PROCEEDINGS

of the 4th

Graduate Research Showcase

GRS 2024

"UNLOCKING THE POTENTIAL OF ECOSYSTEMS FOR FOOD AND NUTRITION SECURITY"

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

11th September 2024
Wayamba University of Sri Lanka, Makandura, Gonawila, (NWP)

4th Annual Graduate Research Showcase (GRS)

of the

Faculty of Livestock, Fisheries and Nutrition

of the Wayamba University of Sri Lanka

Unlocking the Potential of Ecosystems for Food and Nutrition Security

11th September 2024

Key-highlights of the Fourth Graduate Research Showcase of the Faculty of Livestock, Fisheries and Nutrition, Wayamba University of Sri Lanka.
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Message from the Vice-Chancellor

I am pleased to write this message to mark the Proceedings of the "Graduate Research Showcase 2024" organized by the Faculty of Livestock, Fisheries & Nutrition (FLFN) for the 4th consecutive time under the theme of *"Unlocking the Potential of Ecosystems for Food and Nutrition Security".*

This is a one of the utmost efforts of the FLFN where the findings of work carried out by 21 Postgraduate Students are presented to an educated audience.

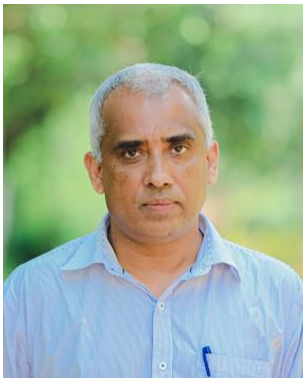
In light of that, I would like to offer my sincere appreciation to the Organizing Committee, including the Academic, Administration and Other Staff and the students who were involved in setting this collaborative event.

I congratulate all the postgraduate students for the success in the present event and in their future academic achievements as responsible citizens to the society.

Snr. Prof. Udith K. Jayasinghe

Vice-Chancellor

Message from the Dean – Faculty of Livestock, Fisheries and Nutrition



It is a great pleasure to write this message as the Dean, Faculty of Livestock, Fisheries and Nutrition, for the 4th consecutive Graduate Research Showcase which will be conducted this year as "GRS 2024", a platform for our postgraduates to showcase their vibrant research, inventions and innovations.

Faculty of Livestock, Fisheries and Nutrition is the leading faculty offering Master of Philosophy and Doctor of Philosophy Degrees at Wayamba University of Sri Lanka. We are proud of our growing number of postgraduate students. This year, there are 21 students presenting their findings at the GRS 2024. Postgraduate students will never ever will get this type of a platform because after completing their graduate studies they will have nothing to obtain as academic qualifications. Therefore, GRS platform is a wonderful opportunity for them to shape up their creativity, innovativeness and more importantly to dig out the entrepreneurial skills hidden deep within them. I believe that they will fairly use this opportunity. The faculty is committed to conducting impactful research. I would expect the multidisciplinary research culture of the faculty to further evolve while nurturing a future generation of young scientists. I believe that this will provide us with an opportunity to serve together for the betterment of the humanity and country's development.

I congratulate all postgraduate students and academics for their extended research work. I expect exciting and fruitful discussions and interactive exchange of knowledge at this event.

I am grateful to our Vice-Chancellor Senior Professor Udith K. Jayasinghe for his thoughts and support. I highly appreciate the Chairman and the members of the Faculty Higher Degree Committee, the co-ordinator, and the organizing committee of the GRS 2024 for their passion and hard work in organizing this event. I especially mention the involvement of the postgraduate students in organizing this event, I hope this culture will continue to enrich

I wish you every success with "GRS 2024, on the theme "Unlocking the potential of ecosystems for food and nutrition security".

Prof. Gamika A. Prathapasinghe

Dean - Faculty of Livestock, Fisheries and Nutrition

Message from the Chairman – Faculty Higher Degree Committee

I am happy to write this message to the Proceedings of the 4th Graduate Research Showcase of the Faculty of Livestock, Fisheries & Nutrition, Wayamba University of Sri Lanka named "Graduate Research Showcase (GRS-2024)" at the Wayamba University of Sri Lanka. The GRS. It is with great pride, pleasure and honor that the Higher Degree Committee in the Faculty of Livestock, Fisheries and Nutrition has been successful in organizing the third GRS physically this year.

