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5th INTERNATIONAL SYMPOSIUM ON AGRICULTURE 2026

Growing More with Less - Securing the Future of Farming

4th March, 2026

**Faculty of Agriculture
Eastern University, Sri Lanka
Palachcholai**

ISA 2026



**Proceedings of the
5th International Symposium on Agriculture
(5th ISA 2026)**

“Growing more with less – Securing the future of farming”

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Faculty of Agriculture,
Eastern University, Sri Lanka

PROCEEDINGS OF THE

5TH INTERNATIONAL SYMPOSIUM ON AGRICULTURE - 2026

“Growing More with Less – Securing the Future of Farming”

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MESSAGE FROM THE VICE CHANCELLOR

5th International Symposium on Agriculture 2026

It is with great pleasure that I extend my warmest greetings to all participants of the 5th International Symposium on Agriculture (ISA 2026), organized by the Faculty of Agriculture, Eastern University, Sri Lanka, under the timely theme “*Growing More with Less – Securing the Future of Farming.*”



Research in the agricultural field refers to the systematic study and investigation aimed at improving farming practices, enhancing productivity, ensuring sustainability, and addressing challenges related to food production and rural livelihoods. It serves as the foundation upon which innovation and progress in agriculture are built. In a country like Sri Lanka, where agriculture plays a vital role in rural livelihoods and national food security, the need to optimize limited resources - such as land, water, energy, and capital - has never been more urgent. Climate change, fluctuating market conditions, and increasing population demands compel us to rethink traditional approaches and embrace innovation, modern technology, and evidence-based policies.

The concept of “*Growing More with Less-Securing the Future of Farming*” goes beyond increasing agricultural output. It emphasizes efficiency, resilience, sustainability and responsible stewardship of natural resources. As stakeholders in this sector, we must collectively strive to enhance productivity while minimizing environmental impact. This can be achieved through approaches such as precision agriculture, climate-smart farming practices, renewable energy integration, digital transformation, and strengthened value chains.

I am pleased to note that this conference has attracted significant academic and professional interest, with contributions from both local and international researchers. This reflects the strong commitment of the scholarly and practitioner communities to advancing knowledge and developing practical, impactful solutions to contemporary agricultural challenges.

I firmly believe that the discussions, research findings, and collaborations emerging from this conference will contribute meaningfully to policy formulation, technological advancement, and sustainable development initiatives, both in Sri Lanka and beyond.

I take this opportunity to congratulate the organizing committee, researchers, and all participants for their dedication and hard work in making this event a success. I wish you all productive deliberations and impactful outcomes.

Prof. P. Peratheepan
Vice Chancellor,
Eastern University, Sri Lanka

MESSAGE FROM THE DEAN

5th International Symposium on Agriculture 2026

I am delighted to extend my warm greetings to all participants in this conference, organized around the meaningful theme, “*Growing More with Less – Securing the Future of Farming*”. This theme is both timely and visionary, especially in our rapidly changing world, where sustainability, efficiency, and innovation are no longer optional but essential.



In the context of Sri Lanka, optimizing our limited resources while ensuring economic growth and food security is particularly relevant. As a nation facing constrained land resources, increasing climate variability, and evolving socio-economic demands, we must reinforce our commitment to sustainable agricultural practices, technological innovation, and research-driven development. Universities and academic institutions play a crucial role in generating knowledge, fostering innovation, and preparing future leaders to tackle these challenges.

The overwhelming response to this conference, receiving 94 research papers, of which 77 were accepted after a rigorous review process, including 4 from international contributors, highlights the growing academic engagement with our theme. The diversity of research presented, ranging from sustainable agriculture and water management to renewable energy, smart technologies, and policy frameworks, underscores the multidisciplinary efforts needed to truly “grow more with less.”

As Dean, I am proud of the dedication shown by our faculty members, researchers, students, and the organizing committee in making this conference a success. Academic platforms like this not only promote knowledge sharing but also strengthen collaboration among institutions, industries, and policymakers at both national and international levels.

I am confident that the insights and discussions generated during this conference will significantly contribute to sustainable development initiatives and evidence-based policymaking in Sri Lanka and beyond.

I wish all participants a productive and enriching conference experience.

**Prof. M. Sugirtharan,
Acting Dean,
Faculty of Agriculture,
Eastern University, Sri Lanka**

MESSAGE FROM THE COORDINATOR

5th International Symposium on Agriculture 2026

It is with great pleasure that I welcome you to this conference, centered on the important theme “*Growing More with Less - Securing the Future of Farming.*” This theme addresses one of the most pressing challenges of our time: how to sustainably increase productivity while efficiently using limited resources such as land, water, energy, and other inputs.



In the context of Sri Lanka, this theme is particularly relevant. As an agricultural nation with limited arable land, Sri Lanka faces increasing pressures from climate variability, rising production costs, and resource constraints. Therefore, it is essential for Sri Lanka to adopt innovative, climate-smart, and resource-efficient strategies to ensure food security and promote sustainable development. Enhancing productivity in key sectors such as paddy cultivation, plantation crops, and horticulture, while minimizing environmental impact, is crucial to our national resilience and economic stability.

We are pleased to announce that the conference received 94 research papers, reflecting a strong academic and professional interest in this vital theme. After a thorough review process, 77 papers have been accepted, including 4 international contributions. This selection underscores the growing global collaboration and exchange of knowledge aimed at improving resource efficiency and sustainable growth.

The accepted papers showcase innovative research in sustainable agriculture, water management, renewable energy, smart technologies, circular economy practices, and policy strategies that help achieve “more with less.” These contributions will certainly provide valuable insights for researchers, practitioners, policymakers, and industry stakeholders.

