The fermented beverage was prepared using *Saccharomyces cerevisiae* and allowed to ferment for eight weeks, while the carbonated beverage was formulated using Bael flower extract, honey, ginger, and controlled carbonation (2.5 volumes CO₂), without fermentation. The physicochemical properties, including pH, titratable acidity, total soluble solids, alcohol content, density, and colour, were evaluated. Retention of key bioactive compounds was determined by measuring total phenolic content (TPC) using the Folin–Ciocalteu method, total flavonoid content, and antioxidant activity through the 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging assay. Microbial stability was assessed using total plate count and yeast and mould counts. The final fermented beverage recorded a pH of 3.23, alcohol content of 12% (v/v), and TPC of 2346.00 µmol GAE/ml, with a maximum phenolic enhancement of 3606.00 µmol GAE/ml observed during fermentation. A strong positive correlation was observed between TPC and DPPH inhibition ($r = 0.940, p < 0.001$). The carbonated beverage maintained 0% alcohol with a pH of 5.49 and retained 1108.00 µmol GAE/ml, demonstrating 60.13% radical scavenging activity with lower IC₅₀ values, indicating effective antioxidant preservation. Both beverages exhibited microbial counts below detectable limits ($< 1.0 \times 10^2$ CFU/mL) and achieved high sensory acceptability scores (4.35 ± 0.67 and 4.35 ± 0.68 , respectively). These findings demonstrate the feasibility of incorporating Bael flower extracts into alcoholic and non-alcoholic beverage systems while retaining functional phytochemicals with potential cardioprotective relevance.

Keywords: *Aegle marmelos*, antioxidant activity, carbonated beverage, fermentation, LDL oxidation

Effect of gamma irradiation on the stability of bioactive compounds and microbial quality of selected spices: (*Capsicum annum*, *Curcuma longa*, *Piper nigrum*)

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Spices such as chilli (*Capsicum annum*), turmeric (*Curcuma longa*), and black pepper (*Piper nigrum*) are popular exports in Sri Lanka. Yet, they remain susceptible to degradation of microbial, functional, and sensory quality during handling. Gamma irradiation is a cold sterilization technique to ensure microbiological safety while preserving nutritional integrity. This study aimed to evaluate the impact of drying methods and gamma irradiation doses on the microbial quality, bioactive stability, and sensory attributes of these selected spices. Sun-dried and oven-dried samples were subjected to gamma irradiation at doses of 2, 4, and 6 kGy. Microbial safety was evaluated through Yeast and Mold Count using serial dilution. Total polyphenol content, Antioxidant Activity, Vitamin C, and Free Fatty Acid (FFA) levels were conducted to determine chemical stability. A sensory evaluation was performed to compare the aroma intensity of chilli and pepper. At 2 kGy, microbial loads in sun-dried turmeric fell from 1.08 ± 0.06 log CFU/g to undetectable levels, whereas chilli and pepper counts remained at 3.65 ± 0.1 and 2.14 ± 0.14 log CFU/g, respectively. Total polyphenols increased across all spices and doses, irrespective of the drying method. Vitamin C content decreased after oven-drying (4.65 ± 0.24 to 3.87 ± 0.15 mg/g) and after 6 kGy irradiation (6.69 ± 0.13 to 4.8 ± 0.35 mg/g) in Turmeric. FFA levels increased with all irradiation doses across the spices, and after oven-drying (3.08 ± 0.05 to 6.25 ± 0.16 mg/g in Pepper). Aroma intensity in chilli and pepper declined following both oven-drying and irradiation. Findings confirm that while turmeric requires low irradiation doses for sterilization, chilli and pepper necessitate higher doses to achieve complete microbial reduction. Customized irradiation doses should be applied to each spice type to achieve microbial compliance while optimally preserving bioactive compounds and sensory quality.

Keywords: Antioxidant activity, aroma intensity, bioactive compounds, gamma irradiation, microbial safety

Acknowledgement: The authors would like to acknowledge the Sri Lanka Gamma Center for providing the irradiation facility required for the research

A consumer-friendly non-destructive mobile-based tool to predict the ripeness of TomEJC mango

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Mango is one of the most popular tropical fruits worldwide, yet consumers often struggle to identify the perfect stage of ripeness. This challenge is particularly evident in *Mangifera indica* (TomEJC variety), which undergoes rapid physicochemical and nutritional changes during ripening. This study was conducted to develop a Smart Mango Ripeness Tracker capable of accurately identifying the ideal consumption stage by monitoring key quality indicators. TomEJC mangoes were stored under ambient conditions and analyzed at regular intervals for peel color, firmness, total soluble solids, titratable acidity, vitamin C, β -carotene and total phenolic content. The data were statistically analyzed using R Studio software to determine significant differences among ripening stages. Firmness declined to approximately 0.5 N on day 7, representing the preferred consumer texture. Sweetness increased and acidity decreased during ripening, resulting in a balanced sugar–acid ratio around days 7–8. Although vitamin C content progressively declined, it remained at a moderate level on day 7, while β -carotene approached near-maximum levels. When all parameters were integrated, day 7 consistently demonstrated the most balanced combination of texture, flavor and nutritional quality. Therefore, the Smart Mango Ripeness Tracker provides a practical, science-based approach to predict optimal ripeness of TomEJC mangoes, ensuring superior eating quality, improved market consistency and reduced postharvest losses. A QR code-based system was integrated into the mango ripeness tracker to enable instant access to ripening stage information and quality parameters through digital scanning. This feature helps with traceability tracking and real-time decision-making in postharvest management. This study highlights the potential of integrating quality indicators into smart monitoring systems to transform varietal-specific ripeness management in the fresh fruit industry.

Keywords: Firmness, mango ripening, peel color, quality monitoring, smart mango ripeness track

Acknowledgement: Financial assistance provided by the Australian Centre for International Agricultural Research (ACIAR), Grant No.CS/2020/193 is gratefully acknowledged.

Development of a nutritionally and functionally enhanced protein-enriched powder from koji-fermented rice fortified with cowpea protein isolate

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Protein-energy malnutrition and the rising demand for sustainable plant-based proteins underscore the need for nutritionally improved and functionally versatile protein ingredients. Rice protein is hypoallergenic and widely accepted but limited by low lysine content and moderate digestibility. Cowpea protein offers complementary amino acids but contains antinutritional factors that can impair bioavailability and sensory quality. This study aimed to develop a nutritionally and functionally enhanced protein-enriched powder by fermenting rice via Solid-State *Koji* fermentation with *Aspergillus oryzae*, followed by fortification with cowpea protein isolate, and to optimize the blend ratio for improved nutritional, functional, and sensory properties. *Koji* fermentation of Rice (*Pachchaperumal*) significantly increased protein content (9.07% to 13.19% dry basis), protein solubility, in vitro digestibility, total phenolic content, water solubility index, foaming capacity, and swelling power, while reducing phytic acid and tannins ($p < 0.05$), indicating enhanced nutritional and functional quality. Amino acid profiling showed increased glutamic acid, alanine, and methionine, with the emergence of essential amino acids such as lysine, arginine, and histidine. Cowpea protein isolate (*Waruni*) was extracted via alkaline solubilization and isoelectric precipitation. Rice–cowpea blends containing 20%, 30%, and 40% cowpea protein were evaluated. Increasing cowpea content raised protein concentration (29.3%, 38.0%, and 43.4%) but reduced sensory acceptability, due to beany flavor indicating a strong negative correlation ($r = -0.80$), while taste, aftertaste, and texture positively influenced preference. Adding cowpea protein enriched essential amino acids like lysine, arginine, cystine, and methionine, while maintaining high levels of non-essential amino acids, improving protein digestibility, and creating a more complete amino acid profile. The 30% rice–cowpea blend provided an optimal balance of protein quality, digestibility, antioxidant activity, functional properties, and consumer acceptability. These results demonstrate that *Koji* fermentation combined with cowpea protein fortification is an effective cereal–legume strategy to produce high-quality, functional protein-enriched powders with improved nutritional and sensory attributes.

Keywords: Amino acid enhancement, cowpea protein isolate, koji fermentation, protein-enriched powder, rice protein

Effect of fermentation, firing and reducing sugar on the sensory and chemical parameters of black tea

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Black tea, produced from *Camellia sinensis*, is the second most consumed beverage in the world. Therefore, enhancing tea colour and functional characteristics through processing modifications is important to maintain the Sri Lankan tea industry's competitiveness. This study investigated the effect of fermentation time, firing temperature and reducing sugar incorporation on the quality of black tea. Fresh leaves were withered, rolled and fermented for 30, 60 or 90 minutes under controlled conditions. Glucose (0%, 2%, 5%, and 8%) was added to 60 minutes treatment before fermentation. Subsequently, the samples were fired at temperatures of 98°C and 120°C. Tea liquor was prepared according to ISO 3103 standard, and colour (chromameter), acidity and antioxidant (DPPH free radical scavenging) activity were evaluated using standard analytical methods. Based on descriptive statistics, developed tea powder had moisture <6%, bulk density around 310 g/1000 mL, antioxidant value around 35 mg AAE/g and liquor dry matter around 0.6 g/100 mL. Fermentation time, firing temperature and reducing sugar had effect ($p<0.05$) on tea powder colour (lightness), while fermentation time was the only factor that affected ($p<0.05$) the colour (lightness) of tea liquor. Liquor dry matter was affected ($p<0.05$) by fermentation time and sugar level. Antioxidant value was affected ($p<0.05$) by fermentation time, firing temperature and reducing sugar levels. This study provides scientific insight for developing value-added black teas with improved sensory and functional properties through sugar incorporation during processing.

Keywords: Antioxidant activity, fermentation of black tea, firing of black tea, glucose incorporation, Millard reaction

Functional fermented probiotic dairy beverage using whey and coconut (*Cocos nucifera*) water

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Whey, a by-product of cheese production, and coconut (*Cocos nucifera*) water (CW) are nutrient-rich substrates that remain underutilized in the food industry, contributing to environmental challenges upon disposal. This study aimed to develop and evaluate a probiotic fermented beverage using whey and CW as a value-added product. The formulation included whey, CW, bee honey, and *Lactobacillus rhamnosus* as the probiotic culture. Preliminary trials were conducted to determine the optimal CW:whey ratios (1:1, 1:3, and 3:1). Four formulations were assessed through sensory evaluation (n = 30), and the carbonated formulation containing *Lactobacillus rhamnosus* was selected as the most acceptable. The selected mixture was pasteurized at 72 °C for 15 seconds, cooled, and inoculated with *Lactobacillus rhamnosus* (0.0116% w/v), followed by controlled fermentation. Bee honey (1.8% w/v) was incorporated as a natural sweetener after fermentation, and the beverage was carbonated (1.5–2.0 volumes) at 4 °C and stored under refrigeration. Physicochemical properties, including pH, titratable acidity, and viscosity, were monitored during storage. The product maintained viable probiotic counts of 10⁷–10⁸ CFU/mL over 21 days at 4 °C, exceeding recommended levels. Proximate analysis revealed moisture (93.72±0.09%), ash (0.33±0.00%), protein (0.14±0.00%), reducing sugar (0.21±0.03%), and fat (0.15±0.05%). The beverage also contained measurable levels of total phenolics (0.193×10⁻²±3.85mgGAE/100g), flavonoids (3.08±0.51mgQE/100ml), and vitamin C (0.553±0.001mg/100g), indicating potential antioxidant benefits. Sensory evaluation showed no significant difference in carbonation perception between fresh and stored samples, while microbiological analysis confirmed product safety. In conclusion, the developed beverage demonstrates probiotic and functional potential while promoting sustainable utilization of dairy by-products.

Keywords: Carbonation, *Lactobacillus rhamnosus*, natural sweetener, physicochemical properties

Evaluation of antimicrobial properties of garcinia sequential extracts for the control of pathogenic bacteria

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Foodborne pathogens remain a major global health concern, particularly due to outbreaks associated with contaminated fresh produce. Fresh leafy vegetables are highly susceptible to microbial contamination, and conventional washing methods may not be sufficient to eliminate harmful bacteria, highlighting the need to explore suitable antimicrobial agents. Due to increasing concerns about the health risks associated with synthetic chemicals, there is growing interest in natural antimicrobial agents, particularly plant derived extracts. This study evaluated the antimicrobial activity of sequential garcinia extracts against pathogenic bacteria and their potential for controlling microbes in food safety. Sun dried garcinia rinds were subjected to polarity guided sequential extraction in the order of hexane, acetone, ethanol, and water, and a composite extract equivalent to the garcinia was prepared by combining the respective fractions. Antibacterial activity against *Escherichia coli* and *Staphylococcus aureus* was determined using the agar well diffusion method at defined garcinia equivalence levels (300, 150, 100, 70, 35, 17.5 mg of garcinia) and dose response relationships were established. Ciprofloxacin intravenous infusion was used as positive control. The best performing extract, acetone, was evaluated for its antimicrobial efficacy against *Escherichia coli* in a lettuce matrix. Among the tested fractions, the acetone extract exhibited the highest antibacterial activity ($p < 0.05$), with maximum inhibition zones of 30.16 mm against *E. coli* and 36.56 mm against *S. aureus*. This study revealed a significant ($p < 0.05$) dose response effect of tested extracts against microbes. In a lettuce washing model, 1% garcinia acetone extract reduced natural microflora by 2.97 log₁₀ CFU/g (99.9%), while 5% extract achieved a 3.27 log reduction (99.95%) ($p < 0.05$). Against inoculated *E. coli*, 1% and 5% acetone extracts reduced counts by 3.77 log (99.98%) and 4.30 log (99.995%), respectively ($p < 0.05$). These findings demonstrate the potential of garcinia as a natural antimicrobial agent for food sanitation applications.

Keywords: Antimicrobial activity, *Escherichia coli*, garcinia, sequential extraction, *Staphylococcus aureus*

Protein extraction from Sri Lankan Duckweed (Family *Lemnaceae*) species and characterization of physicochemical properties for application in nutritional bar texture development

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The global demand for sustainable, nutrient rich plant-based food sources has intensified interest in alternative plant proteins derived from fast growing, underutilized biomass. This study examined the physicochemical properties of protein isolated from three Sri Lankan Duckweed species (*Landoltia punctata* (Lp), *Lemna minor* (Lm) and *Spirodela polyrhiza* (Sp)) to identify the most suitable species for application in development of textural properties of Nutritional bar. Proximate analysis revealed that Lp exhibited the highest crude protein content ($27.81 \pm 0.16\%$) followed by Lm ($21.50 \pm 0.32\%$) and Sp ($17.75 \pm 0.12\%$). Ultrasonication-assisted alkaline extraction process yielded protein extraction efficiencies of $15.63 \pm 3.71\%$ (Lp), $14.52 \pm 1.89\%$ (Lm) and $11.23 \pm 2.53\%$ (Sp). Lm Protein Isolate (LmPI) showed the highest essential amino acid content of 156.10 mg/g, followed by Lp Protein Isolate (LpPI) with 124.21 mg/g and Sp Protein Isolate (SpPI) with 74.12 mg/g. LmPI had the highest leucine (30.42 mg/g) and valine (21.56 mg/g) content, while SpPI showed highest glutamic acid (65.45 mg/g) and aspartic acid (57.58 mg/g) content. Physicochemical characterization showed LmPI with highest oil holding capacity of 4.67 ± 0.32 g/g, an emulsifying activity index of 17.53 ± 0.31 m²/g and an emulsifying stability index of $77.11 \pm 0.70\%$, indicating strong potential for texture and flavour absorption in formulated foods. Antioxidant evaluation showed that LpPI exhibited the highest DPPH radical scavenging rate ($31.41 \pm 1.33\%$) & the highest total phenolic content (4.85 ± 0.10 mg GAE/g), indicating a moderate antioxidative potential. Accordingly, LmPI was identified as best isolate for incorporation in to a Nutritional bar to enhance the both nutritional & textural properties. Significantly textural properties were enhanced with hardness increasing by 19% after 24-hour storage. Sensory evaluation confirmed 7.8 texture acceptability on a 9-point hedonic scale confirming the results. These findings show that among three species, *Lemna minor* Duckweed possesses a favorable physicochemical profile for enhancing the textural properties of Nutritional bar as a sustainable plant-based ingredient as a viable alternative to conventional protein sources in the food industry.