The GRS aims to showcase our current postgraduate research and this great event will provide opportunities for our postgraduate students to communicate and interact with academics and other Researchers. We hope that they will receive useful guidance/suggestions for their experimental methods and designs, data analysis, and completion of their theses. The research culture at the Wayamba University of Sri Lanka is deeply entrenched, and as a result, student enrolment in research-based postgraduate programs is rapidly increasing in the Faculty of Livestock, Fisheries and Nutrition is privileged to have researchers of a high caliber to guide these students in their chosen fields. As a result, the faculty is gaining significant recognition as a hub of applied research and most of the research outcomes presented at GRS-2024 have resulted from multi-disciplinary research including

aquaculture and fisheries, livestock and avian sciences, applied nutrition and food science & technology. Accordingly, the FLFN can offer a leading and lively research environment and has many outstanding areas of research strength. For the 3rd GRS, there are about 21 postgraduate students to make presentations under the theme "Unlocking the potential of ecosystems for food and nutrition security". As most of these postgraduates are presenting their ongoing research findings, we provided a platform for them to snapshot their research highlights.

On behalf of the Faculty Higher Degree Committee, I wish to thank all our postgraduate students for their contributions to the GRS-2024.

Dr. Haily Seneviratne and the organizing committee are greatly acknowledged for her utmost contribution as the Coordinator of GRS-2024 to make this event a great success. I would like to express my sincere gratitude to Senior Prof. Udith K. Jayasinghe, the Vice-Chancellor of the Wayamba University of Sri Lanka for his continuous support and encouragement. Also, I must appreciate Prof. Gamika Prathapasinghe, the Dean of the Faculty of Livestock, Fisheries and Nutrition for the valuable support and guidance given in organizing GRS-2024. I congratulate and appreciate all our postgraduate students who showcase their research highlights. I convey my thanks to all Postgraduate supervisors who guided the students for this great achievement. Also, all academic and non-academic staff of the faculty assisted in various ways to organize the 3rd GRS-2024.

Professor KDPP Gunathilake

Chairman - Faculty Higher Degree Committee

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*ඇන්කර් සම්පූර්ණ යොදය සහිත කිරිපිටි, විටමින් A සහ D3 වලින් සරු කර (Enriched) ඇති අතර අනෙකුත් පෝෂ්‍ය පදාර්ථ, ස්වභාවිකවම (Inherent) ඇන්කර් ඇතුළු සියළුම සම්පූර්ණ යොදය සහිත කිරිපිටි වල අන්තර්ගත වේ. වැඩි විස්තර සඳහා පැකට්ටුව බලන්න. දිනකට වීදුරු 1-2 ක් නිර්දේශ කෙරේ. සමබල සහ විවිධත්වයෙන් යුතු ආහාර වේලක් සඳහා අපි සැමවිටම ඔබව දිරිමත් කරන්නෙමු. ඔබේ සෞඛ්‍ය/පෝෂණයට අදාළ කරුණු සඳහා හොඳම මූලාශ්‍රය වන්නේ සුදුසුකම්ලත් සෞඛ්‍ය සේවා වෘත්තිකයන්ය.

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Intake 2 – BSc in Food Quality Management

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Effect of improved school garden and school food environment on food literacy among secondary school children

***Karunanayaka M.M.S.**, Perera T., Mohotti J., Hunter D and Silva K.D.R.R.*

Effect of supply-demand-food environment interventions on adults' dietary intake of fruits and vegetables

Sitisekara S.M.H.D.[a*], Ranathunga R.M.T.K.[a], Perera T.[a], Olney D.[b] and Silva, K.D.R.R.[a]

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Key-highlights

- Increasing fruit and vegetable (F&V) intake requires an end-to-end approach starting with consumers, understanding dietary patterns, and addressing barriers to consumption.
- This research aims to increase F&V intake among the Sri Lankan population, as a part of the Fruit and Vegetables for Sustainable Healthy Diets (FRESH) Initiative.
- A qualitative study will be conducted to assess the consumer behavior of adolescents and adult women on F&V consumption.
- A quantitative study will be conducted to evaluate the impact of supply-demand-food environment interventions on adults' dietary intake of F&V.