I thank all authors, reviewers, committee members, and participants for their dedication and commitment. Your contributions make this conference an invaluable platform for knowledge sharing and collective progress. Let us work together toward a future where sustainability, innovation, and efficiency guide our efforts to grow more with less.

Dr. T. Geretharan,
Coordinator/ ISA 2026

MESSAGE FROM THE SECRETARY

5th International Symposium on Agriculture 2026

It is with great privilege that I pen this Secretary's message for the proceedings of the 5th International Symposium on Agriculture (ISA 2026), hosted by the Faculty of Agriculture, Eastern University, Sri Lanka. The symposium serves as an essential platform for scholarly engagement and drives transformative agricultural solutions forward.



The theme of this year's symposium, "*Growing More with Less - Securing the Future of Farming*," highlights the urgent need to enhance agricultural productivity while ensuring the sustainable and efficient use of limited natural resources.

ISA 2026 provides a platform for researchers, academics, industry professionals, and students to present their research findings, exchange innovative ideas, and engage in meaningful, evidence-based discussions.

I sincerely acknowledge and appreciate the valuable contributions of all presenters, reviewers, sponsors, keynote speakers, and members of the organizing committee whose dedication and commitment have made this event possible. The success of ISA 2026 stands as a testament to their unwavering efforts and collective support.

I am confident that this symposium will stimulate insightful discussions and generate impactful outcomes that contribute significantly to shaping the future of agriculture.

I wish all participants a successful and intellectually enriching symposium.

**Mrs. Krishnananthi Arunothayan,
Secretary/ ISA 2026**

ADDRESS FROM THE GUEST OF HONOUR

It is a great pleasure to extend my warm greetings to the organizers and participants of the symposium held under the theme “*Growing More with Less—Securing the Future of Farming.*”



Agriculture today faces a critical challenge: the need to increase food production while conserving limited natural resources. Climate change, water scarcity, rising production costs, and shrinking arable land demand innovative, efficient, and sustainable approaches to farming. In this context, the theme of this symposium is both timely and highly relevant, as it highlights the importance of maximizing productivity while ensuring responsible resource management.

Financial institutions also have an important role to play in supporting the transformation of the agricultural sector. Commercial Bank of Ceylon PLC remains committed to empowering farmers and agri-entrepreneurs by improving access to financial services, promoting modern technologies, and supporting sustainable development initiatives that encourage efficient and environmentally responsible farming practices. By facilitating investments in modern agricultural machinery, advanced irrigation systems, and climate-smart farming technologies, we aim to help farmers enhance productivity while utilizing resources more efficiently—truly reflecting the vision of *growing more with less*.

I would also like to express my sincere appreciation to Eastern University, Sri Lanka for providing us the opportunity to share our journey and future goals in advancing agriculture modernization. We are grateful for the continued support extended to strengthen our collaborative ecosystem, which enables us to drive sustainable farming practices while minimizing environmental impact.

Universities and research institutions such as Eastern University play a vital role in generating knowledge, fostering innovation, and developing skilled human resources necessary for strengthening the agricultural sector. Platforms such as this symposium create valuable opportunities for researchers, policymakers, industry partners, and farming communities to exchange ideas and develop collaborative solutions.

I congratulate the organizing committee for their dedication and efforts in bringing together experts and stakeholders to address one of the most pressing challenges of our time. I am confident that the discussions and insights generated through this symposium will contribute meaningfully toward building a sustainable and productive agricultural future for Sri Lanka.

Mr Pussawalage Malika Thushara De Silva
Senior Manager,
Development Credit Department,
Commercial Bank of Ceylon PLC.

ADDRESS FROM THE KEYNOTE SPEAKER

5th International Symposium on Agriculture 2026

Recent events have promoted a change away from high-input agriculture in order to feed the world, instead shifting towards using more sustainable methods. This change may produce slightly lower crop yields but achieve that with lower input costs, boosting profit margins for the farmer and also promoting other benefits such as improved soil organic matter, better water holding capacity, drought tolerance, and even pest and disease suppression. We get crop disease when three things coincide: a susceptible crop, environmental conditions conducive for disease, and the presence of the pathogen. The time duration that these three factors coincide also influences the amount of disease we get.



There are a number of things we can manipulate to reduce disease risk, including crop rotation to separate crops in space and time from inoculum released from previous crop debris, using resistant varieties, mixtures of varieties, intercropping, and cover-crops. We can think of these things as a foundation of integrated pest management, mainly harnessing natural processes as a strategy to reduce overall disease (and other pest) pressure. In addition, we can augment those natural processes with disease forecasting and surveillance methods to optimize what interventions might be made in the case of a disease starting to take-hold. Even then, biological controls are becoming increasingly available rather than established chemical pesticides.

Pathogens may react to control methods to evolve pesticide resistance or to overcome host resistance, particularly when a successful pesticide is over-applied, or a good variety is grown on a large scale. Again, nature can provide a solution, through the discovery of novel and more durable sources of host resistance, including polygenic resistance, diversification and alternation of varieties, and targeted integration with biological control and other control methods to ensure a reliable and secure supply of food and other crop products.