Keywords: Duckweed, plant based proteins, physico-functional properties, ultrasonication assisted extraction

Development of a functional umami-rich ingredient from cowpea: Waruni (*Vigna Unguiculata* L. Walp) using germination-assisted koji bioprocessing

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Cowpea, an underutilized, nutrient-dense legume in Sri Lanka offers potential as a multifunctional additive due to its high protein content. The study investigates a novel bioprocess integrating germination and koji fermentation (*Aspergillus Oryzae*) to produce an umami-rich functional ingredient from cowpea cultivar WARUNI (*Vigna Unguiculata* L. Walp). The effect of germination and fermentation on the functional and nutritional properties of cowpea evaluated by four treatments. T1: 12-hour soaking (12h-S) of cowpea followed by steam blanching for a minute (SB-1min), T2: 12h-S with 48-hour germination (48h-G) followed by SB-1min, T3: 12h-S, mixing with the koji spores in a ratio 5g:15kg Cowpea, 72-hour fermentation (72h-F) followed by SB-1min, T4:12h-S, 48h-G, mixing koji spores in a ratio 5g:15kg Cowpea, 72h-F followed by SB-1min. All samples were dehydrated at 50 °C and ground to 180 µm. Proximate composition, physicochemical and functional properties were analyzed. Fermented treatments T3 and T4 showed significant protein increases by 65.44% and 78.05% respectively, indicating vigorous proteolytic activity by *Aspergillus Oryzae*. Highest titratable acidity the lowest pH shown in T4 confirms acidic conditions. SDS-PAGE confirmed extensive proteolysis in T4, with reduced high molecular weight bands and increased low molecular weight bands. T4 achieved a 14-fold of increase in glutamic acid content, indicating enhanced umami potential. Sensory evaluation confirmed T4 exhibited the highest perceived umami intensity. In conclusion, germination assisted koji fermentation significantly enhanced WARUNI cowpea's functional and sensory properties. This research illustrates a novel sustainable bioprocessing approach to valorize underutilized Sri Lankan cowpea into a high value functional, clean label umami ingredient for plant-based food matrices.

Keywords: Cowpea, fermentation, flavor enhancement, functional food ingredient, germination

Extraction, stabilization and application of anthocyanin extracted from *Melastoma malabathricum* L. (Maha Bovitiya) fruits as a natural food colorant

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The increasing demand for natural food colorants, driven by their health benefits and reduced side effects, has encouraged the exploration of plant-based pigment sources. *Melastoma malabathricum* L. (Maha Bovitiya), widely distributed in Sri Lanka, produces anthocyanin-rich fruits with significant potential as a natural food colorant. However, anthocyanins are highly sensitive to heat, light, and pH, necessitating effective stabilization strategies to preserve their functionality. This study aimed to extract, stabilize, and evaluate the storage stability and application potential of anthocyanins from *M. malabathricum* fruits. Two extraction methods—conventional solvent extraction and ultrasound-assisted extraction were compared, and the method yielding higher anthocyanin content was selected for further analysis. Stabilization was conducted using maltodextrin encapsulation (anthocyanin: maltodextrin ratios of 1:0, 1:1, 1:2, 1:3, 1:4) and catechin copigmentation (anthocyanin: catechin ratios of 1:0, 1:1, 1:3, 1:5). Three samples (control, encapsulated, and copigmented) were stored under four conditions (5°C refrigeration, room temperature dark, room temperature light, and 50°C) for 24 days. Anthocyanin content, retention rate, first-order degradation kinetics (rate constant k and half-life $t_{1/2}$), and total color change (ΔE) were evaluated at 6-day intervals, while sensory evaluation compared natural samples with an artificial colorant. Ultrasound-assisted extraction produced significantly higher ($p < 0.05$) anthocyanin content (417.93 ± 0.617 mg/L) than conventional extraction (170.92 ± 0.508 mg/L). The 1:4 encapsulation ratio showed the highest efficiency ($92.30 \pm 0.40\%$), while the 1:5 copigmentation ratio produced the greatest hyperchromic effect ($47.43 \pm 0.69\%$). Degradation followed first-order kinetics ($R^2 > 0.96$). The refrigerated encapsulated sample showed highest stability ($k = 0.003187 \pm 0.0001 \text{ day}^{-1}$, $t_{1/2} = 217.5 \pm 0.49$ days, $\Delta E = 1.89 \pm 0.333$, retention = $92.79 \pm 0.135\%$). Optimal storage was 5°C. Sensory evaluation ranked copigmented samples highest, while encapsulated samples scored lower due to maltodextrin effects. Industrially, encapsulation at 5°C is recommended for stability, while copigmentation enhances aesthetic appeal. These findings support the transition from synthetic dyes to plant-based alternatives using local botanical resources.

Keywords: Anthocyanin retention rate, anthocyanin stability, copigmentation, encapsulation, sensory evaluation, ultrasound-assisted extraction.

8th April 2026, Faculty of Livestock, Fisheries & Nutrition, Wayamba University of Sri Lanka

Quality characteristics of snack bars formulated with cereal-legume blends and ash plantain flour

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This study aimed to develop a healthy, vegan snack bar to meet the increasing demand for nutritious foods while promoting the use of underutilized ash plantain. The formulation of incorporated unripe ash plantain, finger millet, and chickpea flours with a warmed peanut butter–sorbitol binder to produce a high-protein, low-sugar product and achieve a complete protein profile through cereal–legume complementation. Composite flour blends were prepared by replacing up to 30% of chickpea flour with ash plantain flour, while maintaining finger millet at a constant 25%. The developed snack bars were evaluated for proximate composition, functional and physical properties, sensory characteristics, and shelf-life stability. Major findings showed that increasing ash plantain flour significantly increased moisture and carbohydrate content while reducing crude fat and total energy ($p < 0.05$). Although protein content decreased with reduced chickpea flour, all formulations retained more than 10 g protein per 100 g, supporting a high-protein claim. Functional analysis revealed decreased water absorption capacity and increased oil absorption capacity with ash plantain incorporation ($p < 0.05$). Importantly, only snack bars containing ash plantain achieved sugar levels below 5 g per 100 g, qualifying as low-sugar products. There were no significant differences ($p > 0.05$) in color, texture, taste, aftertaste, and overall acceptability among these low-sugar snack bars. However, treatment-01 (ash plantain: finger millet: chickpea in 4:5:11 ratio) showed higher consumer preference for aroma. Treatment-01 was identified as the optimal formulation, offering desirable functional properties and overall quality. It contained less than 5 g of sugar per 100 g and provided 10 g of protein per 55 g bar, meeting 20% of the Nutrient Reference Value, with a shelf life of 24 days. In conclusion, ash plantain flour is a promising ingredient for developing nutritious plant-based snack bars without compromising sensory quality.

Keywords: Ash plantain, complete protein, composite flour, plant-based, vegan snack bar

Functional potential of yam flours in chicken meat emulsions: Effect on physicochemical and textural quality

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The application of plant-derived functional ingredients in processed meat products has gained increasing attention for enhancing product quality and reducing formulation costs. This study evaluated the physicochemical and textural properties of chicken meat emulsions formulated with underutilized Sri Lankan yam flours and examined their behaviour during refrigerated storage. Four yam species, Kiri Kodol (*Dioscorea esculenta*), Dandila (*Dioscorea alata*), Kahata Ala (*Dioscorea alata*), and Kiri Ala (*Xanthosoma sagittifolium*) were processed into flours and characterized for proximate composition and techno-functional attributes. Chicken meat emulsions were prepared by incorporating 10% of each flour, along with flour-free control, and assessed for water-holding capacity (WHC), cook loss, purge loss, colour, texture, and storage stability for 4 weeks. The incorporation of yam flours significantly enhanced moisture retention and reduced both cooking and purge losses compared with the control ($p < 0.05$), while maintaining stable physicochemical characteristics throughout storage. Among the treatments, Dandila (*D. alata*) flour showed a significantly higher ($p < 0.05$) initial WHC (79.27%), low cooking loss (3.77%), and consistently low total fluid loss during storage. After 4 weeks, it maintained lower ($p < 0.05$) purge loss (1.40–3.31%) and higher ($p < 0.05$) WHC (up to 81.45%). Kiri Kodol (*D. esculenta*) also performed well, supported by its relatively high protein content, strong water- and oil-absorption capacities, and favourable textural attributes. Kahata Ala (*D. alata*) and Kiri Ala (*X. sagittifolium*) contributed acceptable stability and texture, characterized by low cooking loss and high WHC. Overall, the findings demonstrate that yam flours are effective plant-based binders in chicken meat emulsions. At the tested replacement level, Dandila flour emerged as the most promising option, performing comparably to wheat flour while offering additional functional and nutritional advantages.

Keywords: Chicken meat emulsion, cooking loss, purge Loss, yam flours

Development of an electrochemical sensor for methanol detection in alcoholic beverage distillation

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Methanol contamination remains a critical safety risk in distilled alcoholic beverages, yet routine monitoring is limited in decentralized and artisanal settings because laboratory gold standard methods (e.g., GC-FID/HPLC) require costly instrumentation, skilled personnel, and centralized facilities. To bridge this gap, this study developed, optimized, and validated a rapid, low-cost analytical method that couples electrochemical oxidation of methanol to formaldehyde followed with Nash reagent based colorimetric detection. A two electrode system was implemented using a nickel working electrode (Rod; 2 mm × 15 mm) and a stainless-steel counter electrode (Cuboid; 15 mm × 4 mm × 1 mm). Accurately 2.00 mL of 1000 ppm methanol standards (n=432) were oxidized in phosphate buffer (2 mL, 0.1 M, pH 7.0) with optional catalyst (CuO) by applying varied voltages (6.06 V, 7.05 V, 8.06 V) for two temperature (25°C, 50°C) and time (60 s, 120 s) intervals. Formaldehyde produced upon oxidation was quantified by an accelerated Nash protocols (n=6; 25°C, 60°C, 80°C; 3 min, 5 min; 412 nm). Respective formaldehyde concentrations were calculated using standard Nash reference calibration curve (0.25-10 ppm). A full-factorial analysis (144 treatments × triplicate) revealed the effect size of Nash temperature ($\eta^2 \approx 0.39$), electrochemical oxidation time ($\eta^2 \approx 0.22$), and oxidation temperature ($\eta^2 \approx 0.12$) as the dominant determinants of analytical response, whereas catalyst (CuO) showed negligible practical benefit under the nickel driven oxidation setup. Factor-level comparisons (EMM±SE) revealed that 7.05 V, 120 s electrolysis period, 50°C oxidation temperature, with no catalyst was the most practical methanol oxidation conditions, whereas 80°C and 3 min period was the most practical Nash incubation conditions. Validation of above procedure (14 concentrations within 100-8000 ppm methanol with triplicates) demonstrated excellent linearity ($R^2 = 0.9923$) and repeatability (RSD<5% across all levels). Sensitivity analysis estimated ~791 ppm as the level of detection, ~2397.6 ppm as the level of quantification and 2400-8000 ppm as the quantitative working range. The development of prototype integrating above optimized conditions is expected to provide rapid technology for methanol identification accessible to small and medium scale distilleries.

Keywords: Alcohol, distillation, electrochemical sensor, formaldehyde, methanol

Effect of different milk sources on fermentation, shelf life, and consumer preference of kefir produced with kefir grains

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Kefir is a probiotic fermented milk beverage widely commercialized globally; however, its development under Sri Lankan conditions remains limited. This study aimed to develop kefir using cow, buffalo, and goat milk and evaluated grain growth development, shelf-life stability, consumer acceptance and consumer willingness to pay. Activated kefir grains (0.2% w/v) were inoculated into pasteurized milk and fermented at 25°C for 24 h. Grain biomass development was monitored for seven days. Shelf life was assessed over a period of 28 days, during which physicochemical and microbiological properties were monitored at 4°C and 14°C. Grain mass development was not significantly influenced by milk type ($p>0.05$), however, progressive acidification was observed, and noticeable grain growth initiated after the fifth propagation cycle. During storage of kefir, pH decreased and acidity increased significantly ($p<0.001$), with faster changes observed at 14°C compared to 4°C. Buffering capacity declined over time, particularly at 14°C. Overall Total Plate Count (TPC) did not differ significantly among milk types and storage temperature ($p>0.05$). Storage temperature had a significant effect on yeast and mold growth ($p<0.05$). Samples stored at 14°C generally showed higher alcohol levels compared to those stored at 4°C. Shelf-life prediction indicated that all kefir types remained stable for 28 days at 4°C, whereas storage at 14°C limited shelf life to approximately 20 days for most treatments. Cow milk kefir demonstrated comparatively better physicochemical and microbial stability at 14°C. Sensory evaluation showed significantly higher appearance ($p=0.006$) having highest scores for buffalo and goat kefir, while cow and buffalo kefir received the highest consumer preferences (45.7% and 40.0% respectively). At a reference price of Rs.150/180 mL, 57.1% participants expressed positive purchase intention. All plain kefir types stored at 4°C ensured acceptable stability for 28 days, indicating strong commercialization potential for cow milk kefir in Sri Lanka.

Keywords: Consumer acceptance, kefir, physicochemical properties, shelf life, Sri Lanka

Comparative evaluation of physicochemical, functional, organoleptic, and microbial attributes of smoked tender jackfruit with barbecue chicken

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The increasing demand for sustainable plant-based meat alternatives has intensified the need for scientific validation of whole-food substitutes such as tender jackfruit (*Artocarpus heterophyllus*). This study evaluated the physicochemical, microbiological, antioxidant, and organoleptic characteristics of smoked tender jackfruit processed under different boiling times and compared them with market available barbecue chicken. Tender jackfruit cubes were boiled for 5, 15, and 25 minutes (T1, T2, T3 respectively), smoked at 80 °C, vacuum packed, and stored under refrigeration conditions at 4 °C. Proximate analysis indicated smoked tender jackfruit contained significantly higher crude fiber and significantly lower crude fat contents ($p < 0.05$). Total phenolic content, total flavonoid content, vitamin C content, and DPPH radical scavenging activity of smoked tender jackfruit significantly decreased ($p < 0.05$), with increasing boiling time. Increasing boiling time resulted in higher cooking loss, while water holding capacity, total soluble solids, and retention of bioactive compounds decreased ($p < 0.05$). Colour analysis showed lightness (L^*) increased significantly with boiling duration, whereas redness (a^*) was not significantly affected ($p > 0.05$). Texture profile analysis demonstrated variations in firmness and chewiness among treatments. Microbiological assessments indicated that smoked tender jackfruit samples remained acceptable for up to 56, 42, and 28 days for T1, T2, and T3, respectively, whereas market available barbecue chicken remained acceptable for only 2 days. Sensory evaluation showed significant differences among treatments ($p < 0.05$), with T2 demonstrating the highest overall acceptability among smoked tender jackfruit samples. Overall, the 15-minute boiled smoked tender jackfruit (T2) demonstrated the most balanced nutritional quality, antioxidant activity, sensory performance and storage stability, confirming its potential as a viable plant-based alternative to conventional barbecue chicken.

Keywords: Antioxidant activity, plant-based meat analogue, smoking, vegan

Role of Jackfruit seed and Chickpea flours in modulating the quality properties of hybrid chicken patties

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Growing concerns regarding the health, environmental, and sustainability impacts of excessive meat consumption have intensified research into reduced-meat products. However, complete substitution of meat remains challenging due to strong consumer preference for meat-specific texture and flavor. Hybrid meat systems, incorporating functional plant ingredients, offer a promising transitional strategy. Despite increasing interest, limited research has explored the combined functionality of jackfruit seed flour (JSF) and chickpea flour (CPF) in poultry-based hybrid formulations. This study therefore investigated the physicochemical, microbiological, and functional properties of hybrid chicken patties partially substituted with JSF and CPF. Chicken meat was replaced with graded levels of JSF and CPF, and formulations were evaluated for proximate composition, microbiological safety, water-holding capacity, cooking yield, and structural stability using standardized analytical methods. Incorporation of plant flours significantly ($p < 0.05$) reduced moisture content while maintaining acceptable, fat, protein and mineral levels. Protein content ranged from 13.94% to 16.42% (wet basis), demonstrating that partial substitution did not result in nutritionally limiting reductions. All samples complied with established microbiological safety limits, confirming processing adequacy. Functional evaluation revealed significant improvements ($p < 0.05$) in water-holding capacity and cooking yield in formulations containing moderate levels of both JSF and CPF. These effects are attributed to synergistic interactions among plant polysaccharides, legume proteins, and the meat protein matrix, thereby improving hydration, binding, and structural integrity. The formulation containing balanced proportions of JSF and CPF exhibited the most favorable overall quality profile. In conclusion, JSF and CPF can be strategically utilized to develop nutritionally enhanced hybrid chicken patties with improved functional performance and assured microbiological safety. The findings support hybrid meat systems as a scientifically viable and consumer-relevant approach for sustainable meat reduction.