Enhancing bioavailability of Eppawala rock phosphate by chemical and physical method to be used in poultry rations

Manopriya S.[a], Premarathne J.M.K.J.K.[a]*, Jayaweera B.P.A.[a], Prathapasinghe G.A.[a], Jayasooriya L.J.P.A.P.[b], Satharasinghe D.A.[b], Fernando C.A.N.[c], Mantilaka M.M.M.G.P.G.[d], Liyanage J.A.[e]

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Key-highlights

- Calcium and Phosphorus supplements are crucial for poultry, especially in broiler nutrition.
- Nano calcium phosphate supplement is one of the effective ways of supplying Calcium and Phosphorus.
- Nano Hydroxy Apatite (NHA) is derived from Eppawala rock phosphate and serves as a cost-effective nano additive for poultry.
- NHA can be added to the broiler feed up to a 0.2 % inclusion rate without affecting broiler performance and welfare.
- Including NHA in broiler feed is effective over traditional Calcium and phosphorus supplements.

Market chain and product variability of giant freshwater prawns that come from reservoir culture-based fishery of Sri Lanka

Digamadulla D.S.[a], Jayasinghe J.M.U.K.[b], Amarasinghe U.S.[c] , Wijenayake W.M.H.K.[a] and De Croos M.D.S.T.[a]*

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Key-highlights

- The market chains survey of giant freshwater prawns (GFP) from culture-based fisheries (CBF) was conducted in 24 reservoirs using systematic random sampling.
- The study mainly focuses on GFP pricing, product differentiation, and market segmentation throughout the market chain from the reservoirs to the end consumer.
- The study identifies the static pricing of GFP caused by monopolistic market conditions and decision-making regardless of market demand due to the influence of exporters.
- Product differentiation and market segmentation of GFP are apparently prone to the intrinsic growth variation of CBF GFP.

Formulation of millet and rhizome flour incorporated noodles and evaluation of their functional properties using in vitro assays and human clinical trial

Chiranthika N.N.G.[a*], Chandrasekara A.[b] and Gunathilake K.D.P.P.[a]

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Key-highlights

- A noodle was formulated by incorporating Panicum milaceum, Paspalum scrobiculatum, Setaria italica, Lasia spinosa, and Nelumbo nucifera. Incorporation level was 40% (dry basis).
- Newly formulated noodle was rich in dietary fiber and resistant starch with a low level of starch compared to 100% wheat flour noodle.
- Formulated noodles had 65.75% of α amylase inhibition action and 70.85% amyloglucosidase inhibition action that showed anti-diabetic properties.
- A randomised, placebo-controlled human clinical trial was conducted to assess the functionality of the product, basically in weight management.
- The findings indicated positive changes in anthropometric and biochemical parameters associated with improved insulin sensitivity, in the intervention group compared to placebo.

Production trends and yield predictive models for culture-based fisheries in irrigation reservoirs of Sri Lanka

Adikari A.M.A.N.[a], De Cross M.D.S.T.[b*], Amarasinghe U.S.[c], Clive J. [d] and Perera H.A.C.C.[c]

[a]National Aquatic Resources Research and Development Agency, Crow Island, Mattakkuliya, Colombo 15; [b]Department of Aquaculture and Fisheries, Faculty of Livestock, Fisheries and Nutrition, Wayamba University of Sri Lanka, Makandura, Gonawila, 60170, Sri Lanka; [c]Department of Zoology, Faculty of Science, University of Kelaniya, 11600, Sri Lanka; [d]Centre for Sustainable Tropical Fisheries and Aquaculture, College of Science and Engineering, James Cook University, Australia

Key-highlights

- Prediction of reservoir yield under culture-based fisheries (CBF) is important for scientific management.
- Therefore, this study investigated the feasibility of developing suitable yield prediction models for perennial irrigation reservoirs in the country.
- Limnological and biological parameters were collected from 36 perennial reservoirs under major, medium and minor categories.
- The limnological characteristics were subjected to Principal Component Analysis (PCA).
- The PC1 axis scores were then plotted against fish and giant freshwater prawn (FWP) yields.