**Prof. Jon West,
Plant Pathologist; Aerobiologist,
Agroecosystem Health and Pest Management,
Rothamsted Research,
UK**

ADDRESS FROM THE KEYNOTE SPEAKER

5th International Symposium on Agriculture 2026

Growing More with Less in a High-CO₂ World: Exploiting Genetic and Environmental Interaction for Climate-Resilient and Nutrient-Secure Agriculture

The global food system is at a critical juncture, characterized by unprecedented climatic shifts and rising demographic pressures. Since the Industrial Revolution, atmospheric carbon dioxide (CO₂) concentrations have risen from approximately 280 ppm to more than 420 ppm today, an increase of nearly 50% within two centuries. Current projections suggest CO₂ levels may exceed 550–700 ppm by the end of this century. At the same time, global temperatures are expected to rise by 0.2 to 0.4°C every ten years, reaching a total increase of 2 to 4°C by 2100. Droughts, floods, and heat waves are occurring more frequently, and rainfall patterns are becoming more erratic. By 2050, the global population is likely to reach 9.7 billion, resulting in a 60–70% increase in food demand. By the middle of the century, global cereal production could decrease by 10–25% in vulnerable areas if adaptation strategies aren't used. Therefore, agriculture faces a major challenge: it needs to produce much more food while using fewer natural resources, such as water, land, and external inputs, all within changing atmospheric and climatic conditions that differ from those of current crop breeding. To solve this problem, agriculture must strategically shift away from simple intensification and toward the smart use of genetic × environment (G×E) interactions. Elevated atmospheric CO₂ levels present both advantages and disadvantages for agricultural systems. Since carbon dioxide is essential for photosynthesis, higher levels of CO₂ help C₃ plants, like rice and wheat, absorb more carbon.



Studies using Free-Air CO₂ Enrichment (FACE) have repeatedly shown that when atmospheric CO₂ levels rise from about 350 ppm to 700 ppm, net photosynthesis in C₃ plants can increase by 10–30%. In addition, wheat grain yield could potentially increase by 20–25% if nitrogen is readily available. Furthermore, enhanced water-use efficiency, stemming from reduced stomatal conductance, can offer some protection to crops against drought stress, especially in semi-arid areas. Conversely, these advantages are limited by physiological acclimation, source–sink constraints, and nutrient availability. More importantly, higher levels of CO₂ are consistently associated with reduced grain nutritional quality. Meta-analyses indicate that elevated CO₂ levels correlate with a 5–15% reduction

in protein concentration in wheat and rice. Likewise, the concentrations of zinc and iron decline similarly. Given that approximately one-third of the global population experiences zinc deficiency and that iron deficiency is the primary cause of anemia worldwide, this "nutritional dilution effect" constitutes a substantial global health challenge. In many developing nations, cereals and pulses account for approximately 70% of caloric and protein intake; consequently, any decrease in nutrient density disproportionately affects vulnerable groups. Therefore, increased levels of carbon dioxide in the atmosphere could boost carbohydrate production, but at the same time, they might reduce the availability of micronutrients.

Extensive studies of plant biology and genetics have led to a crucial understanding: how crops respond to higher CO₂ levels and climate-related stresses is significantly influenced by their genetic makeup and the physiological processes that underlie them. Notably, major cereal crops show considerable genetic variation in how they respond to increased CO₂ levels, how efficiently they use nitrogen, their ability to tolerate heat, and their capacity to accumulate micronutrients. Studies have identified quantitative trait loci (QTLs) linked to increased biomass and faster growth in wheat under higher CO₂ levels. This shows that the ability to respond to atmospheric changes is a trait that can be passed down and selected for. Similarly, the absorption and subsequent accumulation of zinc within grains are governed by specific anatomical structures and gene families, including YSL transporters and metal chelation pathways; these constitute crucial targets for biofortification efforts. Long-term data derived from historical investigations, exemplified by the Broadbalk Wheat Experiment Station, indicate that while grain yields experienced substantial augmentation following the advent of the Green Revolution, the concentrations of essential minerals, including zinc, iron, copper, and manganese, demonstrated a marked decline subsequent to the adoption of semi-dwarf, high-yielding cultivars. This finding implies that the focus on yield in breeding initiatives unintentionally contributed to the reduction of micronutrient content. Therefore, the future of farming requires a strategic approach that combines advanced breeding methods, such as marker-assisted selection, genomic selection, CRISPR-based gene editing, and synthetic biology, along with physiological phenotyping in realistic environmental conditions. Furthermore, agronomic innovations, such as slow-release nitrogen systems and nanohybrid fertilizers, present opportunities to improve nitrogen-use efficiency and, to some extent, alleviate protein depression in environments with elevated CO₂ levels.

To study how genetics and the environment interact, we need to use climate simulation tools, conduct field trials in different locations, and use advanced methods for measuring traits. Identifying plant varieties that will

thrive in changing climates depends on these methods. In addition to genetic and physiological factors, improving productivity sustainably requires optimizing environmental conditions and using digital technologies. Precision agriculture, which includes remote sensing, soil nutrient mapping, AI-driven crop modelling, and variable-rate input application, allows for site-specific management. This approach reduces input waste and helps stabilize yields. Furthermore, efficient irrigation systems, water-harvesting technologies, and integrated soil health management enhance resilience amid unpredictable rainfall patterns. At the systems level, the tenets of ecological intensification promote nutrient recycling, soil carbon sequestration, and reduced greenhouse gas emissions. Economic assessments underscore the substantial impacts stemming from even minor productivity gains. Consider, for instance, the case of Sri Lanka: a one-ton-per-hectare increase in rice yield across roughly 1.3 million hectares could yield upwards of US\$650 million annually in additional economic value for economies reliant on rice. Nevertheless, it is crucial that productivity advancements are harmonized with nutritional stability; this ensures that food security initiatives effectively address both the quantity and quality of available sustenance. The forthcoming strategic approach hinges on three interconnected components: climate-responsive genetics, which has the potential to sustain both yield and nutrient density; a mechanistic physiological understanding to regulate carbon-nitrogen equilibrium under elevated CO₂; and precision-guided environmental management to maximize resource efficiency. These approaches together create a new agricultural model. This model moves away from systems that rely heavily on inputs and towards those that rely on knowledge. It also shifts the focus from maximizing crop yields to improving resilience, and from just providing enough calories to ensuring adequate nutrient intake. In a high-CO₂ world, growing more with less is not merely a technical challenge; it is a scientific, economic, and moral imperative to ensure sustainable food systems for nearly 10 billion people.