Keywords: Functional properties, hybrid meat products, meat reduction strategy, nutritional quality, plant-based extenders

Development of an iron-rich plant powder using *Moringa oleifera* and *Centella asiatica* and its effect on iron bioaccessibility in a smoothie-based food system

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Iron deficiency anemia remains a significant public health concern in Sri Lanka, affecting approximately 7.20% of women and 5.40% of children (WHO Global Nutrition Report, 2023), highlighting the need for cost-effective, sustainable dietary interventions. This study developed a plant-based iron-rich functional powder from *Moringa oleifera* and *Centella asiatica* leaves and evaluated its iron content, anti-nutritional factors, bioaccessibility in a smoothie system, storage stability, and effects of ascorbic acid (50 and 100 mg) and vitamin B (100 mg) fortification. Fresh leaves were washed, blanched at 50–55°C for 2–5 min, cabinet tray-dried at 50°C, and ground into fine powders to reduce anti-nutritional factors. Four blending ratios (50:50, 60:40, 70:30, 80:20 *Moringa:Centella*) were tested, with the 80:20 blend optimal. Total iron and tannic acid were quantified via colorimetric and UV–visible spectrophotometric methods, respectively; sensory acceptability used a 9-point hedonic scale. The optimized blend was incorporated into a smoothie, with in vitro gastrointestinal digestion assessing iron bioaccessibility under fortification and a 4-week storage stability study conducted. The 80:20 blend exhibited the highest total iron (31.90 ± 0.10 mg/100 g; $p < 0.05$) and lowest tannic acid (112.67 ± 16.1 mg/100 g; 63.33% reduction from pre-treatment). Ascorbic acid significantly enhanced bioaccessibility (100 mg: $35.12 \pm 0.32\%$; 463.72% increase vs. unfortified), while vitamin B had no effect. Iron retention was $96.20 \pm 0.17\%$ over 4 weeks, though ascorbic acid declined to $84.6 \pm 0.6\%$. A 17 g serving in 250 mL smoothie delivered 5.42 mg iron, meeting 20–65% of daily requirements for Sri Lankan children, women, and pregnant women. This powder offers a practical, low-cost strategy to combat iron deficiency anemia.

Keywords: Anti-nutritional factors, ascorbic acid fortification, plant-based powder, storage stability

Jackfruit peel–derived chemically activated biochar for delaying ripening of *Ambul* banana (*Musa acuminata*)

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Chemically activated biochar (CAB) is a porous carbon material with diverse uses. This study evaluated the effectiveness of chemically activated jackfruit peel biochar as an ethylene scavenger to delay ripening and extend the shelf life of *Ambul* banana (*Musa acuminata*) under ambient conditions. Biochar was prepared from tender and mature jackfruit peels using phosphoric (H_3PO_4) and citric acids at 0.1 M and 1 M, followed by one-step pyrolysis. Physicochemical properties, including moisture, ash, bulk density, pH, yield, and iodine number, were analysed to select the most suitable activating agent for CAB. The highest iodine number was recorded for 1 M H_3PO_4 -activated mature and tender peel biochar (583.21 ± 1.02 and 579.38 ± 0.95 mg/g, respectively), indicating high adsorption capacity. XRD analysis showed a broad hump peak at $20\text{--}30^\circ(2\theta)$, confirming an amorphous structure, while FTIR analysis indicated formation of phosphorus-containing functional groups after activation. Biochar was packed in non-woven sachets, and unripe bananas were stored in ventilated LDPE packages for 9 days. Based on results, 8 g of CAB was selected as the optimum dosage, as treated bananas showed optimum properties compared to controls. To compare activation concentrations, a 15 days final study was conducted under ambient conditions using 8 g of 1 M and 0.1 M H_3PO_4 -activated biochars. The 1 M tender peel biochar (TPB) treated banana performed well, with lower weight loss (4.97 ± 0.05 %), higher firmness (3.47 ± 0.12 kg/cm²), slower TSS increase (20.57 ± 0.06 °Brix), lower pH (5.46 ± 0.01), higher TA (0.246 ± 0.001 %), and higher hue angle ($88.61 \pm 0.62^\circ$) on day 15. Sensory evaluation showed control sample and 0.1 M H_3PO_4 activated TPB-treated bananas had higher overall acceptability. Bananas treated with 1 M H_3PO_4 -activated TPB showed lower acceptability, due to excessive ripening delay. However, aroma did not significantly differ among treatments ($p > 0.05$). Therefore, 1 M H_3PO_4 -activated TPB applied package effectively delays the ripening of *Ambul* banana under ambient conditions.

Keywords: Activated biochar, ethylene scavenger, jackfruit peel, phosphoric acid activation

Extraction and characterization of lipids of duckweeds (*Lemnaceae*) in Sri Lanka for application in nutraceuticals

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The increasing demand for sustainable, plant-based omega-3 sources has intensified interest in aquatic biomass as an alternative to conventional marine oils. This study evaluated the nutraceutical potential of three Sri Lankan duckweed species, *Spirodela polyrhiza*, *Lemna minor*, and *Landoltia punctata*, by analysing lipid yield, fatty acid composition (GC–MS), oxidative stability (peroxide and conjugated diene values), antioxidant capacity (DPPH assay), and physicochemical properties (colour and solubility). Ultrasonication-assisted Bligh and Dyer extraction significantly enhanced lipid recovery (9.54–11.57%) compared to Soxhlet extraction (2.17–5.15%). GC–MS analysis revealed α -linolenic acid (ALA, ω -3) as the predominant polyunsaturated fatty acid, with total omega-3 content ranging from 29.5% to 37.9%. *Spirodela polyrhiza* exhibited the highest omega-3 content and a favourable ω 3: ω 6 ratio (4.24), whereas *Lemna minor* showed comparatively moderate omega-3 levels but strong antioxidant potential. Among the species, *Lemna minor* demonstrated the highest Soxhlet lipid yield ($5.15 \pm 0.07\%$), flavonoid content (88.41 ± 12.39 ppm), and antioxidant activity (0.461 ± 0.056), along with lower conjugated diene (10.57 ± 0.55) and peroxide values (6.87 ± 0.96 meq/kg), indicating enhanced oxidative stability. Colour analysis revealed that purification of crude oil significantly improved lightness and yellow intensity, reflecting better visual quality. *Spirodela polyrhiza* exhibited the highest lightness ($L^* = 30.82$), whereas *Landoltia punctata* showed greater yellowness ($b^* = 14.82$) and redness ($a^* = 3.28$). Overall, Sri Lankan duckweeds, particularly *Spirodela polyrhiza* for fatty acid quality and *Lemna minor* for oxidative stability, represent promising sustainable plant-based sources of omega-3-rich lipids for functional food and nutraceutical applications.

Keywords: Alpha-linolenic acid, duckweed, lipid extraction, nutraceuticals

Acknowledgement: The author gratefully acknowledges Prof. E.M.R.K.B. Edirisinghe, Faculty of Applied Sciences, Rajarata University of Sri Lanka, for assistance with FAME analysis. The author also acknowledges the National Aquatic Resources Research and Development Agency (NARA), Mattakkuliya, Sri Lanka, and Sunshine Aquarium, Pannala, for providing the samples used in this study.

8th April 2026, Faculty of Livestock, Fisheries & Nutrition, Wayamba University of Sri Lanka

Assessing the impact of food handling practices on food safety among street food vendors in Kadawatha

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Street food is a vital part of the culinary culture in the Kadawatha area, offering diverse and convenient meals while providing employment opportunities. However, ensuring food safety remains a persistent challenge, and research on food safety within the sector remains limited. A stratified random sampling technique was used, and data were collected through a structured questionnaire-based survey, and responses were analyzed using Chi-square tests and Multiple Logistic Regression. The findings indicate that hygiene compliance among street food vendors was generally low, with only 35.0% achieving satisfactory compliance scores ($\geq 75\%$), while 65.0% remained non-compliant. Significant associations were observed between hygiene compliance and hand hygiene ($\chi^2 = 8.32$, $p = 0.004$), sanitation ($\chi^2 = 6.45$, $p = 0.004$), storage conditions ($\chi^2 = 5.12$, $p = 0.024$), food handling practices ($\chi^2 = 7.80$, $p = 0.005$), waste disposal mechanisms ($\chi^2 = 7.15$, $p = 0.007$), and food safety awareness ($\chi^2 = 6.98$, $p = 0.031$). Further, a moderate positive correlation was found between food safety awareness and food handling practices ($r = 0.46$). Multiple logistic regression further confirmed that hand hygiene practices were the strongest predictor of hygiene compliance (OR = 1.45, $p = 0.001$), followed by food handling practices (OR = 1.39, $p = 0.008$) and food safety awareness (OR = 1.36, $p = 0.003$). Overall, the study demonstrates that behavioral, environmental, and infrastructural factors collectively play a significant role in determining food safety compliance.

Keywords: Street food; food safety; food handling practices; foodborne illness; questionnaire, Kadawatha

Department of Nutrition and Dietetics

Consumer understanding, barriers, and opportunities for pulse consumption in adult females in Tamil communities

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Consumer understanding of pulses significantly influences household dietary practices, particularly among women who play a central role in food selection and preparation. Although pulses are recognized as affordable sources of plant-based protein, dietary fibre and essential micronutrients, their regular consumption remains inconsistent. Adult females in Sri Lanka eat too few pulses, reducing diet variety and increasing risk of nutrient deficiencies. This study aimed to explore consumer understanding, perceived barriers, and opportunities related to legume consumption among adult females in Tamil communities. A qualitative study using focus group discussions was conducted among women aged 25–55 in urban and rural areas of the Batticaloa District. Participants were selected through purposive sampling to capture variation in socioeconomic background and living environments. Data were analyzed thematically using NVivo software, generating seven key themes: nutritional awareness of Pulses, factors influencing acquisition, preparation practices, household food allocation, consumption patterns, barriers to consumption, and recommendations for improvement. Participants showed good awareness of pulses' nutritional benefits, especially their protein content, ability to promote fullness, and suitability for people with diabetes and heart conditions. Lentils were the most commonly consumed pulse due to affordability and ease of preparation. However, knowledge of recommended intake levels was limited. Misconceptions related to digestive discomfort and perceived body heat, along with economic constraints, rising prices, limited availability, storage issues and lengthy preparation time, restricted regular consumption. Household decision-making was influenced by women's caregiving roles, family preferences and cultural beliefs, shaping allocation patterns. Participants suggested improving affordability, simplifying preparation methods and strengthening nutrition education to enhance acceptability. The study highlights a gap between awareness and consistent practice and emphasizes the need for culturally appropriate, community-based strategies to promote sustainable pulse consumption among Tamil women.

Keywords: Adult females, barriers, pulse consumption, qualitative study, Tamil communities

Dietary patterns and lifestyle-related attributing factors for chronic kidney disease in Wilgamuwa, Matale District: A matched case-control study

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Chronic kidney disease (CKD), including chronic kidney disease of unknown etiology (CKDu), is a major public health problem in Sri Lanka, particularly affecting rural agricultural communities. This study investigated dietary patterns and lifestyle risk factors associated with CKD in Wilgamuwa, an agricultural area with growing disease burden but limited prior research. A population-based, individually matched case-control study was conducted among 30 pairs of CKD/CKDu cases and non-CKD controls, matched by age, gender, occupation, education, and income. Socio-economic, dietary, lifestyle and physical activity data were collected using interviewer administered questionnaires, along with anthropometric and clinical measurements. Principal component analysis was used to identify dietary patterns, and conditional logistic regression was used to assess associations between variables and CKD status. The high saturated fat dietary pattern was significantly associated with CKD (OR=3.50, 95% CI: 1.15–10.63, p=0.027), and remained significant after adjustment (OR=3.56, p=0.035). Cases consumed significantly higher total fat (61 g vs. 45 g, p=0.038), sodium (4095 mg vs. 3046 mg, p=0.016), and percentage of energy from saturated fat (11.1% vs. 8.8%, p=0.019), and had significantly lower n-3 fatty acid intake (p=0.005). Past alcohol consumption (OR=8.00, p=0.050), herbal medicine use (OR=4.00, p=0.032), and family history of CKD (OR=3.67, p=0.046) were associated with CKD. Cases exhibited significantly lower BMI (20.75 vs. 23.45 kg/m², p=0.025), and reduced walking activity (p=0.048). In conclusion, high saturated dietary pattern, past alcohol consumption, family history of CKD and herbal medicine use were identified as significant risk factors for CKD. Integrated prevention strategies focusing on saturated fat reduction, safe use of herbal medicines, and lifestyle modification should be strengthened in these high-risk rural populations.

Keywords: Chronic kidney disease, dietary patterns, saturated fat intake, lifestyle risk factors, case-control study

Food consumption patterns and nutritional status of adolescents in the Puthukkudiyiruppu Educational Zone

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Adolescent malnutrition is a major public health concern in Sri Lanka, especially in post-conflict regions. Poor dietary practices and inadequate nutrient intake affect growth and development during adolescence. This study assessed nutritional status, dietary patterns, and nutrient intake among adolescents in the Puthukkudiyiruppu Educational Zone, Mullaitivu District, Sri Lanka. It also examined the association between dietary factors and nutritional status. A school-based cross-sectional study was conducted among 180 adolescents aged 12–19 years from 10 schools using convenience sampling. Data were collected using interviewer-administered questionnaires and anthropometric measurements. Dietary intake was assessed using a semi-quantitative food frequency questionnaire. Nutritional status was determined using BMI-for-age and Height-for-age indices generated with WHO AnthroPlus software. Nutrient intake was calculated using Foodbase 2000 and compared with Recommended Dietary Allowances (RDA) for adolescents. Data were analyzed using descriptive statistics and Chi-square tests. Statistical significance was set at $p < 0.05$. The findings showed that 45.0% of participants were underweight and 46.7% had normal weight. Overweight and obesity were observed in 5.6% and 2.8% of participants, respectively. Stunting was observed in 37.8% of adolescents. Meal skipping was reported by 22.2%, and 20.0% skipped breakfast regularly. Food choice was mainly based on taste (75.0%), while only 23.9% considered nutritional value. Egg avoidance was reported by 81.7%. Tea consumption after meals was reported by 16.7%. Inadequate intake of energy (68.9%), carbohydrate (53.3%), fat (46.7%), and protein (52.8%) was observed compared with RDA. Inadequate intake of iron (72.2%), vitamin B6 (55.6%), and vitamin B12 (64.4%) was also observed compared with RDA. Protein intake showed a significant association with BMI-for-age ($p = 0.042$). Energy ($p = 0.041$), carbohydrate ($p = 0.038$), and fat intake ($p = 0.041$) showed significant associations with height-for-age. In conclusion, undernutrition and unhealthy dietary patterns were highly prevalent among adolescents in this region. Targeted nutrition education and dietary interventions are recommended to improve adolescent nutritional status.

Keywords: Adolescents, dietary patterns, malnutrition, nutrient intake, nutritional status

Phenolic content and antioxidant activities of processed induced Velvet beans (*Mucuna pruriens*)

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Mucuna pruriens, commonly known as Velvet beans, is an underutilized tropical legume valued for its high protein content and bioactive compounds, particularly polyphenolics possessing antioxidant properties. Processing methods can influence the availability and extractability of these bioactive compounds. This study investigated the effects of different processing methods on total phenolic content (TPC), total flavonoid content (TFC), and antioxidant activities of Velvet beans. Six processing conditions, namely raw, 72-hour soaked, 72-hour germinated, 1-hour boiled, 72-hour soaked followed by 1-hour boiling, and 20-minute roasted were evaluated. Beans subjected to different processing conditions were defatted using hexane and extracted with 50% aqueous acetone prior to analysis. TPC and TFC were determined using the Folin-Ciocalteu and aluminium chloride colourimetric assays, respectively. Antioxidant activities were measured using 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging activity (DRSA) and ferrous ion chelating assay (FICA). One-way ANOVA indicated significant differences among the six processing conditions for TPC, TFC, DRSA, and FICA ($p < 0.05$). The 72-hour soaked and boiled sample recorded the highest TPC (12.01 ± 0.89 mg GAE g⁻¹ dry weight) and TFC (23.94 ± 0.74 mg CE g⁻¹ dry weight), followed by the boiled sample. Wet processing methods generally enhanced antioxidant activities compared with dry heat treatment. The soaked and boiled processing condition showed the highest DRSA (62.17 ± 5.08 mg TE g⁻¹ dry weight) and the highest FICA (9.75 ± 0.42 mg EE g⁻¹ dry weight). In contrast, the roasted sample exhibited comparatively lower phenolic contents and antioxidant activity. These findings suggest that wet heat processing, particularly soaking followed by boiling, increases the extractability of phenolic compounds and improves antioxidant potential, highlighting its importance in maximizing the functional and nutritional value of Velvet beans for food applications.