Development of a model school garden for enhancing knowledge and attitudes towards nutrition and agriculture of school children

Indramali O.S.[a*], Perera T.[a] , Silva K.D.R.R.[a], Dissanayake U.[b] Mohotti J.[c] and Hunter D.[d]

[a]Department of Applied Nutrition, Faculty of Livestock, Fisheries and Nutrition, Wayamba University of Sri Lanka, Makandura, Gonawila, 60170, Sri Lanka; [b]Department of Agricultural Extension, Faculty of Agriculture, University of Peradeniya; [c]Department of Crop Science, Faculty of Agriculture, University of Peradeniya; [d]Alliance of Bioversity International Rome, Italy.

Key-highlights

- To effectively address the importance of nutrition, agricultural interventions are essential, with school gardens being one of the best interventions.
- This study aimed to identify challenges in school gardening and suggest improvements for a model school garden.
- This qualitative study involved in-depth interviews with teachers and agriculture experts experienced in school gardening projects.
- The introduction of a model garden intervention that combines innovative agricultural practices that enhance practical skills of agriculture and enriches students' understanding of food sources and nutrition.

Enhancement of bioavailability of phosphate by microbial methods to sustainable utilization of Eppawala rock phosphate

Aberathna A.A.A.U.[a], Premarathne J.M.K.J.K.[a*], Jayaweera B.P.A.[a], Prathapasinghe G.A.[a], Liyanage J.A.[b], Fernando C.A.N.[c], Satharasinghe D.A.[d], Jayasooriya A.P.[d] and Jinadasa R.N.[e]

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Key-highlights

- Phosphate solubilizing microorganisms (PSM) were isolated from soil samples.
- PSMs were morphologically and molecular biologically identified.
- Solubilizing ability of High Graded Eppawala Rock Phosphate (HERP) of isolated microorganisms was studied qualitatively and quantitatively.
- HERP solubilization was optimized by using the best-selected PSMs.
- A field trial of biofertilizer application of selected PSM was done with rice variety.

Red seaweed: *Kappaphycus alvarezii* as a source of natural bioactives, nutritional and functional properties

Simmaky S.[a], Gunathilake K.D.P.P.[b*] , Sukirtha S.[a] and Wijesekara R.G.S.[c]

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Key-highlights

- *Kappaphycus alvarezii* species, the largest tropical red algae available in large quantity as abundant resources and grown fast are currently considered to be inexpensive and underutilized in Sri Lanka.
- Interesting nutritional profile and bioactivity provide huge scope for supplementation of food items with edible seaweeds which implies health benefits to the consumers.
- It was rich in fibre, ash, protein and carbohydrate and low in fat.
- It showed better solubility, flowability, swelling, water holding, oil holding and foaming capacity.
- Extraction using 70% methanol and 70% ethanol had a higher yield than water, hence, water extract had higher phenolic and flavonoids than ethanolic and methanolic extract.

Kala oya estuary mangrove ecosystem: Least Concern (LC) status on the IUCN Red List, yet grounds for optimism remain

Abeygunawardana A.P.[a,b] *, Jayakody S.[b] , Wikramanayake E.[c] , Fernando S.[d] and Wickramarathne C.[e]

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Key-highlights

- We applied the IUCN Red List of Ecosystems framework 1.1 - The global standard for assessing ecosystem collapse to the Kala Oya Estuary mangrove ecosystem as a pilot-level study.
- The outcome for the Kala oya estuary mangrove ecosystem in Sri Lanka resulted in a conservation status of Least Concern (LC) for the year 2022.
- However, the absence of data for assessment at sub-criteria levels may have impacted the outcome.
- Current results highlighted the need for further revisions to the current Red List of Ecosystem (RLE) version to better accommodate data-deficient and smaller patches.

Identification and quantification of selected phytochemical compounds using heated ESI-Ion trap HPLC-MS/MS

Hettiarachchi H.A.C.O.*, Jayatilake S. and Gunathilake K.D.P.P.

Department of Food Science and Technology, Faculty of Livestock, Fisheries and Nutrition, Wayamba University of Sri Lanka, Makandura, Gonawila, 60170, Sri Lanka.