**Prof. Saman Seneweera,
School of Agriculture,
Food and Ecosystem Sciences,
Faculty of Science,
The University of Melbourne,
Australia**

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**AGRICULTURAL ECONOMICS, EXTENSION &
ENTREPRENEURSHIP**

**HOME GARDEN CHARACTERISTICS AND ADOPTION
CONSTRAINTS OF HOME GARDENERS IN KATARAGAMA,
SRI LANKA**

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Abstract

Sri Lanka is currently experiencing a severe food and economic crisis characterized by high inflation, rising food prices, reduced household income, and disruptions to food supply. Under these conditions, home gardening has gained attention as a household-level food production practice. This study assesses home garden characteristics and the adoption constraints of home gardeners in the Kataragama Divisional Secretariat Division of Moneragala District, Sri Lanka. Primary data were collected from 80 households selected using stratified random sampling across five Grama Niladhari divisions. Respondents were categorized into home gardeners and non-home gardeners. Data were collected through structured questionnaires, and the collected data were analyzed using the Statistical Package for Social Sciences (SPSS). Descriptive statistics were used to interpret the results. The findings reveal that awareness of home gardening was high, with 80% of households reporting awareness. Among home gardeners, 55.6% practiced gardening on a part-time basis, primarily for household consumption. Women constituted the dominant group involved in home gardening (69.4%), and 44.4% of practitioners belonged to the middle-aged category. Home gardens exhibited notable species diversification, with vegetables adapted to local agro-ecological conditions commonly cultivated. Banana was present in all home gardens, while coconut emerged as the most dominant plantation species. Fruit crops, medicinal plants, other field crops, and ornamental species were also commonly observed, reflecting diversified production systems. Although all non-home gardeners (100%) expressed willingness to adopt home gardening, actual adoption was constrained by lack of time, limited space, insufficient resources, inadequate technical knowledge, pest and disease problems, and animal damage. These findings highlight a clear gap between household willingness and actual adoption. Targeted interventions addressing these barriers could enhance adoption and strengthen household food security during economic and food crises.

Keywords: Adoption, Awareness, Food crisis, Home gardening, Sri Lanka

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CHALLENGES AND MARKETING PRACTICES OF TURMERIC FARMERS IN GAMPAHA DISTRICT, SRI LANKA

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Abstract

Turmeric cultivation plays a significant role in the livelihoods of smallholder farmers in Sri Lanka, providing supplementary income and contributing to rural economic stability. However, farmers often face multiple challenges that limit their effective participation in markets and reduce profitability. This study aims to identify the major constraints encountered by turmeric farmers and to examine prevailing marketing practices in Gampaha District, Sri Lanka. Primary data were collected from randomly selected 100 turmeric farmers in the Mirigama and Divulapitiya Divisional Secretariat divisions using structured questionnaires administered through face-to-face interviews. The questionnaire captured information on farmer demographics, cultivation practices, and production and marketing constraints. Descriptive statistical analysis was conducted using SPSS and Microsoft Excel. The results indicate that turmeric cultivation in the study area is predominantly practised as an intercrop under coconut, with farmers mainly producing turmeric for sale as seed rhizomes. Marketing analysis revealed that 60% of farmers sold their produce to wholesalers, while 16% sold to village traders, 14% to government institutions, 6% to middlemen, and 4% to out-traders. Transport was not a major constraint for 48% of farmers as buyers collected the produce directly from farms, whereas 52% incurred additional transport costs. Farmers reported several key constraints affecting turmeric cultivation, including high seed rhizome prices, scarcity of labour, increasing input costs, pest and disease incidence, lack of technical knowledge, and limited access to credit facilities. The estimated marketing margin of Rs. 72.40 per kilogram indicates relatively low farm-gate returns and dependence on a limited number of buyers. The study emphasizes the need for targeted policy interventions aimed at improving access to affordable inputs, strengthening extension services, facilitating credit availability, and diversifying market channels. Addressing these challenges can enhance farmer income, strengthen market participation, and promote the sustainability of turmeric farming in Sri Lanka.

Keywords: Gampaha district, Marketing practices, Production constraints, Spice crops, Turmeric

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**THE EFFECT OF PESTS AND DISEASES ON THE YIELD AND
INCOME OF SMALLHOLDER COCONUT CULTIVATION OF THE
KURUNEGALA DISTRICT IN SRI LANKA**

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Abstract

Kurunegala is one of the major coconut-cultivating districts situated in the coconut triangle. There is a possibility of being threatened by pests and diseases. This study examines the effect of pests and diseases on the yield and income of coconut cultivation in the Kurunegala district. The primary data were collected from 100 growers who cultivate 2 to 5 acres using the snowball sampling method. The pests mentioned were mite (97%), mammalian pests (61%), coconut black beetle (53%), coconut caterpillar (39%), plesispa beetle (31%), and red weevil (23%). The diseases mentioned were leaf blight disease (76.3%), stem bleeding (23.3%), and bud rot (27.1%). Pest attacks were mostly observed from May to August, while disease attacks were mostly observed from September to December. 88% experienced a slight effect of mites on the nuts of the coconut. 33% reported leaf blight disease moderately affected leaves. 57% responded that pests and diseases affected the quality of the coconut nut. 67% responded as paid less due to pest and disease attacks. 57% agreed that the pest and disease attacks changed the monthly income from coconut. In chi-square analysis, the variables: frequency of coconut pest's occurrence, whether mammalian pests affect parts of the coconut, and the condition of mammalian pests' attack showed significant association ($p < 0.05$) with the reduction of marketable yield by pest and disease, respectively. Also, in chi-square analysis, the variables: frequency of coconut pest's occurrence, nut loss under the effect of pests and diseases, and whether mammalian pests affect parts of the coconut showed significant association ($p < 0.05$) with the effect of pest and disease on monthly income changes, respectively. The frequency and chi-square analyses confirmed the effect of pests and diseases on coconut yield and income. Farmers should be educated on identification and proper control measures for pests and diseases to prevent the loss of marketable yield and income from coconut farming.