Keywords: Bioactive compounds, functional foods, legumes, processing methods

Value addition to parboiled rice: sensory attributes

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Rice is the main staple food for half of the world's population, predominantly in developing countries. Improving the nutritional quality of rice presents a practical and sustainable strategy to promote public health and reduce non-communicable disease burden. This study evaluated the effect of value addition using natural flavoring agents—cinnamon, cloves, and ginger—and natural colorants—turmeric and black tea—on the sensory attributes of value-added parboiled rice. Six formulations were developed: Black tea added cinnamon flavored rice (BTC), turmeric added cinnamon flavored rice (TC), black tea added clove flavored rice (BTCL), turmeric added clove flavored rice (TCL), black tea added ginger flavored rice (BTG), and turmeric added ginger flavored rice (TG). Sensory attributes including color, appearance, aroma, texture, taste/flavor, aftertaste, and overall acceptability were evaluated using a 9-point hedonic scale by 50 untrained panelists. Statistical analysis using the Friedman test, followed by the Wilcoxon signed-rank test for pairwise comparisons showed significant differences among formulations ($p < 0.001$). TG showed significantly higher scores for color (6.18 ± 1.72), appearance (6.18 ± 1.70), texture (5.88 ± 1.64), indicating strong consumer preference. TCL achieved the highest scores for aroma (5.96 ± 2.34), flavor (5.98 ± 2.36), aftertaste (5.98 ± 2.44), overall acceptability (6.06 ± 2.29). BTC demonstrated superior aroma (6.86 ± 1.21), flavor (6.86 ± 1.26), aftertaste (6.80 ± 1.32) and overall acceptability (6.96 ± 1.34) compared to other black tea-based formulations. In general, turmeric-based formulations exhibited enhanced color and visual appeal, while cinnamon and ginger followed by clove flavoring agents improved aroma and taste perception. Furthermore, value-added formulations significantly influenced several sensory attributes compared to the control. Further research is warranted to examine the antioxidant activity, keeping and cooking quality of value-added parboiled rice.

Keywords: Natural colorants, natural flavoring agents, parboiled rice, sensory evaluation, value addition

Development and validation of digital learning materials for women affected with hyperglycemia in pregnancy

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Dietary modification is one of the feasible and sustainable strategy of managing the hyperglycemia in pregnancy (HIP). In the absence of access to structured and culturally appropriate digital dietary guidance in Sri Lanka, current study aimed to develop and validate a multi-platform digital dietary intervention for women with HIP. A qualitative study was conducted among hundred (n=100) women with HIP attending De Soysa Hospital for Women, Colombo. Anthropometric and biochemical data were extracted from their pregnancy records. Dietary intake and physical activity were assessed using a three-day diet diary and a three-day physical activity diary respectively. The majority were either overweight (41%) or obese (23%), with a mean pre-pregnancy body mass index of 27.1 kg/m² and a mean fasting plasma glucose level of 101 mg/dL. Based on their dietary intake pattern, pre-pregnancy BMI, weight gain, glycemic status and treatment algorithm, nine diet plans were developed. In delivering those developed diet plans, seven low glycemic food recipes were formulated and evaluated for sensory properties, including chickpea soup, yoghurt with fruit salad, bitter gourd salad, wing bean salad, spinach and egg scramble, finger millet dosa, and sprouted mung bean salad. Out of those, chickpea soup and yoghurt with fruit salad had good overall acceptability. In addition, dietary algorithms based on pre-pregnancy BMI and glycemic management were developed and incorporated to interfaces. Interfaces and respective algorithms were integrated into a mobile app featuring calorie requirement calculation, diet diary, and dietary guidance to support meal planning and real time dietary guidance. It is expected that this study will provide an evidence-based digital dietary tool to support dietary self-management and improve glycemic control among women with HIP.

Keywords: Dietary control, digital health, glycemic control, hyperglycemia in pregnancy

Acknowledgement: This study was funded by Wayamba University Research Grant Scheme (SRHDC/URG/2025/10)

Added sugar consumption and its association with overweight and obesity in primary school-aged children

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Childhood overweight and obesity have become major public health concerns globally and in Sri Lanka, contributing to the early development of non-communicable diseases. Added sugar intake from foods and beverages is an important dietary factor that may promote excess energy intake and weight gain among children. This cross-sectional study aimed to assess the contribution of added sugars to total daily energy intake and examine its association with overweight and obesity among primary school children aged 5–10 years attending selected urban and rural schools in Sri Lanka. Dietary intake data were collected from 163 children using a single 24-hour dietary recall and a food frequency questionnaire (FFQ), with assistance from parents or caregivers. Energy and nutrient intakes were analyzed using FoodBase 2000 software. Anthropometric measurements, including weight, height, and waist circumference, were obtained following standard procedures. Nutritional status was classified using body mass index-for-age Z-scores based on WHO growth reference standards. The combined prevalence of overweight and obesity was 18%. The mean contribution of added sugars to total daily energy intake was 8%. While 28% of children exceeded the WHO recommendation of limiting added sugar intake to less than 10% of total energy intake, 64% exceeded the more stringent recommendation of less than 5%. No statistically significant association was found between added sugar intake and overweight or obesity status. However, birth weight ($p=0.033$) and higher household income ($p=0.042$) were identified as significant predictors of overweight and obesity. The mean dietary diversity score (DDS) was 7.12 out of 10 food groups, indicating relatively high dietary diversity. FFQ results indicated high daily consumption of sugar-sweetened beverages (77%) and biscuits (47%). These findings highlight the need for nutrition education and policy interventions to reduce added sugar consumption and promote healthier dietary practices among Sri Lankan children.

Keywords: Added sugar, children, obesity, overweight, sugar-sweetened beverages

Market availability of vitamin D fortified foods and supplements, and their knowledge, perception, and consumption in rural households

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Vitamin D deficiency remains a significant public health concern in Sri Lanka, despite abundant sunlight exposure. Fortified foods and supplements are recognized as alternative sources for improving vitamin D status. This cross-sectional study assessed the market availability of vitamin D fortified foods and supplements and evaluated household knowledge, perception, and consumption in rural areas of the Kegalle and Pannala Divisional Secretariat divisions. Market surveys in supermarkets, grocery shops, and pharmacies were conducted using a checklist. A household survey of 150 adults was carried out using an interviewer-administered questionnaire. Data were analysed using the Statistical Package for the Social Sciences (SPSS) software. Vitamin D fortified foods, including margarines, malted drinks, milk powders, cereal products, jam, and biscuits, were available, with vitamin D content ranging from 2.40-8.24 µg per 100 g, highest in margarine. Tablets were the most common vitamin D3 supplement in rural pharmacies, containing 1,000 to 60,000 IU each. Most participants had poor knowledge, with 71.3% and 70% of having poor knowledge of fortified foods and supplements, respectively. Similarly, low perception was determined in 53.3% and 62.7% of participants for fortified foods and supplements, respectively. The median daily vitamin D intake from fortified foods was 0.16 µg, representing 1.6% of the Estimated Average Requirement (EAR) of 10 µg per day, while the mean intake from supplements was 2.08 µg, representing 20.8% of the daily requirement. Knowledge of fortified foods was associated with age, education, and income, while perception was associated with age, and consumption was associated with income. Knowledge of supplements was associated with ethnicity and income, and perception was associated with age and education. Despite availability, household knowledge, perception, and consumption of vitamin D products were low. Future research should explore fortification and supplementation as strategies for improving vitamin D status.

Keywords: Consumption, fortified foods, knowledge, perception, supplements

Acknowledgement: This study was funded by Wayamba University Research Grant (SRHDC/URG/2025/09)

Association between dietary energy and macronutrient intakes and type 2 diabetes mellitus in adults: a case-control study

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Type 2 diabetes mellitus (T2DM) is a major metabolic disorder, and its rising prevalence is closely linked with modifiable lifestyle-related factors, especially diet. The aim of this study was to examine the association between dietary energy and macronutrient intakes and T2DM among adults in Kurunegala District. A case-control study was conducted among 100 adults aged 35-65 years, including 50 newly diagnosed T2DM patients (cases) and 50 healthy controls. Dietary intake over the past year was assessed using a validated food frequency questionnaire and analysed using food composition database. Statistical analyses included descriptive statistics, the Wilcoxon test, and logistic regression. Results indicated significant differences in macronutrient intake between cases and controls. Cases had significantly higher total energy (2779.6 vs 2417.0 kcal/day, $p=0.04$) and carbohydrates (491.4 vs 403.2 kcal/day, $p=0.008$) intake compared to controls, while dietary fibre intake was significantly higher among cases (21.7 vs 18.1 g/day, $p=0.006$). Although total fat intake did not differ significantly between groups (67.0 vs 65.8 g/day, $p=0.76$), the proportion of energy derived from fat was higher in the control group (22.0% vs 23.9%, $p=0.04$). In logistic regression analysis, high energy, high carbohydrate and low dietary fibre intake were not associated with T2DM. In conclusion, none of the dietary intake variables considered in this study were significantly associated with T2DM risk. These findings suggest that there may be factors other than diets that are associated with T2DM in Sri Lanka. Further research is needed with larger sample size to explore the other factors associated with T2DM.

Keywords: Case-control study, dietary intake, type 2 diabetes mellitus

Exploring the interplay of food literacy and nutritional status among school children in North-Western Province

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Food literacy plays an important role in shaping adolescents' dietary behaviours and long-term health outcomes, as eating habits established during adolescence often persist into adulthood. Despite increasing concerns regarding both undernutrition and overnutrition among Sri Lankan adolescents, limited research has examined food literacy and its relationship with nutritional status in this population. Therefore, this study aimed to assess the current level of food literacy among school children aged 12–14 years in selected schools in the Kurunegala Educational Zone and to evaluate their nutritional status and determine the association between food literacy level and nutritional status. A school-based cross-sectional study was conducted among 160 students selected from three schools in the North Western Province. Food literacy was assessed using a validated 25-item questionnaire covering knowledge, attitudes, and practices, while socio-demographic data and anthropometric measurements were collected to determine BMI-for-age. The mean food literacy score was $69.96 \pm 8.35\%$, indicating a moderate level of food literacy, with scores ranging from 50.4% to 94.4%. Most students demonstrated higher knowledge (75.6%) and positive attitudes (71.4%), comparatively lower food-related practices (58.3%). Nutritional assessment showed that 63.7% of students had normal BMI-for-age, while 25.6% were underweight. No statistically significant association was observed between food literacy level and nutritional status ($p=0.881$). However, Female students demonstrated a significantly higher mean Food Literacy Score (71.5 ± 7.72) compared with male students (67.2 ± 8.71) ($p=0.001$). Positive correlations were identified between knowledge and attitudes and between knowledge and practices ($p<0.01$). Overall, the findings indicate moderate food literacy among adolescents with a gap between knowledge and practice, highlighting the need for school-based experiential food literacy interventions to promote healthier dietary behaviours.

Keywords: Adolescents, food literacy tool, food knowledge, nutritional status, practices

Acknowledgement: This study was funded by Nestlé Foundation, Switzerland

Fish protein consumption and sarcopenia risk among older adults in coastal and non-coastal communities

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Sarcopenia, the progressive age-related decline in muscle mass and muscle function, poses a growing public health burden in rapidly ageing populations. Fish protein, which is rich in essential amino acids and bioactive micronutrients including omega-3 fatty acids, vitamin D, and calcium has been proposed as a dietary strategy for sarcopenia prevention. Geographic differences in fish accessibility between coastal and non-coastal communities may therefore influence sarcopenia risk. A comparative cross-sectional study was conducted among 126 older adults aged ≥ 65 years recruited from Negombo (coastal, $n=63$) and Lunugala, Bibile in Uva Province (non-coastal, $n=63$). Sarcopenia was assessed using the AWGS (Asian working group on sarcopenia) criteria, incorporating appendicular skeletal muscle mass (ASMM) measured by body composition analysis, handgrip strength, and gait speed. Anthropometric measurements including weight, height, mid-upper arm circumference (MUAC), and calf circumference were obtained. Dietary intake was evaluated using multiple pass 24-hour dietary recalls. Coastal adults had significantly higher skeletal muscle mass ($p=0.008$), handgrip strength ($p=0.039$), and gait speed ($p=0.001$) compared to non-coastal adults. Severe sarcopenia prevalence was higher among non-coastal adults (30%) than coastal adults (10%), while non-sarcopenia was more prevalent in the coastal group (37%) compared to non-coastal (14%). Coastal elders derived a higher proportion of protein from animal sources ($>60\%$), particularly fish compared to plant sources ($<40\%$) with significantly higher median fish protein intake driven by fresh fish and marine seafood consumption ($p<0.001$). Fish protein intake showed significant positive correlations with ASMM ($r=0.688$, $p<0.001$), muscle strength ($r=0.527$, $p<0.001$), and physical performance ($r=0.593$, $p<0.001$). Logistic regression revealed that higher fish protein intake was significantly associated with reduced odds of sarcopenia (OR=0.986; 95% CI: 0.975–0.997; $p=0.004$). These findings suggest that higher fish protein consumption is associated with improved muscle mass and function among older adults in coastal area, highlighting the protective role of regular fish intake in sarcopenia prevention.

Keywords: Coastal communities, fish protein, handgrip strength, older adults, sarcopenia

Estimation of nutrient composition tables for blenderized feeds used in enterally fed patients in Sri Lanka

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Enteral nutrition is essential for patients with insufficient oral intake. Blenderized enteral feeds (BEFs) are commonly used in Sri Lankan hospitals as an affordable and culturally familiar alternative to commercial feeds. However, the unavailability of standardized nutrient composition data results in underfeeding, nutrient losses, variations in feed consistency, and naso-gastric (NG) tube obstruction. This study aimed to develop and standardize BEF recipes for hospitalized elderly patients by evaluating their nutritional composition, physicochemical properties, and flow characteristics. A two-phase study design was employed. Phase I involved an online questionnaire administered to dietitians in Sri Lankan hospitals to identify commonly used foods and feeding practices. In phase II, BEF recipes were developed across four categories: porridge-based, fruit-based, soup-based, and milk-based preparations. Each preparation was separately assessed for flow characteristics through 14 F.G. and 18 F.G. NG tubes under gravity. pH and viscosity of each preparation were analysed in triplicate. Nutrient composition, including macro-nutrients and selected micro-nutrients were calculated using Foodbase 2000 software and nutrition fact labels. Energy density was highest in porridge-based (28.4–205.6 kcal/100 mL) and lowest in soup-based (6.1–33.2 kcal/100 mL). Carbohydrate content was highest in porridge-based (5.5–21.5 g/100 mL) and lowest in soup-based (0.8–4.8 g/100 mL). Protein and fat contents were highest in milk-based (3.4–6.5 g/100 mL protein; 0.1–7.5 g/100 mL fat), while fruit-based had the lowest protein (0.1–3.2 g/100 mL) and soup-based had the lowest fat (0.1–3.8 g/100 mL). The highest pH was observed in milk and egg-based (6.6–7.2), whereas fruit-based had the lowest pH (3.2–5.7). Viscosity was highest in soup-based (21.6–146.3 mPas) and lowest in milk and egg-based preparations (0.9–3.5 mPas). The findings were compiled into a reference booklet to serve as a reference to assist dietitians in addressing the nutritional requirements of hospitalized elderly patients.