Key-highlights

- Methanolic extracts of underutilized crops were analyzed using LC-MS for twelve compounds with bioactive properties, comparative to the mass spectra of reference standards.
- Lutein, Apigenin, Kampferol-3-O-glucoside and Myricetin were not detected in any of the crop extracts and Delta-tocopherol and Zeaxanthin were detected in all crop extracts.
- Chlorogenic acid was detected in *Mucuna pruriens* and *Solanum torvum*, while Syringic acid was detected in *Phyllanthus emblica, Elaeocarpus serratus* and *S. torvum* extracts.
- Hesperidin was detected only in *Canavalia gladiata* and Alpha-tocopherol was found in *P. emblica, Pouteria campechiana, M. pruriens* and *S. torvum* methanolic extracts.
- Ferulic acid and Sinapic acid were detected only in *S. torvum* methanolic extract.

A spatiotemporal analysis of distribution pattern of elephants in and around Maduruoya National Park, Sri Lanka

Wilson A.S.C.[a*], Padmalal U.K.G.K.[b] and Jayakody S.[a]

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Key-highlights

- The monthly elephant distribution data of the Maduruoya National Park (MNP) were collected from the 2020 to 2023 period.
- The cumulative distribution map indicated the preference of elephants for the grasslands, scrub lands, rocky out crops and areas closer to the reservoirs. Very few observations were made in dry mixed evergreen tropical forests. However, the elephants inhabited throughout the year in MNP.
- It is evident that elephants are having preference for certain habitats and their occupancy shows temporal variations within these areas each year.
- The elephants maintain their population closer to the boundaries of the park throughout the study period. These individuals may pose a significant threat to the integrity of the electric fences that are situated around the national park. The elephants tend to move out of the MNP's boundaries increasing the possibilities for human-elephant conflict in neighboring villages.

Teachers' confidence in delivering food literacy education in Sri Lanka

Rathnayake M.P.S.[a]*, Nanayakkara J.[b], Perera T.[a], Worsley T.[c], Booth A.[b] and Silva K.D.R.R.[a]

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Key-highlights

- The study aimed to explore teachers' confidence levels across various aspects, identifying their teaching methods and the key factors influencing their confidence.
- The study used a quantitative, island-wide cross-sectional survey with a self-administered questionnaire to assess teachers' confidence.
- The study revealed that teachers exhibited high confidence in delivering food literacy education, with 96% confident in their knowledge and 97% in engaging students.
- Teachers' confidence was supported by stakeholders but challenged by resource limitations and the unsupportive home environments of the students.
- Variations in tool usage and school environments significantly impact teachers' confidence in delivering food literacy education, with differences observed across school types and locations.

Optimization of microalgal lipid extraction protocol using green solvents

Walpita C.C.[a*], Walpita C.N.[b] and De Croos M.D.S.T.[a]

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Key-highlights

- Most solvent-based microalgal lipid extraction methods rely on toxic and non-environmentally friendly solvents, which are unsuitable for food and nutraceutical applications.
- This study attempted to modify the microalgal lipid extraction protocol using a green solvent to meet food and nutraceutical standards.
- Initially, lower lipid contents were observed compared to the standard protocol however, further investigations are underway to analyse the fatty acid profile of the extracted lipids.
- This lipid extraction protocol needs to be further modified to better meet the requirements of the food and nutraceutical industries.

Nudging for good: Real-time AI-driven diagnostics and behavior change to improve adolescents' diets and nutrition in Sri Lanka

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Key-highlights

- The aim of the study is to develop, validate and examine the feasibility of using AI-based smartphone applications to improve the diets of Sri Lankan adolescent girls.
- Activities include developing software functionality to allow for accurate, AI-based diagnostics of food intake.
- The functionality of the application includes the ability to recognize different dishes, foods, and portion sizes when the smartphone is held over the dish.
- It helps users accurately record meal intake and nudge users to improve diets by providing tailored feedback based on dietary guidelines.

Reproductive biology and population dynamics of the slipper lobster in Pethalai, Sri Lanka

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Key-highlights

- Slipper lobster, *Thenus orientalis* populations in Pethalai were studied using underwater visual sensors and their optimum density was found to be at 20m depth.
- The first-ever Gonadosomatic Index (GSI) analysis of *T. orientalis* in Sri Lankan waters shows bimodal peaks suggesting two distinct reproductive seasons.
- Key population dynamics parameters, such as $L\infty$ = 107.63 mm, K = 0.59 yr-1 and E = 0.57, highlight the importance of sustainable harvesting.
- Reduced reproductive capacity, as indicated by the yield-per-recruit analysis and a spawning potential ratio (SPR) of 0.19, highlights the need for size-specific fishing regulations.
- Economic efficiency and social cohesion demonstrate the need for integrated approaches to improve the resilience and sustainability of fishing communities.