Keywords: Coconut, Coconut growers, Coconut triangle, Control measures, Pests

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**SOCIO-ECONOMIC CHALLENGES OF VEGETABLE FARMING
HOUSEHOLDS IN WALAPANE DS DIVISION, NUWARA ELIYA
DISTRICT**

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Abstract

Vegetable farming is a primary livelihood source for many households in Sri Lanka's upcountry regions; however, households solely dependent on this activity face increasing socio-economic vulnerabilities. This study assessed the socio-economic challenges faced by households solely dependent on vegetable farming and factors affecting their income in the Walapane Divisional Secretariat Division of the Nuwara Eliya District. Primary data were collected from 100 randomly selected vegetable farmers using a structured questionnaire, while secondary data were obtained from relevant institutional sources and published literature. Data were analyzed using descriptive statistics and multiple regression analyses. The results indicate that most farmers operate on small landholdings (1–3 acres) and experience severe income instability. Major challenges identified include high input costs, extreme market price fluctuations, seasonal income variation, climate-related risks, frequent crop failures, pest and disease outbreaks, inadequate post-harvest storage facilities, and weak institutional and financial support. Only a small proportion of farmers had access to crop insurance or formal agricultural credit. The multiple regression results revealed that cultivated land extent ($p=0.000$) and farming experience ($p=0.066$) positively influence annual farm income, while lack of storage facilities and limited diversification negatively affect income levels. Despite these constraints, a majority of farmers perceived vegetable farming as a sustainable long-term livelihood, indicating strong resilience. The study concludes that improving extension services, strengthening market systems, expanding access to credit and insurance, and investing in post-harvest infrastructure are essential to enhance the livelihood sustainability of vegetable-farming households in the Walapane DS Division.

Keywords: Income stability, Livelihoods, Socio-economic challenges, Vegetable farming, Walapane DS Division

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**DETERMINANTS OF TEA CULTIVATION AND CHALLENGES FACED
BY SMALLHOLDER TEA FARMERS IN THE BADDEGAMA DS
DIVISION, SRI LANKA**

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Abstract

The tea smallholder sector plays a crucial role in Sri Lanka's agricultural and rural economy, particularly in low-country regions. This study examined the factors affecting tea cultivation and the challenges faced by tea smallholders in the Baddegama Divisional Secretariat Division. The study utilized primary data and secondary data. Primary data were collected through a structured questionnaire survey administered to 100 tea cultivators selected from the Ellakanda, Dodangoda, Ganegama West, and Yahaladuwa GN divisions. Descriptive statistics and regression analysis were employed to analyze socio-economic characteristics and key determinants influencing tea cultivation. The findings revealed that the majority of tea smallholders were middle-aged, predominantly female, and operated small family-owned plots that were often inherited across generations. Intercropping was widely practiced, with betel nut, pepper, and cinnamon being the most common intercrops. Labour shortages, high labour wages, higher fertilizer prices, fluctuating green leaf prices, and high overall production costs were identified as major challenges faced by tea cultivators. Climatic variability, pest and disease incidences, and the high cost of planting materials further contributed to yield fluctuations. Results of the regression analysis revealed that land size (1-5 acres) ($p < 0.01$) and intercropping with betel nut ($p < 0.05$) showed statistically significant effects on the annual harvest, with land size having a notably strong positive impact. The coefficient of determinant (R^2) is 0.585, suggesting that 58.5% variation in annual harvest from tea cultivation is accounted for by variations in the selected explanatory variables. The study highlighted the need for strengthened extension support, affordable inputs, and stable pricing mechanisms to ensure the sustainability of tea cultivation in the Baddegama DS Division.

Keywords: Challenges, Intercropping, Smallholders, Socioeconomic factors, Tea cultivation

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SMALL-SCALE MUSHROOM CULTIVATION AS AN INCOME SOURCE FOR RURAL HOUSEHOLDS IN KAMBURUPITIYA, SRI LANKA

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Abstract

A small-scale mushroom cultivation project was implemented in a selected rural household in the *Kamburupitiya* area to demonstrate the potential for income generation through the use of underutilized indoor spaces. The project aimed to introduce a low-cost, convenient, and sustainable mushroom production method for rural households. A room measuring 10 ft × 8 ft was prepared for cultivation by sealing and covering it with polythene to minimize contamination. The *hanging bag culture technique* was adopted, using discarded fabric strips to suspend the mushroom-growing bags. The *growth medium* consisted of sawdust (20 kg), rice bran (2 kg), calcium carbonate (400 g), *Samaposha* (200 g), and magnesium sulfate (40 g). The substrate was packed into bags, steam-sterilized for 2-3 hours, and cooled to room temperature. Mushroom-growing bags were purchased locally, while *American Oyster mushroom (Pleurotus ostreatus)* spawn was obtained from the *Vidatha Center, Kamburupitiya*, due to its suitability for local climatic conditions and market demand. The bags were inoculated, covered with black polythene to regulate light and humidity, and incubated for three weeks until complete mycelial colonization. The bags were then hung, watered twice daily, and maintained under standard temperature and light conditions. Fruiting bodies appeared within one week, yielding an average of 150 g every two days, with a total harvest of 1600 g. Infrastructure and material costs amounted to Rs. 16,400, while the project generated a gross income of approximately Rs. 32,780, resulting in a net income of Rs. 16,380. Additionally, a value-added product, a “mushroom bun,” was developed to enhance marketability. This project demonstrates that small-scale mushroom cultivation can effectively utilize unused household space while providing a viable source of supplementary income for rural families.