Keywords: Blenderized enteral feeds, enteral nutrition, hospitalized elderly patients, naso-gastric tube, nutrient composition table

Comparison of phenolic content and antioxidant activities of raw and steamed selected Sri Lankan vegetables

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Phenolic compounds present in vegetables contribute significantly to antioxidant activity and may help to reduce oxidative stress leading to cause non-communicable diseases (NCDs). This study was conducted to determine the phenolic content and antioxidant activities of 26 commonly consumed Sri Lankan vegetables in raw and steamed forms. The vegetables included Eggplant, Pumpkin, Bitter Gourd, Thai Eggplant, Cooking Melon, Okra, Snake Gourd, Ridge Gourd, Capsicum, Banana Blossom, Turkey Berry, Cauliflower, Carrot, Long Bean, Green Bean, White Cucumber, Beetroot, Radish, Drumstick, Knol-Khol, Lotus Root, Kohila Root, Winged Bean, Ash Plantain, Tomato, and Cabbage. Fresh vegetable samples were washed, edible part cut into uniform pieces, and steamed at 100 °C for 10 minutes using a laboratory steam cooker to simulate typical cooking. Soluble phenolic compounds of raw and steamed vegetables were extracted using 70% aqueous methanol. The phenolic extracts were analysed for their total phenolic content (TPC), total flavonoid content (TFC). The antioxidant activities were measured by using 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging activity (DRSA), reducing power (RP) and ferrous ion chelating activity (FICA). Among the analysed vegetables, raw tomatoes showed the highest TPC and RP 8.11 ± 0.18 mg GAE/g, and 18.46 ± 3.04 mg AAE/g. Steamed turkey berry (10.56 ± 0.66 mg CE/g) had the highest TFC, whereas raw turkey berry (136.35 ± 2.08 mg TE/g) exhibited the highest DRSA. Furthermore, raw cucumber (59.35 ± 3.35 mg EE/g) showed the highest FICA among all vegetables. A significant positive correlation was observed between TPC, DRSA, and RP in raw vegetables ($p < 0.05$). In cooked vegetables, TFC was significantly correlated with DRSA ($p < 0.001$) and RP ($p < 0.05$). No significant correlations were found between FICA and either TPC or TFC. The findings suggested that steaming preserved the phenolics content and metal chelating activity of the selected vegetables, although significantly influenced their radical scavenging activity. Steamed vegetables remain valuable dietary sources of phenolic compounds with considerable antioxidant activities.

Keywords: Antioxidant activity, oxidative stress, phenolic compounds, Sri Lankan vegetables

Market availability of vitamin D fortified foods and supplements, and their knowledge, perception, and consumption in urban households

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Vitamin D deficiency remains a public health concern in urban populations despite adequate sunlight availability. Food fortification and supplementation are recognised strategies to improve vitamin D status. However, the data on availability and household use of vitamin D fortified foods and supplements in Sri Lanka remain limited. This cross-sectional study assessed the availability, knowledge, perception, and consumption of vitamin D fortified foods and supplements among urban households in Colombo and Gampaha Municipal Council areas. A household survey included 150 adults recruited for convenience sampling. A market survey covered 34 outlets including grocery stores, supermarkets, wholesale outlets, and pharmacies. Data were collected for the market survey, using a checklist and an interviewer-administered questionnaire. Fortified foods including milk powder, malted drinks, cereals, and biscuits, were available at all outlet types. Margarine had the highest vitamin D content while biscuits had the lowest. Vitamin D tablets and capsules ranged from 125 to 60,000 IU per dose. Almost all supplements contained vitamin D₃, except one soft gel capsule containing vitamin D₂. Knowledge of vitamin D supplements was poor among most participants (81.3%) while knowledge of fortified food was moderate among more than half (59.3%) of the participants. The perception of fortified foods was generally positive; however, perception towards supplements were less favourable. Mean vitamin D intake from fortified foods was 0.85 µg/day while supplement users obtained a mean of 2.79 µg/day from supplements per household. Education and ethnicity influenced the knowledge of fortified foods; family type influenced fortified food perception; and income was associated with the consumption of both fortified foods and supplements. Gender and ethnicity influenced knowledge of supplement. This study highlighted the need for nutrition education and further research on possible avenues for nutrition interventions to improve the vitamin D status in the community.

Keywords: Consumption, fortified foods, knowledge, perception, supplements

Acknowledgement: This study was funded by Wayamba University Research grants (SRHDC/URG/2025/09)

AI-driven dietary monitoring for school meals in Sri Lanka

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School age is a critical period for physical growth, cognitive development, and overall health. In Sri Lanka, the National School Meal Program provides a daily breakfast meal to primary school children; however, limited evidence exists regarding the actual nutritional quality and dietary diversity of these meals. This study utilized the AI-based dietary assessment application FRANI (Food Recognition Assistance and Nudging Insights) as an objective tool to evaluate the nutritional composition and dietary diversity of school meals provided in the Giriulla and Kuliypatiya Zonal Education Areas. An observational study was conducted in ten schools with primary grades. Standardized photographs of breakfast meals were captured and analysed using FRANI to estimate portion sizes and nutrient content. Nutrient values were calculated per meal and expressed as mean \pm standard deviation, and the percentage contribution to the Recommended Dietary Allowances (RDA) was determined. Descriptive statistical analysis was performed using SPSS software. Overall, the breakfast meals made a meaningful contribution to daily protein requirements and showed adequate provision of zinc, vitamin A, and vitamin C with good dietary diversity. However, energy and several essential micronutrients, including calcium, iron, folate, niacin, thiamine, riboflavin, vitamin B6, and vitamin B12, were comparatively low. Noticeable variation was observed among schools in nutrient composition and food group distribution, suggesting inconsistencies in menu planning and implementation practices. In conclusion, while the school meal programme provides a reasonable contribution to protein intake and selected vitamins, improvements are needed to address existing energy and micronutrient gaps. The study demonstrates that AI-based tools such as FRANI offer a culturally tailored, cost-effective, and time-efficient solution for effectively monitoring and evaluating school meal quality in Sri Lanka.

Keywords: Artificial intelligence, child nutrition, dietary diversity, nutritional quality, school meal programme

Effects of time-restricted eating on insulin sensitivity, and metabolic health outcomes in adults with overweight and obesity

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Circadian rhythm is the body's internal biological clock that regulates daily physiological processes, including, metabolism, and hormone secretion according to the light-dark cycle. Circadian misalignment alters metabolic regulation and is associated with an increased risk of non-communicable diseases as well as overweight and obesity. This research specifically investigated the effects of a 10-hour time-restricted eating (TRE) intervention on insulin sensitivity, metabolic health outcomes, sleep quality, and energy intake among adults with overweight and obesity. The 12-week study completed 25 participants from the TRE intervention group, 20 participants from the control group. Inclusion required BMI >23kg/m², and aged between 18-40. The intervention group followed a 10-hour time-restricted eating window without calorie restriction, while the control group maintained their usual eating patterns. Data collection included anthropometric measurements, dietary assessments, and biochemical testing. At baseline, there were no significant differences in age or other measured parameters between the intervention group and the control group. Results indicated that the TRE group experienced significant reduction in BMI (p=0.034), calorie intake (p=0.001) and biochemically significant reduction in fasting blood glucose levels(p=0.001), significant increase in HDL-C (p=0.04), insulin levels (p=0.01), HOMA -IR (p=0.034) compared to baseline. Further TRE group showed significant reduction in BMI (p=0.011), body weight (p=0.021), body fat mass (p=0.028), visceral fat levels (p=0.012) and biochemically significant increase in HLD-C (p=0.016) compared to control group. However, no significant differences were found in sleep quality scores in TRE group. The study concludes that a 10-hour TRE window effectively improves body weight, BMI, fasting blood glucose, and HDL levels. Nevertheless, the concurrent increase in insulin and HOMA-IR suggests that insulin sensitivity was not enhanced during this period. While TRE remains a beneficial dietary approach for improving metabolic parameters in adults with overweight and obesity, a longer duration of exposure is necessary to fully understand these conflicting insulin dynamics.

Keywords: Time-restricted eating, insulin sensitivity, sleep quality

Vitamin D status and its association with dietary intake, sun exposure, and sociodemographic factors in air force athletes

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Vitamin D deficiency is a growing global health concern, particularly among athletes, where its role in musculoskeletal health and physical performance is significant. The aim of this study was to investigate the vitamin D status and its associations with dietary intake, sun exposure, and sociodemographic factors among Sri Lankan Air Force athletes. A cross-sectional study was conducted among 150 Air Force athletes, both male and female, aged 18–40 years, recruited from the Air Force Base, Katunayake. Serum 25-hydroxyvitamin D [25(OH)D] levels were obtained from the medical records, dietary vitamin D intake was assessed using a validated Food Frequency Questionnaire (FFQ), sun exposure data, body composition and sociodemographic data were gathered using a structured questionnaire, and physical activity levels were calculated using the long format of the International Physical Activity Questionnaire (IPAQ). The mean serum 25(OH)D level was 29.2±4.3 ng/mL. The majority of athletes demonstrated insufficient (63.1%) serum 25(OH)D levels. The mean dietary vitamin D intake was 9.77±8.55 µg/day, including vitamin D supplements (n=05; 10.9%), representing approximately 65% of the Recommended Dietary Allowance (RDA) of 15 µg/day. None of the sun exposure variables were associated with vitamin D levels, except sunscreen use, which showed a significant negative association ($p<0.003$) with serum 25(OH)D. Sociodemographic and lifestyle factors, including smoking, alcohol consumption, hydration status, and training environment were not demonstrated significant associations with serum 25(OH)D levels. Conversely, PAL ($r=0.471$, $p=0.001$) and BMI ($r=0.386$, $p=0.01$) demonstrated a significant positive association with serum 25(OH)D, whilst body fat percentage was not significantly associated with vitamin D level. In conclusion, these findings indicated that sunscreen use, PAL, and BMI are the primary determinants of vitamin D status, and the majority of athletes showed insufficient 25(OH)D levels. Therefore, sun exposure guidelines and nutrition interventions are recommended for Air Force Athletes.

Keywords: Air force athletes, serum 25(OH)D, sun exposure, vitamin D status

Validation of the food frequency questionnaire and assessment of dietary diversity among reproductive age women

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Accurate assessment of habitual dietary intake and dietary diversity is essential for monitoring nutritional status among reproductive-age women (WRA). This study aimed to validate a semi-quantitative Food Frequency Questionnaire (FFQ) developed for reproductive-age women and to assess their dietary diversity using the Minimum Dietary Diversity (MDD) for Women indicator in Gampaha District, Sri Lanka. The study was conducted among 50 healthy, non-pregnant women aged 18–48 years selected through convenience sampling from four Public Health Midwife areas in Gampaha District, Sri Lanka. Dietary intake was assessed using the FFQ and two non-consecutive 24-hour dietary recalls. Nutrient intakes were analysed using Food Base 2000 software. Validation was done using the Wilcoxon signed rank test, correlation analysis and Bland–Altman plots. The Wilcoxon signed-rank test indicated statistically significant differences in energy, macronutrients, and selected micronutrients intakes between the two methods ($p < 0.05$). The correlation coefficients between the two methods ranged from 0.126 (vitamin B6) to 0.685 (carbohydrates). However significant positive correlations were observed for energy, macronutrients and selected micronutrients ($p < 0.05$) with correlation coefficient ranged from 0.685 to 0.310. Bland Altman analysis was demonstrated acceptable limits of agreement for energy and macronutrients, indicating reasonable agreement between the methods despite the observed differences. Assessment of MDD showed that 60% of participants achieved consumption of at least five out of ten defined food groups within the previous 24 hours. The low consumption was observed for nuts, seeds and dairy products. In conclusion, the semi-quantitative FFQ demonstrated moderate to good relative validity for estimating habitual energy, macronutrients and selected micronutrients among reproductive-age women and the study population showed a moderate level of dietary diversity.

Keywords: Food frequency questionnaire, minimum dietary diversity, nutrition, reproductive-age women, validation

Nutritional status of institutionalized older adults in Kurunegala District, Sri Lanka

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Sri Lanka is undergoing a rapid demographic transition with a growing older population. Ensuring the health and wellbeing of older adults has become a key public health priority. Institutionalized older adults are especially vulnerable to malnutrition, which can reduce functional ability, increase disease risk, and raise mortality. However, limited district level data are available, particularly for the Kurunegala District, highlighting the need for local evidences. The objectives of the current study were to assess the nutritional status of institutionalized older adults in Kurunegala District and to identify the prevalence of malnutrition and its associated factors. A cross-sectional study was conducted recruiting 150 institutionalized older adults, using randomly selected institutions. Data were collected using a pretested general questionnaire, a validated semi quantitative food frequency questionnaire (SQFFQ), and dietary diversity score. Anthropometric measurements, body composition using bioelectrical impedance analysis (Karada Scan HBF-375), functional status using activities of daily living (ADL) score and Timed Up and Go Test (TUG), and nutritional assessment using the 18-item Mini Nutritional Assessment (MNA) were performed. The results showed that 40% of institutionalized older adults had normal nutritional status, while 57.3% were at risk of malnutrition and 2.7% were malnourished according to the MNA. According to Body Mass Index (BMI) classification, 17.3% of participants were underweight, 40% had normal BMI, and 42.7% were either overweight or obese. Nutritional status was significantly associated with type of institution and betel chewing ($p<0.05$), whereas other socio-demographic, morbidity, dietary, and functional indicators showed no significant associations. These findings highlight that considerable proportion of institutionalized older adults were at risk of malnutrition in the Kurunegala District, emphasizing the importance of regular nutritional screening and appropriate interventions in institutional settings.

Keywords: Dietary diversity, functional ability, malnutrition, mini nutritional assessment

Chefs' knowledge, attitudes, and behaviours towards nutrition during food handling in food establishments

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Frequent consumption of meals from food establishments has been identified as a significant contributing factor to the increasing prevalence of non-communicable diseases. Through menu design, ingredient selection, cooking techniques, and food handling procedures, chefs, as important players in food enterprises, significantly affect the nutritional quality of food given to customers. Studies on chefs' knowledge, attitudes, and behaviour (KAB) about nutrition in food handling are scarce in Sri Lanka. Thus, the purpose of this study was to evaluate chefs' KAB about nutrition when handling food in establishments. A descriptive study with a cross-sectional design was conducted with 65 conveniently selected fourth- and fifth-star hotel chefs in Negombo, Sri Lanka. A structured questionnaire was employed for data collection on socio-demographic information, knowledge, attitudes, and behaviours concerning nutrition. The KAB levels were divided into low (<46), moderate (47-60), and high (>60); negative (<75), moderate (76-90), and positive (>91); and poor (<74), moderate (75-80), and good (>81), based on the scoring for the questions in the respective sections. Simple descriptive analysis was done using SPSS Statistics Version 29. The distribution of the sample according to their nutritional knowledge was low (33.8%), moderate (36.9%), and high (29.2%), with a mean of 53.2 (± 13.9). Attitudes were negative (35.4%), moderate (35.4%), and positive (29.2%), with a mean of 81.8 (± 14.1), whilst behaviours were poor (33.8%), moderate (33.8%), and good (32.3%), with a mean of 76.0 (± 7.4). Knowledge was significantly associated with attitude ($r_s = 0.328, p = 0.008$), and attitude was significantly associated with behaviour ($r_s = 0.281, p = 0.023$). However, knowledge was not significantly associated with behaviour ($p = 0.092$). This suggests that improvement in attitudes is more closely related to improvement in food handling behaviours than nutrition knowledge, reinforcing the need for nutrition education programs for chefs in food establishments.