Building a Repository of DNA sequences to unravel the trade-in Chondrichthyans in Sri Lanka

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Key-highlights

- Elasmobranchs (sharks and rays) play a vital role in maintaining a balanced and healthy marine ecosystem.
- This research involves building up a DNA reference library to support the monitoring of elasmobranch trade in Sri Lanka.
- Tissue samples from the 48 most abundant species were selected and mitochondrial DNA was sequenced from each species.
- Sequenced results were used for the buildup phylogenetic trees and listed with images of voucher species and their sequence for the reference library.
- The established reference library would provide a preliminary identification of species at points of export and for disaggregating trade data to species level.

Innovative and sustainable approaches to extract type-I collagen from the skin offcuts of the yellowfin tuna (*Thunnus albacares*)

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Key-highlights

- The skin of yellowfin tuna was identified as the most suitable raw material for collagen extraction among the various by-products generated during fish processing.
- Three novel inventions, with two minor modifications, were introduced to simplify, shorten, and reduce the cost of the conventional collagen extraction process.
- Collagen yields from all modifications were similar to the conventional process and varied between 55-62% on a dry weight basis.
- The extracted collagens were confirmed to be type I, high purity and to retain native triple-helix structure.
- This study demonstrates the potential of using skin offcuts as a source of collagen and the methods developed as a potential industrially applicable protocol.

Estimates of population parameters of Culture-based fishery (CBF) species and ensure strategies for enhancing yields in selected irrigation reservoirs in Sri Lanka

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Key-highlights

- Length-based stock assessment tools are used to determine optimal stocking practices that produce optimal yields of finfish and giant freshwater prawn (GFP; *Macrobrachium rosenbergii*)
- In Sri Lanka, reservoir fishers use gillnets to catch both GFP and finfish. And gillnets are used extensively to catch GFP, increasing fishing efficiency (FE).
- This increased FE leads to overexploitation of finfish species. Therefore, an alternative specific method for GFP without overexploitation of finfish is needed.
- The behaviour of GFP has been studied to develop a new trap and also to minimize the physical damage to GFP during harvesting to minimize rejections from the export market.

Extraction and characterisation of chitosan from shellfish waste for product development

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Key-highlights

- Each year, Sri Lankan processing plants dispose of around 1.6 million kg of shell waste offering a key opportunity to convert it into valuable chitosan.
- The newly modified chitosan protocol merges traditional steps into a single, efficient process, cutting chemical use and energy while producing high-quality chitosan.
- This enhanced technique reduces chemical use by 8.10% and energy consumption by 13%, showing its potential for industrial application.
- A chitosan-based edible film was developed with vitamin E nanoemulsion, enhancing transparency, flexibility, UV protection and antioxidant properties for food packaging.

Taxonomic identification and present status of jellyfish resources in the coastal waters of Sri Lanka

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Key-highlights

- The "Waya-jel-survey", the first-ever jellyfish survey conducted in the coastal waters of Sri Lanka, from 2017 to 2020, reported 01 new species and 25 first records of jellyfish.
- The effect of physicochemical parameters of coastal waters on the diurnal and seasonal variations in jellyfish was identified.
- The ecological and economic importance of jellyfish in Sri Lanka was described based on their status.
- Stakeholders' opinions on the local jellyfish industry were analysed to identify the strengths, weaknesses, opportunities and threats.
- About 800 scientific literature from 1800 to 2022 were tabulated to contrast the broader spectrum of jellyfish use by species.

Effect of improved school garden and school food environment on food literacy among secondary school children

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Key-highlights

- Addressing food literacy early in life is a compelling way to persuade individuals to engage in healthy dietary behaviours.
- The school food environment has been identified as an ideal setting to promote food literacy among secondary school children.
- The study aims to promote food literacy among secondary school children through improved school gardens and school food environments.
- The status of school gardens and school food environment in Sri Lanka was investigated using a mixed-method approach.
- An integrated nutrition model was developed to investigate its effect on improving food literacy among adolescents compared to control schools.