Keywords: American oyster, Hanging bag culture technique, Mushroom, Rural household

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ANALYSE THE POTENTIAL FOR VALUE-ADDED PRODUCTS OF JACKFRUIT IN EXPORT MARKETS AND EXPLORE POTENTIAL EXPORT MARKETS

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Abstract

Jackfruit (*Artocarpus heterophyllus*) is an abundant yet underutilized tropical fruit in Sri Lanka, possessing significant potential for value addition and export market expansion. With increasing global demand for plant-based, healthy, and sustainable food products, jackfruit-based value-added products such as dried flakes, chips, flour, ready-to-eat meals, and meat substitutes are gaining international attention. Despite favorable agro-climatic conditions and traditional knowledge supporting jackfruit cultivation, Sri Lanka has not fully capitalized on this opportunity due to limited processing capacity, weak market linkages, and insufficient export-oriented research. This study aims to analyze the potential for value-added jackfruit products in export markets and to identify promising international destinations for Sri Lankan exports. A mixed-method research design was employed, integrating qualitative data from structured questionnaires administered to 20 purposively selected jackfruit exporters and quantitative analysis of secondary trade data obtained from the UN Comtrade database under HS Code 081090. Import trends of selected countries were analyzed using graphical techniques, followed by the application of the Gravity Model of international trade to estimate trade potential based on GDP and geographical distance. The results indicate that the United States and China demonstrate the highest trade potential for Sri Lankan value-added jackfruit products, driven by large market sizes and growing demand for plant-based foods. European markets such as the United Kingdom and Italy show moderate to high potential, particularly for niche segments including vegan, organic, and health-oriented products. Australia and the Netherlands present moderate opportunities, while market fluctuations were observed in Middle Eastern countries. The study concludes that Sri Lanka can enhance its export performance by prioritizing high-potential markets, improving product differentiation, strengthening branding strategies, and investing in modern processing technologies. These findings provide valuable insights for policymakers, exporters, and agripreneurs aiming to develop a competitive and sustainable jackfruit export industry.

Keywords: Jackfruit, Value Addition, Export Market, Gravity Model, Trade Potential, Sri Lanka

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CROP HEALTH & PRODUCTIVITY

TEMPERATURE-DEPENDENT PHENOLOGY OF *Spodoptera frugiperda* IN BATTICALOA DISTRICT, SRI LANKA

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Abstract

The present study investigates the development of fall armyworm, *Spodoptera frugiperda*, under laboratory conditions during the *Maha* (November, 2024 -February, 2025) and *Yala* (April-July, 2025) seasons in the Batticaloa District. In each season, 100 larvae were individually reared and observed. The mean temperature and RH during the *Yala* season were 35 ± 3 °C and $65\pm 5\%$, while during the *Maha* season they were 26 ± 2 °C and $90\pm 5\%$. The longevity of egg, larval, pupal, and adult stages, as well as the total developmental duration, were compared between the two seasons. During the *Maha* season, eggs hatched in 3.7 ± 0.6 days, whereas during *Yala*, hatching was delayed to 7.0 ± 1.0 days. Likewise, larvae developed more rapidly in *Maha* (18.0 ± 1.0 days) than in *Yala* (26.7 ± 1.5 days). Durations of larval period in *Maha* and *Yala* seasons were 18.0 ± 1.0 and 26.7 ± 1.5 days, respectively. A similar pattern was observed in pupal duration, which was 10.2 ± 0.8 days in *Maha* and 15.7 ± 1.2 days in *Yala*. Adults in *Maha* exhibited a slightly longer lifespan (3.7 ± 0.6 days) than those in *Yala* (2.3 ± 0.6 days). The total developmental period was 35.8 ± 1.3 days in *Maha* and 50.7 ± 1.5 days in *Yala*, indicating a clear temperature-dependent variation. Other findings confirmed that during the *Maha* season, *S. frugiperda* exhibited six larval instars based on Dyar's Law. Larval head capsule width and body length increased progressively across six instars. Between the fourth and fifth instars, there was the greatest size shift, with the body length increasing from 7.19 mm to 19.9 mm and the head capsule width enlarging from 0.79 mm to 1.42 mm. The present study shows that the *Maha* season favors the development of *S. frugiperda* under laboratory conditions at a temperature of 26 ± 2 °C and an RH of $90\pm 5\%$.

Keywords: Fall armyworm, Larval development, Lepidopteran pest, *Maha*, *Yala*

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**SOIL ORGANIC CARBON LIMITS SYNERGISTIC EFFECT OF
BIOFERTILIZERS AND CHEMICAL FERTILIZERS ON THE EARLY
GROWTH AND SYMBIOTIC NODULATION OF BLACK GRAM
(*Vigna mungo* L.)**