Keywords: Attitudes, behaviours, chefs, food establishments, knowledge

Appetite regulating effect of nuts in overweight and obese adults- Randomized controlled crossover acute feeding trial

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Poor adherence to weight reduction plans is often linked to between-meal hunger and food cravings. Nutrient-dense nuts, rich in monounsaturated and polyunsaturated fatty acids, protein, and fibre, may offer a practical strategy for appetite regulation. This randomized, three-arm, crossover acute feeding trial aimed to compare the effects of locally available peanut and cashew which are made as milkshakes on appetite sensations and post meal energy intake level. Fourteen overweight/obese (BMI 25.59 ± 1.56 kg/m²) adults (aged 25.21 ± 0.98 years) completed three study visits separated by one-week washout periods. In a randomized order, participants consumed isocaloric shakes (~220kcal): peanut, cashew or control (carbohydrate rich) shakes. Appetite sensations were measured using 100 mm visual analogue scales (VAS), at baseline and at regular intervals over 3 hours following snack consumption. Plasma variable glucose was measured at baseline and at 2 hours after snack consumption. Post-meal energy intake was assessed 3 hours later using a standardized lunch. Analysis of Incremental Area Under the Curve was performed using Kruskal-Wallis, followed by Bonferroni's multiple comparison test. Both peanut and cashew shakes significantly suppressed appetite versus control (hunger: $p=0.002$ and 0.003 ; fullness: $p=0.001$ and 0.002). For all five VAS measures, peanut and cashew shakes each significantly differed from control (all $p<0.05$) but not from each other ($p>0.05$), showing equivalent short-term appetite regulation. Notably, only the peanut shake led to a significant reduction in post meal energy intake at the lunch meal compared to control shakes ($p<0.05$). Sensory evaluation indicated preference for the peanut-incorporated test meal (Friedman rank: 63.9; $p<0.05$). In conclusion, both peanut and cashew shake effectively manage acute appetite in overweight/obese adults. The peanut shake provided an additional benefit of reducing post meal energy intake, the most preferred snack option. Both nut shakes have potential of dietary strategy to improve adherence to weight management plans by controlling hunger between main meals.

Keywords: Appetite regulation, cashew, obesity, peanut, satiety

Screen time and sedentary behaviour as determinants of obesity among university students

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Obesity is a growing public health concern among young adults in Sri Lanka. State University students, undergo significant lifestyle transitions that predispose them to become overweight and obese. University students tend to spend substantial time on screening during their learning process. Present study was intended to determine the association between screening time, other sedentary behaviours and obesity status of undergraduates of Wayamba University of Sri Lanka as a case base approach. A total of hundred and twenty (n=120) undergraduate students (75.8% female; mean age 23.6±1.4 years) were recruited using cluster sampling from Makandura premises. Data were collected using a general lifestyle questionnaire to gather sociodemographic and lifestyle information, the International Physical Activity Questionnaire (IPAQ) to assess physical activity levels, and a semi-quantitative food frequency questionnaire (FFQ) to evaluate habitual dietary intake. Anthropometric measurements including BMI, waist circumference (WC), and waist-to-hip ratio (WHR) were obtained to assess body composition and central obesity status. The majority (75.8%) of participants were female. Mean academic screen time was 5.8±1.5 hours/day, and mean weekday sitting time was 413.9±245.7 minutes/day, higher than weekend sitting time (274.8±235.7 min/day). Overall, 55.9% were overweight or obese (BMI>23.0 kg/m²), with central obesity disproportionately prevalent among females (72.5%) versus males (3.4%). Weekday sitting time increased stepwise across BMI categories from 358.0 to 516.0 min/day (p<0.05), and academic screen time rose from 5.13 to 6.60 hours/day. Physical activity declined significantly across academic years, from 30.0% highly active in the first year to 0.0% by the fourth year (p<0.05). High fast-food consumption (78.3%), meal skipping (86.7%), and inadequate sleep co-occurred with elevated screen time and low physical activity, forming a clustered obesity risk pattern. These findings highlight the need for multicomponent, sex-specific interventions targeting sedentary behaviour, physical activity, and diet in Sri Lankan universities.

Keywords: Obesity, physical activity, screen time, sedentary behaviour, university students

Association between dietary intake patterns and risk of developing cardiovascular diseases among adults: a case control study

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Cardiovascular diseases (CVD) is a leading cause of mortality worldwide as well as in Sri Lanka. Diet is a key modifiable risk factor of CVD. However, the specific dietary patterns independently associated with CVD risk in the local population remain insufficiently explored. This study aimed to investigate the association between dietary intake patterns and the risk of developing cardiovascular diseases among adults. A case-control study was conducted with thirty-six (n=36) individuals with clinically diagnosed and confirmed first cardiovascular event from the Teaching Hospital, Kuliyaipitiya as cases. Thirty-six (n=36) apparently healthy controls were recruited from the community, giving a total sample of 72 participants. Dietary intake was assessed using a semi-quantitative food frequency questionnaire. Anthropometric measurements including weight, waist and hip circumferences, and body fat level were measured. Systolic blood pressure (SBP) was significantly elevated in cases (130.8±22.7 mmHg vs 121.4±10.5 mmHg, $p=0.029$). Cases consumed significantly higher proportions of energy from total fat (median 33.1% vs 29.5%, $p=0.046$), saturated fat (median 12.1% vs 8.4%, $p=0.001$), and higher dietary cholesterol (median 256 mg/day vs 143 mg/day, $p=0.002$) compared to controls. Partial correlation analysis revealed significant positive associations between saturated fat intake and SBP ($r=0.29$, $p=0.014$) and between total fat intake and SBP ($r=0.25$, $p=0.038$) after controlling for confounding factors. Saturated fat intake (adjusted OR=1.348, 95% CI 1.093–1.663, $p=0.005$) and dietary cholesterol (adjusted OR=1.009, 95% CI 1.003–1.015, $p=0.005$) were identified as significant independent predictors of CVD risk. These findings suggest that higher saturated fat and dietary cholesterol intake are significantly associated with increased CVD risk among Sri Lankan adults, highlighting the importance of dietary fat modification as a key strategy in CVD prevention.

Keywords: Cardiovascular disease, case-control study, dietary fat intake, saturated fatty acid

Workplace food environment and its influence on healthy eating practices among office workers in Jaffna District: The role of sectoral and socio-economic differences

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Workplace food environments play a critical role in shaping dietary behaviours, particularly among office workers who consume a substantial proportion of their daily meals during working hours. limited research has explored to identify how workplace settings influence food choices in the urban areas of Jaffna District. This study aimed to identify the food environment in and around urban workplaces, focusing on accessibility, affordability, and quality of food options available at workplace canteens and nearby food outlets, and to explore their influence on eating patterns. A qualitative research design was employed using in-depth interviews with 12 adult office workers aged 30–55 years engaged in full-time administrative, clerical, or managerial positions in government and private sector institutions. Data were analysed using thematic analysis using NVivo software. Four major themes emerged: External Food Environment, Personal Food Environment, Socio-Cultural and Organizational Influences, Health and Nutrition Perceptions. The findings revealed limited availability of healthy food options, higher costs of nutritious meals compared with energy-dense foods in the food environment. Distinct sector and socio-economic differences shaped food choices and eating patterns. Government workers relied more on canteen foods and home-prepared meals. However, they faced rigid schedules, whereas private sector workers depended largely on external sources such as food outlets and delivery services. Affordability was a key factor for lower socio-economic level officers, leading to irregular and less nutritious diets. Middle socio-economic level officers maintained a balance under moderate constraints. In contrast, higher socio-economic level officers faced fewer financial limitations and adhered to more structured, health-oriented eating patterns. In conclusion, the workplace food environment in Jaffna District is not sufficiently supportive of healthy eating practices among urban office workers.

Keywords: Food environment, healthy eating, Jaffna district, office workers, socio-economic level

Micronutrient intake and adequacy among pregnant women: exploring dietary diversity as a proxy indicator

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Pregnancy is a critical period with increased macro and micronutrient requirements to support maternal physiological changes and fetal growth. The objective of this study was to assess micronutrient intake adequacy and to evaluate the validity of Food Variety Score (FVS), Dietary Diversity Score (DDS), and Dietary Serving Score (DSS) as proxy indicators of nutrient adequacy among pregnant women in Sri Lanka. A convenience sampling method was used to recruit 170 pregnant women in their second and third trimesters from Maternal and Child Health Clinics. Dietary intake data were collected using a single multiple-pass 24 hour recall, while socio-demographic, anthropometric and biochemical data were gathered using a structured interviewer-administered questionnaire. Nutrient adequacy was assessed using the Nutrient Adequacy Ratio (NAR) and Mean Adequacy Ratio (MAR), calculated based on 11 micronutrients. Dietary Diversity Indicators (DDIs) were computed, and Spearman's rank correlation was used to assess associations with MAR. Sensitivity and specificity analyses determined optimal cut-off points for FVS and DDS in categorizing women with adequate micronutrient intake. The mean (standard deviation) of FVS, DDS, and DSS were 9.4 (2.6), 4.9 (1.1), and 9.7 (2.9), respectively. The MAR of 11 micronutrients was 0.50 (50%), indicating overall inadequacy. Spearman correlation coefficients between MAR and FVS was 0.54 ($p < 0.01$), for DDS it was 0.41 ($p < 0.01$), and for DSS it was 0.36 ($p < 0.01$). When maximizing sensitivity and specificity, the best cut-off point for achieving 70% MAR was about 10.5 and 5.6 for FVS and DDS, respectively. In conclusion, pregnant women in this study had inadequate micronutrient intake. MAR and most NARs were positively correlated with DDIs. Higher FVS and DDS were associated with increased MAR, highlighting their usefulness as proxy indicators of micronutrient adequacy. Adequate dietary intake, together with appropriate supplementation, is essential to meet the increased micronutrient requirements of pregnant women in Sri Lanka.

Keywords: Dietary diversity indicators, micronutrient adequacy, pregnant women

Validation of a food frequency questionnaire against 24-hour dietary recalls for assessing energy and nutrient intake among pregnant women

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Maternal nutrition during pregnancy is critical for both maternal and foetal well-being, yet limited validated dietary assessment tools exist for pregnant women in Sri Lanka. This study aimed to validate a food frequency questionnaire (FFQ) against three-day 24-hour dietary recalls (24DR) for assessing energy and nutrient intake among pregnant women. Thirty pregnant women were recruited from Puttalam district, and socio-demographic data were collected. Dietary intake was assessed using an FFQ for a reference period of one month retrospectively and three non-consecutive 24DRs. Nutrient intakes were calculated using food composition database. Correlation coefficients, Bland-Altman analysis, and cross-classification analysis were performed. Mean daily intakes were significantly different between methods for energy, all macronutrients, and most micronutrients, except for omega-3, vitamin B1, and vitamin B6. There were significant strong correlations between two methods for energy ($r=0.704$, $p<0.001$) and carbohydrates ($r=0.877$, $p<0.001$), and moderate correlations for protein ($r=0.443$, $p=0.018$), iron ($r=0.454$, $p=0.018$), and folate ($r=0.577$, $p=0.003$). However, after adjusted for energy, only correlations for iron remained significant ($r=0.384$, $p=0.048$). Acceptable agreements for all nutrients between methods (95% Limits of Agreements) were observed. According to cross-classification analysis, same-tertile classification ranged from 25% to 59%, with combined same and adjacent category agreement exceeding 70% (76%–96%) and gross misclassification into opposite tertiles remaining low (4%–24%). In conclusion, the FFQ demonstrated an acceptable validity for ranking individuals according to energy and key nutrient intakes among pregnant women, with good agreement and low misclassification rates.

Keywords: Dietary assessment, food frequency questionnaire, maternal nutrition, pregnancy, validation

Validation of an AI-assisted dietary assessment tool against weighed food records and 24-hour recalls among undergraduate male students

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Accurate dietary assessment is essential for developing effective nutrition interventions among university students. Conventional methods, such as weighed food records (WFR) and 24-hour dietary recalls (24HR), are widely used but are limited by high participant burden and recall-related errors. Although AI tools like FRANI (Food Recognition Assistance and Nudging Insights) show promise, validation evidence among Sri Lankan male undergraduates remains limited. This study aimed to validate FRANI against WFR and compare its performance with 24HR among male undergraduates at Wayamba University of Sri Lanka. A validation study was conducted among 30 male undergraduates aged 20–28 years. Dietary intake was assessed on two non-consecutive days using the AI application, observed WFR, and interviewer-administered multiple-pass 24HR. Agreement between methods was evaluated using mixed-effects equivalence testing within 10%, 15%, and 20% bounds, and omission, intrusion, and portion size errors were examined. Mean daily energy intake was comparable between the FRANI (1968.7 kcal) and WFR (1977.5 kcal). A similar level of agreement was observed for protein and several micronutrients including calcium, iron, and zinc. The FRANI method demonstrated acceptable equivalence to WFR for most nutrients. FRANI showed strong equivalence with WFR within a 10% margin for 14 of the 16 nutrients, in contrast, the 24HR method showed greater variability, with carbohydrate, vitamin B6, folate, and vitamin C exceeding the 20% bound. Omission errors were lower for the FRANI (approximately 2.5%) compared with 24HR (approximately 6.8%), indicating reduced memory-related bias. In FRANI, portion size estimation tended to be overestimated for mixed dishes, including coconut sambol and dhal curry. In conclusion, FRANI demonstrated acceptable validity and performed comparably to WFR for major nutrients, while showing improved reporting accuracy over recall-based assessment. These results indicate that AI-based dietary assessment offers a promising, scalable method for nutrition monitoring among Sri Lankan male undergraduates.

Keywords: Artificial intelligence, dietary assessment, male undergraduates, validation study, weighed food records.

Association between adolescents' food literacy and fruit and vegetable consumption

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Globally, inadequate fruit and vegetable (F&V) consumption among adolescents has become a major public health concern, contributing to micronutrient deficiencies and the rising burden of non-communicable diseases. Although food literacy (FL) is increasingly recognised as a key determinant of healthy dietary behaviour, limited evidence exists regarding its association with F&V intake among Sri Lankan adolescents. This study aimed to examine the association between adolescents' FL and F&V consumption. A school-based cross-sectional study was conducted among 126 adolescents using a structured questionnaire. FL was assessed using a previously validated 25-item tool encompassing knowledge, attitudes and practices, demonstrating acceptable internal consistency. F&V intake was measured using a Food Frequency Questionnaire, and anthropometric measurements were obtained to determine BMI-for-age and height-for-age (HAZ). Low (31%), moderate (54.8%) and high (14.3%) levels of FL were reported. Fruit consumption was less frequent, with 36.5% consuming fruits 2-3 times per month and only 2.4% reporting daily intake. Vegetable consumption frequency was relatively higher than that of fruits and demonstrated more consistent weekly patterns. Adolescents with high vegetable intake showed significantly higher total food literacy scores compared to those with low intake ($p=0.005$), and a similar pattern was observed for combined fruit and vegetable intake ($p=0.021$). Students with high FL were 3.74 times more likely to report high F&V consumption compared to those with low FL (95% CI: 1.11-12.57; $p=0.33$), while moderate FL showed a weaker positive association (OR=1.4; 95% CI: 1.03-3.09; $p=0.33$). Significant associations were also observed between FL and grade level (OR=1.54; 95% CI: 1.23-8.28; $p<0.001$), gender (OR=1.36; 95% CI: 1.18-1.73; $p=0.004$) and family income (OR=1.32; 95% CI: 1.15-1.69; $p=0.003$). No significant association was identified between FL and BMI-for-age; however, height-for-age demonstrated a significant positive relationship (OR=4.33; 95% CI: 1.79-10.48; $p=0.003$). These findings underscore the importance of enhancing FL to improve dietary practices among adolescents.

Keywords: Adolescents, food literacy, fruits, vegetables

Consumer understanding, barriers, and opportunities for pulse consumption in adult females in Sinhala communities

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Pulses are nutrient-dense foods that provide high-quality plant protein, dietary fiber, vitamins, and essential minerals, and they contribute significantly to the prevention of non-communicable diseases and the promotion of sustainable diets. Despite their cultural importance in Sri Lanka, pulse consumption among adult females remains inadequate, leading to gaps in dietary diversity and micronutrient adequacy. This study aimed to explore consumer understanding, perceived barriers, and opportunities related to pulse consumption among adult females in Sinhala communities. A qualitative study design was employed using Focus Group Discussions (FGDs). Five FGDs were conducted with 50 adult women aged 20–60 years from selected urban and rural Divisional Secretariat divisions in the Kandy District, using purposive sampling to capture diverse socio-demographic perspectives. Data were analysed thematically using NVivo software, generating seven key themes: nutritional awareness of pulses, factors influencing acquisition, preparation practices, household food allocation, consumption patterns, barriers to consumption, and recommendations for improvement. Although participants were aware of the health benefits of pulses, knowledge of recommended intake levels was limited. Major barriers to consumption included high prices, limited availability and variety, time constraints for preparation, digestive concerns, and limited culinary diversity. Women's pulse consumption was influenced by household responsibilities, cultural food norms, and family preferences, often prioritizing other household members. Participants highlighted the need for improved nutrition education, simple and time-efficient recipes, better affordability and availability of pulses, and community-level interventions. Overall, integrated strategies addressing knowledge, economic, cultural, and practical challenges are essential to improve pulse consumption among adult females in Sinhala communities and long-term dietary behaviour.

Keywords: Adult females, barriers and opportunities, consumer perceptions, pulse consumption, Sinhala communities

Determination of Aflatoxin levels of selected food items & estimation of dietary exposure levels among Sri Lankans

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Aflatoxins are toxic secondary metabolites primarily produced by *Aspergillus* species and are recognized for their carcinogenic and mutagenic effects. Aflatoxin B₁ (AFB₁) is the most potent and is classified as a Group 1 human carcinogen. This study aimed to determine aflatoxin contamination in commonly consumed food commodities and to assess their dietary exposure among Sri Lankans. A total of 60 food samples were collected from local markets, supermarkets, open markets, and households. Samples included parboiled rice, coconut oil, chili powder, chili pods, peanuts, curry powder, corn, soya milk, multigrain cereals, coconut milk, cow's milk, turmeric, and black pepper. Total aflatoxins were quantified using Liquid Chromatography-Tandem Mass Spectrometry. The highest mean aflatoxin levels (μgkg^{-1}) were detected in peanuts (205.49), followed by corn (73.29), parboiled rice (17.72), coconut oil (16.58), and curry powder (11.07). Several commodities exceeded maximum permissible limits established by the Food Control Administration Unit, Sri Lanka for total aflatoxins and AFB₁. Dietary exposure for subsequent risk assessment was evaluated among 100 Sri Lankan adults using a validated Food Frequency Questionnaire (FFQ) and a 24-hour dietary recall. Total aflatoxin exposure was estimated using a multiple linear regression model which included intake of food item, number of days consume and contamination level of Aflatoxin. Margin of Exposure (MOE) values for seven major foods were below 10,000 and indicated a potential public health concern. Monte Carlo simulation (10,000 runs) and Hazard Index modeling further indicated 100% of the simulated population exceeded acceptable risk thresholds for aflatoxin. These findings reveal the aflatoxin contaminations in commonly consumed foods beyond acceptable limits and dietary exposure levels posing a potential health risk. Further investigations are warranted with varied food samples and high number of participants for exposure estimation to understand the depth of the health risk.

Keywords: Corn, hazard index, margin of exposure, parboiled rice, peanuts

Validation of an AI-assisted dietary assessment tool against weighed food records and 24-hour recalls among undergraduate females

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The transition to university life often triggers significant dietary shifts toward energy-dense, convenience foods and irregular eating patterns, heightening nutritional risks for young adults. In Sri Lanka, where 35.2% of young females are overweight, and 10.7% are obese, the urgent need for accurate dietary assessment is met with considerable methodological challenges. This study validated the mobile AI application FRANI (Food Recognition Assistance and Nudging Insights) for dietary assessment among undergraduate females against weighed records (WR) as the gold standard and multi-pass 24-hour dietary recalls (24HR). Thirty female undergraduates aged 20-28 years from Wayamba University of Sri Lanka participated over two non-consecutive days, contributing 60 person-days of dietary intake data collected simultaneously using FRANI, WR, and 24HR. Equivalence testing within 10%, 15%, and 20% bounds revealed that FRANI demonstrated strong equivalence with WR within the 10% margin for 15 out of 16 nutrients, with folate requiring wider bounds. In comparison, 24HR showed greater variability, with iron, niacin, and vitamin A achieving equivalence only at broader margins, while thiamine failed equivalence at all bounds. Bland-Altman analysis confirmed superior agreement for FRANI, with narrower limits of agreement and no proportional bias compared to 24HR. Error analysis revealed lower omission rates for FRANI (2.48%) versus 24HR (5.43%), with intrusion rates of 3.03% and 4.03%, respectively. Portion size estimation was excellent for rice (ratio 1.0) but revealed overestimation for mixed dishes, including coconut sambol (ratio 1.5) and chicken curry (ratio 1.4). Limited recipe coverage within the FRANI database was identified as a limitation. FRANI is a valid tool for assessing nutrient intake among undergraduate females, offering accuracy superior to 24-hour recalls with substantially reduced omission errors.

Keywords: Artificial intelligence, dietary assessment, mobile application, validation study

The association between the nutritional status of university undergraduates and their cardio-metabolic risk: a cross-sectional study

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The transition to university life is often followed by altered dietary habits and sedentary behaviour, potentially increasing cardiometabolic risk in young adults. Therefore, this study aimed to investigate the association between nutritional status, dietary intake, and cardiometabolic risk factors among undergraduate students. A cross-sectional study was conducted with hundred and one (n=101) undergraduates from Wayamba University of Sri Lanka (mean age 24±1.2 years). Anthropometric measurements including weight, height, waist and hip circumferences and body fat level blood pressure were determined using standard procedures. Dietary intake was assessed using two 24-hour recalls on two non-consecutive days. Nutrient intake was analysed using Food Base 2000 software with Sri Lankan food composition data. A significant proportion of the study participants were obese (41%) by BMI, and centrally obese (46.5%). Majority (60%) of them had high body fat level. Males exhibited significantly ($P<.001$) higher blood pressure (mean systolic pressure (mmHg) 119±8.8) and waist-to-hip ratio (mean ratio 0.85±0.05), while females had higher body fat percentage (mean percentage 36±7.1). Nutrient intake analysis showed widespread inadequacies, with all participants having insufficient fibre and calcium intake. Regarding macronutrient distribution, 64.4% had adequate carbohydrate intake, while 29.7% and 5.9% had high and low intake, respectively. Protein intake was adequate in 72.3%, with 22.8% high and 5.0% low. Fat intake was adequate in 58.4%, whereas 36.6% and 5.0% had high and low intake. Macronutrient patterns were significantly associated with BMI, waist circumference, waist-to-hip ratio, and body fat percentage. In conclusion, undergraduate students demonstrated a high burden of cardiometabolic risk and widespread dietary inadequacies, characterized by high obesity prevalence and insufficient fibre and calcium intake. Targeted nutrition interventions are urgently needed to improve dietary quality and mitigate future disease risk.

Keywords: Body fat percentage, cardiometabolic risk, nutritional status

Development and validation of a food frequency questionnaire for elite Sri Lankan athletes

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Food frequency questionnaires (FFQ) are widely recognized as practical and cost-effective method for assessing habitual dietary nutrient intake. However, there is no locally available validated FFQ to assess the dietary nutrient intake of elite national athletes. Therefore, this study intended to develop and validate a semi-quantitative FFQ to assess habitual dietary nutrient intake of elite national athletes. The FFQ was developed based on a comprehensive food list derived from 285 dietary records collected from national athletes involved in our previous studies. Food items were selected based on their frequency of consumption and contribution to nutrient intake, and the FFQ was refined through expert review and pilot testing prior to validation. A validation study was conducted with sixty-one (n=61) athletes (34 males; 27 females). The developed FFQ comprising seventy-two (n=72) food items with a three-month reference period, was administered and validated against a 3-day estimated diet diary (DD). Mean intake of macronutrients in FFQ and DD correlated well, although the FFQ intake data tended to be higher. Moderate to strong correlations were observed between the two methods for energy ($r = 0.748$), protein ($r = 0.782$), fat ($r = 0.603$) and carbohydrate ($r = 0.590$) at $P < 0.001$. Cross classification analysis showed that 68.0% of participants were correctly classified into the same tertile for energy intake, while gross misclassification was 8.2%. Intraclass correlation coefficients indicated moderate agreement for energy (0.497) and carbohydrate (0.446). Bland-Altman analysis showed a systematic positive bias for energy and macronutrients, with wider limits of agreement at higher intake levels. Overall, the developed FFQ demonstrated moderate validity for assessing habitual energy and macronutrient intake among elite Sri Lankan athletes and appears suitable for group level dietary surveillance and ranking. Future studies should assess the reproducibility of this FFQ to further confirm its reliability

Keywords: Active person, dietary record, food group, nutritional assessment, sports nutrition

Energy from added sugar and its association with overweight and obesity in preschool children

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Early childhood, specifically ages between three and five years, represents a critical period for establishing dietary behaviours and metabolic processes. This cross-sectional analytical study quantified added sugar intake, assessed nutritional status using World Health Organization (WHO) 2006 growth standards and 2007 growth references, evaluated Food Based Dietary Guidelines (FBDG) 2021 food group adherence, and examined lifestyle behaviour compliance among 120 preschool children aged three to five years from urban and rural settings in Sri Lanka. Dietary data were collected using a multiple-pass 24-hour dietary recall and food frequency questionnaire. Anthropometric measurements were obtained using WHO Anthro software. The mean daily added sugar intake was 20.8 g/day, contributing 7.5% of total energy, with no significant differences between sectors or by sex. A total of 28.3% and 72.5% of children exceeded the WHO strong and conditional free sugar recommendations respectively. The combined prevalence of overweight and obesity was 4.1%, and thinness was 10.9%. Wasting, stunting, and underweight affected 11.0%, 15.0%, and 13.3% of children respectively, confirming the double burden of malnutrition. Low birth weight prevalence was 19%, with a non-significant correlation with BMI-for-age z score ($p=0.202$). Regarding FBDG 2021 adherence, only cereal intake met the recommended target while other were all below recommended servings, indicating poor dietary diversity. Ordinal logistic regression showed no significant association between added sugar intake and BMI-for-age weight status ($p=0.39$). Monthly income level ($p=0.035$) and ethnicity ($p=0.000$) were significant predictors. Regarding lifestyle behaviours, 70.0% of children exceeded the recommended screen time limit of one hour per day, 74.2% met the recommended three hours of physical activity per day, and 60.8% achieved the recommended total sleep of 10 to 13 hours per day. These findings highlight the need for targeted nutritional interventions addressing dietary diversity, lifestyle behaviours, and the double burden of malnutrition among Sri Lankan preschool children.

Keywords: Added sugar, BMI-for-age z-score, double burden of malnutrition, obesity, preschool children

Development of food literacy assessment tool to evaluate food literacy among grade 4 and 5 children

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Food literacy plays an important role in shaping healthy eating behaviours among children. However, there is a lack of age-appropriate tools to assess food literacy among primary school children in Sri Lanka. Therefore, this study aimed to develop and pilot test a food literacy assessment tool for Grade 4 and 5 children. The study was conducted in three phases: (1) identification of food literacy components through a literature review, (2) development and refinement of the tool through expert review and pretesting, and (3) pilot testing among primary school children. Seven age-appropriate food literacy dimensions were identified: knowledge of food and nutrition concepts, food selection, decision-making and planning, food preparation, ecological and social food practices, hygiene practices, and media and critical food literacy. Following expert evaluation, a final set of 16 multiple-choice questions representing knowledge, attitude, and practice domains were developed. The tool was administered to 100 students from rural and urban schools in the Batticaloa district. The mean food literacy score was 75.6 (SD=20.9), which falls within the high-level category (70–100%) based on the predefined percentage scoring system among the study population. Domain-wise results showed that knowledge scores were relatively higher (mean=76.0, SD=21.8), while practice and attitude domains demonstrated greater variability (means=75.0 and 76.5; SDs=26.2 and 36.9, respectively). This variability suggests inconsistencies in students' attitudes and differences in applying food-related knowledge in daily life. Item difficulty indices ranged from 0.55 to 0.87, indicating that most items were easy, with a smaller proportion being moderately difficult. Discrimination indices ranged from 0.25 to 0.64, demonstrating acceptable to good item discrimination. The internal consistency reliability was 0.79, indicating acceptable reliability. In conclusion, the developed food literacy assessment tool is a valid and reliable instrument suitable for evaluating food literacy among grade 4 and 5 children, and provides a useful foundation for targeted nutrition education interventions.

Keywords: Assessment, food literacy, primary school children, tool development

Dietary patterns and nutritional status of adolescent schoolgirls in the Kuruwita educational zone of Ratnapura District, Sri Lanka

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Adolescence is a rapid growth stage where proper nutrition is vital for healthy development and future health. Adolescent girls need more nutrients due to puberty and menstruation, and their nutrition affects future maternal and child health. Despite these factors, district-level evidence on the dietary patterns and nutritional status of young adolescent schoolgirls in Sri Lanka remains limited. This study assessed the dietary patterns and nutritional status of adolescent schoolgirls in the Kuruwita educational zone of the Ratnapura District and to identified the relationship between dietary patterns and nutritional status. A cross-sectional descriptive study was conducted among 140 adolescent schoolgirls aged 11–18 years, selected from 10 randomly selected schools using convenience sampling. Socio-demographic, dietary patterns, and nutritional status-related information was collected and assessed using pre-tested, interviewer-administered health and lifestyle and semi-quantitative food frequency questionnaires. Anthropometric measurements, including weight, height, waist circumference, hip circumference, mid upper arm circumference, and triceps skinfold thickness were obtained following WHO standards. Nutrient intakes were calculated using Foodbase 2000 and compared with the Recommended Dietary Allowances (RDA) for adolescent girls. Nutritional status was analysed using WHO Anthroplus software to generate Body Mass Index-for-Age and Height-for-Age Z-scores. Chi-square and ANOVA tests were used to assess associations. Results revealed that 35.7% of participants skipped breakfast regularly, and sweet and tempered food types were the most preferred. Protein and vitamin C intakes were adequate; however, energy, fat, calcium, iron, zinc, and folate intakes were below recommended levels in a significant proportion of girls. Anthropometric findings indicated a double burden of malnutrition, with 30.7% of girls stunted and 11.4% as overweight or obese. Inadequate macronutrient intake and breakfast skipping were significantly associated with adverse anthropometric outcomes ($p < 0.05$). These findings show both undernutrition and overnutrition in this group, highlighting the need for targeted school-based nutrition interventions, dietary education, and policy actions to improve adolescent nutrition in the Kuruwita educational zone.

Keywords: Adolescent girls, dietary patterns, malnutrition, nutritional status

Nutritional status of community-dwelling older adults in Kurunegala District, Sri Lanka: A cross-sectional study

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Population ageing is increasing rapidly in Sri Lanka, raising concerns about the nutritional well-being of community-dwelling older adults. This study aimed to assess the nutritional status of older adults aged ≥ 65 years in Kurunegala District and to characterize their dietary diversity, nutrient intake, functional status, and to identify socio-demographic factors associated with malnutrition risk. A community-based cross-sectional study was conducted among 150 community-dwelling older adults (mean age 72.3 ± 5.1 years). A pre-tested questionnaire and a validated semi-quantitative food frequency questionnaire (SQFFQ) were used to collect socio-demographic factors and food intake, respectively. Nutritional status was assessed using the Mini Nutritional Assessment (MNA), anthropometric measurements, and bioelectrical impedance analysis. Functional status was assessed using the Activities of Daily Living Score (ADLs) and Timed Up and Go Test (TUG). According to MNA classification, 0.7% were malnourished, 30.6% were at risk of malnutrition, and 68.7% were well-nourished. Nutritional status was significantly associated with living status ($p=0.049$; higher risk among those living alone). By BMI category, underweight was 10%, whereas overweight and obese were 52%. Functional status assessment showed high fall risk based on the TUG (mean: 12.18 ± 2.99 seconds), and functionally dependent based on ADLs (mean: 15.95 ± 2.27), as 30% and 46%, respectively, though no statistically significant association was found between nutritional status and either TUG ($p=0.2$) or ADLs ($p=0.429$). Dietary diversity showed regular consumption of major food groups with no significant gender differences. Regression analysis identified body composition indicators and living status as significant predictors of nutritional status ($R^2=0.242$, $p<0.001$). Nutritional status is considerably poor among the community-dwelling elderly in the Kurunegala district, indicating need of geriatric nutritional interventions to make improvements.