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Abstract

Biofilm biofertilizers (BFBFs) are known to enhance soil quality and reduce dependence on chemical fertilizers (CF). BFBFs outperform conventional mono- or mixed-culture biofertilizers, depending on the soil condition. Further, the BFBF increases microbial abundance over other biofertilizers, which synergistically helps increase the efficiency of CF. This study examined the effects of BFBF and Rhizobium biofertilizers, compared with CF, on seed germination, early growth, and nodulation of black gram grown in soil with extremely low soil organic carbon (SOC < 0.5%), and assessed the extent to which the low SOC limits the benefits of soil carbon enhancement. A pot experiment was established with eight treatments (T1-T8), including BFBF, Rhizobium, their combination, 50% and 100% of recommended chemical fertilizer levels, and two controls: the un-amended soil having extremely low-SOC (C1), and a coir dust-amended soil control (C2). The pots were arranged in a completely randomized design with four replicates. Measurements included germination percentage, shoot and root length, fresh and dry weights, chlorophyll content, and nodulation. Coir dust amendment (C2) markedly increased SOC to 1.76% and produced significantly higher shoot and root biomass by 200% over the control (C1). In contrast, neither biofertilizer nor distilled water improved germination or biomass. Both the coir dust control (C2) and the combined BFBF + Rhizobium treatment without requiring coir dust and CF (T8) significantly increased root length by over 30% relative to the low-SOC control (C1). Although the combined biofertilizer application (T8) increased shoot length over C1 by 10%, it remained significantly lower than coir dust control, resulting in reduced biomass when coir dust was absent. Overall, the findings indicate that under extremely low SOC conditions (< 0.5%), neither biofertilizers nor CF can compensate for the foundational benefits provided by adequate SOC. Enhancing soil carbon is essential to maximize the effectiveness of biofertilizers in black gram cultivation under very low SOC conditions.

Keywords: Biofilm biofertilizer, Black gram, Coir dust amendment, Seed germination, Soil organic carbon

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**IN VITRO EVALUATION OF THE ANTAGONISTIC ACTIVITY OF
Trichoderma asperellum AGAINST THE MAIZE (*Zea mays* L.)
PATHOGEN *Pectobacterium chrysanthemi***

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Abstract

Maize (*Zea mays* L.) is a major crop cultivated in the Dry Zone of Sri Lanka. However, its production is constrained by several diseases that cause significant yield losses. Among these, *Pectobacterium chrysanthemi* has been identified as a severe pathogen, particularly during the rainy season. Management of this disease using synthetic chemicals is challenging due to the dense crop canopy, which limits effective chemical coverage. Moreover, excessive use of chemicals poses adverse environmental effects. Therefore, current disease management strategies increasingly focus on environmentally friendly biological control approaches. *Trichoderma asperellum* is recognized as an effective biocontrol agent against various plant pathogens, including *P. chrysanthemi*. However, the application of *Trichoderma* spp. in maize cultivation in Sri Lanka has not yet been extensively explored. A laboratory experiment was conducted at the Field Crops Research and Development Institute, Mahailluppallama, to evaluate the antagonistic effect of *T. asperellum* (Accession No. MZ413900), isolated from Dry Zone soil in Sri Lanka, against *P. chrysanthemi*. The study was carried out using a dual culture assay arranged in a Completely Randomized Design (CRD) with ten replicates. The inoculated plates were incubated under controlled laboratory conditions, and the growth of both organisms was measured at 24-hour intervals, beginning 48 hours after incubation. The percentage inhibition of the pathogen was calculated to determine the antagonistic activity of *T. asperellum*. The results revealed that *T. asperellum* significantly suppressed the growth of *P. chrysanthemi*, recording a maximum inhibition of 88.43% compared to the control. However, a gradual decline in inhibition percentage was observed over time, decreasing from 88.43% on day 3 to 76.44% on day 5. These findings demonstrate the strong antagonistic potential of *T. asperellum* against *P. chrysanthemi* and highlight its promise as an environmentally sustainable biological control agent for managing maize bacterial diseases in Sri Lanka.

Keywords: Biological Control, Maize Stalk Rot, *Pectobacterium chrysanthemi*, *Trichoderma asperellum*

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IN VITRO EVALUATION OF THE ANTIFUNGAL EFFECTS OF SPINETORAM ON *Colletotrichum* sp. ASSOCIATED WITH TOMATO ANTHRACNOSE

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Abstract

Tomato (*Solanum lycopersicum* L.) is one of the most widely cultivated vegetable crops globally. Still, its production is severely affected by fungal diseases, among which anthracnose, caused primarily by *Colletotrichum* species, leads to significant yield losses and postharvest fruit deterioration. The overuse of conventional fungicides has raised concerns regarding environmental pollution, the development of resistant pathogen strains, and food safety, emphasizing the need for alternative and sustainable disease management strategies. The present study evaluated the *in vitro* antifungal activity of spinetoram, a semi-synthetic derivative of spinosyns primarily used as an insecticide, against *Colletotrichum* sp. isolated from naturally infected tomato fruits. Spinetoram, obtained from the commercial formulation Radiant® 25% (w/w) insecticide, was incorporated into potato dextrose agar (PDA) at concentrations of 5, 10, 50, 100, 200, and 400 µg ml⁻¹. Mancozeb 0.5% (w/w) served as a positive control, and unamended PDA was used as a negative control. Antifungal efficacy was assessed using the poisoned food technique by measuring the diameter of mycelial growth and calculating the mycelial inhibition percentage. Results demonstrated a clear concentration-dependent inhibition of *Colletotrichum* sp., with lower concentrations causing partial suppression and higher concentrations producing substantial inhibition. The highest tested concentration (400 µg ml⁻¹) achieved 71.56% inhibition, while the positive control completely suppressed fungal growth. Regression analysis indicated an EC₅₀ value of 54.2 µg ml⁻¹, reflecting the potency of spinetoram in reducing mycelial growth. These findings indicate that spinetoram possesses promising antifungal activity and could serve as a supplementary agent in the integrated management of tomato anthracnose, potentially reducing reliance on conventional fungicides and contributing to sustainable crop protection. Further studies under *in vivo* and field conditions are recommended to validate its efficacy, optimize dosage levels, evaluate potential phytotoxicity, and assess environmental safety for practical application.