Keywords: Activities of daily living score, functional assessment, mini nutritional assessment, malnutrition, semi-quantitative food frequency questionnaire

Mapping food literacy in the primary curriculum: A study of Grade 4 and 5

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School aged children experience both undernutrition and unhealthy dietary behaviours in Sri Lanka. Schools provide an important platform to promote healthy eating habits through structured education. However, the extent to which comprehensive food literacy components are covered in the primary school curriculum remains unclear. This study aimed to systematically identify essential food literacy components for primary schools in Sri Lanka and to compare them with the existing Grade 4 and Grade 5 curricula to identify content gaps and overlaps by multi-phase sequential mixed-method design: (1) a scoping review was conducted to identify key food literacy components, (2) expert validation was carried out using the Fuzzy Delphi Method, involving a panel of six experts in nutrition, education, and food systems, (3) curriculum mapping was performed using primary school curriculum documents obtained from Sri Lanka, (4) time allocated for food literacy contents within the curriculum was analyzed in both Grades. Twenty-one food literacy components were initially identified under major food literacy domains including nutrition knowledge, food selection, food preparation, safe food handling and personal hygiene, food sustainability and social responsibility and media and critical food literacy. Out of 21 components, 16 were accepted by expert validation. A total of 19 knowledge components and 7 skill components were recorded across the Grade 4 and 5 curricula through curriculum mapping. **Furthermore**, only 12.5% of instructional time was allocated to food science and nutrition related content. In conclusion while most of the validated components were present in the primary school curriculum, some important gaps were identified in three components including choosing healthy snacks, hand hygiene during eating occasion, awareness on TV advertisement. This imbalance may hinder the effective application of food literacy among Grade 4 and 5 school students. The results highlight the need to strengthen practical skill integration and enhance the overall effectiveness of food literacy education at the primary level.

Keywords: Curriculum mapping, food literacy, primary education, Sri Lanka

Herbal tea as a complementary alternative dietary management for diabetes patients

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Postprandial hyperglycaemia is a major contributor to metabolic complications in type 2 diabetes mellitus, and plant-based dietary interventions have gained increasing attention as complementary strategies for glycaemic control. This randomized crossover study evaluated the acute effect of a standardized herbal tea on postprandial blood glucose response in adults those receiving antidiabetic medication or with type 2 diabetes ($126 \leq \text{FBG} \leq 250$ mg/dL). Eighteen participants, aged below 65 years were recruited, and eleven completed both study visits and were included in the final analysis. On separate study days, participants consumed either a control beverage (50 g glucose in 250 mL water) or an intervention beverage containing 50 g glucose with 4 g herbal tea (75% *Artocarpus heterophyllus* leaves and 25% *Cassia auriculata* flowers, with a small amount of cinnamon) infused in 250 mL hot water for 20 minutes. Capillary blood glucose was measured at fasting and at 15, 30, 45, 60, 90, and 120 minutes. Incremental area under the curve (iAUC) was calculated using the trapezoidal method. The mean iAUC was lower in the herbal tea condition (10083.64 ± 707.36 mg.min/dL) compared to the control (11181.27 ± 1298.76 mg.min/dL). However, this difference was not statistically significant ($p > 0.05$). The time taken to reach peak glucose levels varied between 45–90 minutes in the control and 30–90 minutes in the intervention. Peak glucose levels also varied among participants, ranging from 193–518 mg/dL in the control and 206–398 mg/dL in the intervention. Overall, the results indicate that the herbal tea may help reduce postprandial blood glucose levels in some individuals, but the effect was not consistent across all participants. These findings highlight variability in individual responses and suggest that further studies with larger sample sizes are needed to confirm the effectiveness of this herbal tea.

Keywords: *Artocarpus heterophyllus*, *Cassia auriculata*, incremental area under the curve (iAUC), postprandial glycaemia, type 2 diabetes mellitus

Knowledge, attitudes, and practices regarding unsaturated fatty acid-rich food consumption among working adults in Sri Lanka

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Cardiovascular disease (CVD) is responsible for the 80% of global mortality and 34% of deaths in Sri Lanka. Unsaturated fatty acids (UFA) provide cardio-protective benefits. The Sri Lankan diet contains a high amount of saturated fatty acids (SFA) (17%) and a low amount of both Monounsaturated fatty acids (MUFA) (2.8%) and Polyunsaturated fatty acids (PUFA) (1.2%). This imbalance contributes to increasing the CVD risk. Despite this, the reasons for the low consumption of MUFA and PUFA among Sri Lankan populations remain unknown, highlighting the need to identify these factors to develop and promote effective interventions. It is vital to identify evidence on the knowledge, attitudes, and practices regarding UFA-rich food consumption among Sri Lankan adults for the effective implementation of appropriate intervention programmes. This cross-sectional study assessed KAP regarding UFA-rich food consumption and socio-demographic associations among 200 working adults (aged 22–60 years) recruited through convenience sampling from government and non-government institutions in the Pannala area, Kurunegala District. Data were collected using a purpose-built, pre-tested, interviewer-administered questionnaire with a validated 1–5 Likert scale scoring rubric for KAP classification. Descriptive statistics were used to summarise the data and determine the prevalence of knowledge, attitudes, and practices related to UFA-rich food consumption. Chi-square tests were applied to examine associations between KAP variables and socio-demographic factors at $p < 0.05$. Most participants demonstrated low knowledge (54.7%), and 90.5% had positive attitudes towards UFA-rich foods. Good practices were reported by only 18.4% of participants, while 51.7% and 29.9% demonstrated moderate and poor practices, respectively. No significant KAP inter-associations were identified ($p > 0.05$); however, knowledge was significantly associated with age, gender, and monthly income ($p < 0.05$). The discordance between positive attitudes and suboptimal practices indicates behavioural barriers to dietary adherence. Multi-level nutrition interventions addressing economic, sociocultural, and accessibility barriers are recommended to improve UFA-rich food intake and reduce CVD risk.

Keywords: Attitudes, cardiovascular disease, knowledge, practices, unsaturated fatty acids

Effects of beetroot (*Beta vulgaris*) juice supplementation on arterial stiffness and blood pressure in pre-hypertensive adults

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Pre-hypertension is a transitional stage of elevated blood pressure in which pharmacological intervention is generally not recommended, leaving a therapeutic gap in clinical management. This study aimed to bridge this gap by investigating the primary effects of dietary nitrate, administered via beetroot (*Beta vulgaris*) juice, on both arterial stiffness and blood pressure in pre-hypertensive adults. In a single-blinded, randomised, placebo-controlled crossover trial, 22 participants (baseline pulse wave velocity: 6.8 ± 1.2 m/s; systolic and diastolic blood pressure: 127.4 ± 9.4 mmHg, 82.3 ± 9.3 mmHg, respectively) underwent two 14-day intervention periods separated by a 3-week washout. The treatment intervention consisted of 250 mL of beetroot juice prepared from 160 g of raw beetroot per 100 mL of water daily. In comparison, the placebo group received 10 mL of blackcurrant cordial diluted to 250 mL, organoleptically matched to the treatment. Participants avoided dietary beetroot intake during the intervention periods. Beetroot juice supplementation significantly reduced pulse wave velocity by 0.2 m/s (95% CI: -0.4 to -0.1, $p=0.002$) compared to placebo, indicating attenuation of arterial stiffness, and significantly reduced systolic blood pressure by 7.7 mmHg (95% CI: -11.9 to -3.5, $p=0.001$) compared to placebo. In contrast, no significant change was observed in diastolic blood pressure ($p=0.097$). No statistically significant carryover effects were detected ($p>0.05$). These findings demonstrate that beetroot juice supplementation provides a potent, non-pharmacological mechanism to enhance arterial compliance and regulate blood pressure. Consequently, it represents a high-impact nutritional intervention for cardiovascular risk management during the critical pre-hypertensive window.

Keywords: Arterial stiffness, beetroot juice, dietary nitrate, pre-hypertension, pulse wave velocity

Iron status and its determinants in female Air Force athletes

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Anaemia is a global public health concern that disproportionately affects female athletes owing to increased physiological demands, menstrual blood loss, and elevated iron utilization during training. Female military athletes represent a uniquely vulnerable group; however, their iron status and associated determinants remain poorly identified in Sri Lanka. This cross-sectional study was conducted among 83 female Sri Lanka Air Force athletes to assess their iron status and to identify its key determinants of iron status. Iron status was evaluated by serum haemoglobin (Hb) concentrations which was obtained from medical records and classified according to World Health Organization criteria. Dietary iron intake was assessed using validated FFQ, Physical Activity Level (PAL) was determined using the Mat values of each activity including the sport type, anthropometric measurements such as height and weight were measures. Body Mass Index (BMI) was calculated. Structured questionnaire was used to gather the information about dietary habits, sociodemographic and economic information, and menstrual history. Mean Hb was 11.67 ± 1.21 g/dL, Mean iron intake was 15.3 ± 6.7 mg/day only 39.8% of athletes were non-anaemic (Hb ≥ 12.0 g/dL), while 39.8% were at risk of mild anaemia (Hb 11.0–11.9 g/dL) and 20.4% were at risk of moderate anaemia (Hb 8.0–10.9 g/dL). The majority (72.3%) had inadequate dietary iron intake. Chi-square analysis revealed that no significant associations between anaemia status and dietary iron intake, menstrual abnormality, iron supplementation, PAL or BMI category ($p \geq 0.05$). However, Pearson correlation analysis demonstrated a significant positive association between BMI and Hb ($r=0.333$, $p=0.002$). These findings highlight a high prevalence of sub-optimal iron status among female Air Force athletes in Sri Lanka, emphasizing proper nutrition intervention programmes to improve the iron status of female athletes.

Keywords: Anaemia, dietary iron intake, female athletes, haemoglobin, iron status

Dietary intake patterns of individuals with type 2 diabetes mellitus

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Dietary management is an integral part of managing type 2 diabetes mellitus (T2DM). Dietary intake pattern provides valuable insights to the adherence of T2DM for dietary guidelines. However, evidence on dietary intake patterns and adherence to national dietary guidelines among Sri Lankan adults with T2DM remains scarce. The current study was conducted with the objective of assessing the dietary intake patterns and adherence of T2DM for disease specific dietary guidelines. A cross-sectional study was conducted with hundred and fifty-six (n=156) T2DM individuals. Socio-demographic, general lifestyle details and disease and medical history data were collected using a general lifestyle questionnaire. Anthropometric measurements were taken following the standard methods. Biochemical data were extracted from their clinical records. Dietary intake was assessed using 3-day diet diaries, and nutrient intake was analysed using Foodbase 2000 software. The mean weight of the study participants was 58.09 kg. The median fasting blood glucose level was 148.0 mg/dL. The study population exhibited a median Dietary Diversity Score of 7.0 (Inter Quartile Range: 6.0–7.6) and a median Food Variety Score of 9.0 (Inter Quartile Range: 7.0–11.0). The median daily energy intake was 1472 kcal, with 66% of energy derived from carbohydrates. Contribution of fat and protein for total energy intake were 23% and 11%, respectively. T2DM Dietary patterns were characterized by high intake of cereals and cereal products (median 8.48 servings/day) and low consumption of vegetables (median 1.00 serving/day) and fruits (median 0.33 servings/day). Nearly 93% reported snacking, 71% had an inadequate snacking frequency. Furthermore, 48% failed to maintain recommended meal intervals. Poor adherence to national guidelines was observed, particularly for protein and saturated fat. This study highlights significant deviations of dietary intake of T2DM from the national recommendations, characterized by excessive carbohydrate and saturated fat intake alongside insufficient protein, vegetable, and fruit consumption.

Keywords: Dietary diversity, dietary guidelines, dietary intake patterns, glycaemic control, type 2 diabetes mellitus.

Vitamin B12 status and cognitive function among Sri Lankan older adults: insights from a community-based study

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Population ageing is rapidly increasing worldwide, with Sri Lanka experiencing this transition at a particularly fast pace. As a result, cognitive decline among older adults is becoming an important public health concern, yet the role of nutritional factors remains insufficiently explored locally. Vitamin B12 is essential for neurological function, particularly in maintaining myelin integrity and regulating homocysteine metabolism, both of which are linked to cognitive health. Vitamin B12 is obtained from animal-source foods such as meat, fish, eggs, and dairy products, with limited availability in plant-based diets. This study examined the relationship between serum vitamin B12 status, dietary intake, and cognitive function among community-dwelling older adults in the Gampaha District of Sri Lanka. A community-based cross-sectional study was conducted among 80 adults aged 60 years and above, excluding those receiving vitamin B12 supplementation. Cognitive function was assessed using the Sinhala- validated Montreal Cognitive Assessment, while serum vitamin B12 concentrations were determined using enzyme-linked immunosorbent assay (ELISA). Dietary intake was assessed using a 24-hour recall with the multiple-pass method. The mean serum vitamin B12 concentration was 608.1±234.6 pg/mL, with most participants (90.0%) demonstrating normal levels. Cognitive impairment was prevalent, with 60.7% and 9.0% classified as mild and moderate impairment, respectively. No significant association was observed between serum vitamin B12 levels and cognitive function ($r_s=-0.163$, $p=0.149$), nor between dietary vitamin B12 intake and cognitive scores ($r_s=0.056$, $p=0.601$). However, dietary vitamin B12 intake showed a weak positive association with serum levels ($r_s=0.228$, $p=0.042$). These findings suggest that, within this population, serum vitamin B12 alone may not reflect its role in cognitive function. Other factors may play a more prominent role in cognitive ageing among Sri Lankan older adults, highlighting the need for further research using functional biomarkers and longitudinal designs.

Keywords: Cognitive function, older adults, serum vitamin B12, Sri Lanka, vitamin B12 deficiency

Personalized nutrition intervention for osteoarthritis patients attending the osteoarthritis clinic at Chilaw Base Hospital, Sri Lanka

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Osteoarthritis (OA) is a degenerative joint disease and a major cause of chronic pain, disability, and reduced quality of life. Obesity-related inflammation and poor dietary habits are recognized contributors to progression, underscoring the need for non-pharmacological interventions. This pilot pre-post study assessed the effectiveness and acceptability of a personalized nutrition education intervention among OA patients at Chilaw Base Hospital, Sri Lanka. Twenty female patients (aged 43–71 years) were recruited; 12 completed the eight-week programme. A personalized diet based on anti-inflammatory principles was implemented, emphasizing low glycaemic index foods, healthy fats, high fibre, and reduced energy density, with individualized counselling and dietary guidelines. Data collected at baseline and two follow-ups assessed adherence, anthropometric changes, and disease outcomes using the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC). Adherence improved markedly: weekly fruit (0.25 to 2.92), fish (3.6 to 4.08), nuts and seeds (1.0 to 2.58), and whole grain (0.2 to 2.41) intakes increased; daily vegetable consumption rose (2.0 to 2.92); and sweets and confectionery declined (4.1 to 2.0 per week). All twelve completers showed reduced body weight (mean 1.8 kg; maximum 4.4 kg), eleven had decreased waist circumference (maximum 15 cm) and reduced body mass index, though all remained overweight or obese. WOMAC scores improved in five participants (group mean 55.6 to 55.0). These results suggest that a personalized nutrition education intervention is feasible, acceptable, and effective for improving dietary behaviour, anthropometric outcomes, and disease status in OA patients within a resource-limited Sri Lankan setting.

Keywords: Adherence, inflammation, nutrition education, osteoarthritis, personalized diet

Association between nutritional status, nutrient intake and aging status among free-living older adults

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Sri Lanka is experiencing one of the fastest demographic transitions in South Asia, with the elderly population projected to rise to nearly 25% by 2045. This study aimed to evaluate the aging status, nutritional status, and nutrient intake of free-living older adults aged 65 years and above in selected Grama Niladhari divisions in Jaffna, Sri Lanka. A cross-sectional study was conducted recruiting 100 free-living older adults. Data were collected using an interviewer-administered questionnaire including the Katz Activities Daily of Living (ADL), Lawton Instrumental Activities of Daily Living (IADL), Mini Nutritional Assessment (MNA), and Food Frequency Questionnaire (FFQ). Handgrip strength and the Timed Up and Go (TUG) test were used to assess physical performance. Data were analysed using descriptive statistics and Chi-square tests. According to ADL, the majority (97%) were independent and according to IADL, 98% were independent. However, 79% of participants demonstrated low grip strength and 76% had elevated fall risk assessed using the TUG test, indicating early physical decline in older adults. According to MNA, 38% were at risk of malnutrition, and 15% were malnourished. A mean Body Mass Index (BMI) was 25.30 kg/m². Mean daily energy, protein, vitamin D, and calcium were 1664 kcal/day, 55.32 g/day, 3.39 µg, 436 mg, respectively. Nutritional status demonstrated a significant positive association with muscle strength ($r=0.312$, $p=0.002$), while protein intake did not demonstrate a significant association with muscle strength. Nutritional status was not significantly associated with ADL or IADL scores. Routine nutritional screening and nutrition interventions are essential to support healthy aging in Northern Sri Lanka.

Keywords: Aging status, grip strength, nutrient intake, nutritional status, older adults

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