Keywords: Anthracnose, Antifungal activity, *Colletotrichum* sp., EC₅₀, Spinetoram

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EFFECT OF CHEMICAL FERTILIZER AND GOAT MANURE ON LEAF CHLOROPHYLL CONTENT AND PLANT BIOMASS OF GREEN GRAM

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Abstract

Green gram (*Vigna radita* L.) is one of the most important grain legumes, and it is widely grown for its seeds, which contain a high percentage of easily digestible protein. This experiment was conducted to evaluate the effect of chemical fertilizer and different rates of goat manure (GM) on chlorophyll contents and selected growth parameters at the vegetative stage of green gram in sandy regosol soil. The experiment was laid out in a complete randomized design with five treatments and four replicates. The treatments were recommended chemical fertilizer as a control (T1) and GM at 5 (T2), 10 (T3), 15 (T4), and 20 (T5) t/ha rates. Plants were uprooted from the polybags (0.07 m²) at the 4th week after seeding establishment. Then, chlorophyll was extracted from leaf tissue, and the optical density of the extract was measured using a spectrophotometer. Thereafter, chlorophyll contents were calculated as mg/g of leaf tissue. After measuring the leaf area, the dry weights of plant parts were recorded. All the data were subjected to one-way analysis of variance using SAS 9.1 version, and treatment means were compared according to Tukey's test at 5% significance level. Results showed that the different rates of GM application exhibited significant effects on chlorophyll contents ($p < 0.001$), leaf area ($p < 0.05$), and plant biomass ($p < 0.05$) among the treatments. Usage of 15 t/ha GM (T4) had significantly the highest values ($p < 0.05$) for chlorophyll a, b, and total contents (3.11, 1.43, and 4.54 mg/g, respectively) than the other treatments. It was further noted that there was no remarkable difference in chlorophyll a and b contents among T1, T3, and T5 treatments, but T1 had a significantly higher value ($P < 0.05$) of total chlorophyll content compared to T3 and T5. Leaf area also showed a positive response to T4 (288.89 cm²). Dry leaf weight was high (1.15 g) in T4 but did not vary among the treatments. However, a significant disparity was noticed ($p < 0.05$) in dry root weight among the treatments. The highest values for dry stem weight (0.55 g) and plant biomass (1.88 g) were recorded in T5 and T4, respectively. Goat manure at 15 t/ha exhibited higher values for the plant biomass, leaf area, chlorophyll a, chlorophyll b, and total chlorophyll contents compared to 20 t/ha GM (T5). Therefore, 15 t/ha of goat manure can be applied to increase the chlorophyll contents and plant biomass of green gram at the vegetative growth stage.

Keywords: Biomass, Chemical fertilizer, Chlorophyll, Goat manure, Green gram

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IN VITRO SCREENING OF ENDOPHYTIC FUNGI FROM GROUNDNUT FOR ANTAGONISM AGAINST *Aspergillus niger* CAUSING COLLAR ROT IN GROUNDNUT

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Abstract

Collar rot disease, caused by *Aspergillus niger*, is a major threat to groundnut (*Arachis hypogaea* L.) cultivation, leading to considerable yield losses and economic damage worldwide. Many seed dressing fungicides are reported to be effective against collar rot of groundnut. However, excessive use of fungicides causes environmental deterioration and has non-target effects on plants and animals. Biological control through endophytic microorganisms has recently gained interest as an eco-friendly approach to managing plant diseases. The present study aimed to investigate the antagonistic potential of endophytic fungi isolated from healthy groundnut plants against *A. niger*, the primary causal agent of collar rot, under laboratory conditions. Three endophytic fungi, *Penicillium* sp., *Curvularia* sp., and *Lasiodiplodia* sp., were successfully isolated and identified from healthy groundnut plants (cv. *Tissa*) based on cultural and microscopic characteristics. The experiment was carried out using a Completely Randomized Design (CRD) with five treatments and four replicates. Each endophytic isolate was tested against the pathogen. Control plates were maintained for comparison: the positive control consisted of the pathogen with a standard fungicide (Carbendazim), and the negative control consisted of the pathogen alone. The extent of fungal inhibition was measured based on the percentage reduction in mycelial growth after 14 days of incubation. The highest mycelial inhibition was observed in *Penicillium* sp., which achieved 50.3%, demonstrating strong antagonistic potential against the pathogen. Conversely, the lowest antagonistic activity was recorded in *Lasiodiplodia* sp., with 32.8% mycelial inhibition. These findings indicate that *Penicillium* sp. possesses strong antagonistic potential against *A. niger* and could be developed as an effective biocontrol agent.

Keywords: Antagonistic activity, *Aspergillus niger*, Biocontrol, Collar rot, Endophytic fungi

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THE IMPACT OF DIFFERENT GREEN MANURES ON THE GROWTH AND YIELD OF RED ONION (*Allium cepa* L.)

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Abstract

Onion (*Allium cepa* L.) is one of the most important vegetable crops. It is susceptible to nutrient deficiencies due to its shallow root system. The continuous use of inorganic fertilizers contributes to soil degradation and environmental pollution, thereby indirectly affecting its performance. Therefore, incorporation of green manures serves as a sustainable alternative nutrient source. The present study aimed to evaluate the impact of different green manures on the growth and yield of red Onion under Dry-zone conditions at the Crop Farm, Faculty of Agriculture, University of Jaffna, during July to October 2025. The experiment was laid out in a Randomized Complete Block Design with five treatments: T₁: Cattle manure, T₂: Gliricidia, T₃: Seaweed, T₄: Azolla, and T₅: *Tephrosia*. Each treatment was replicated three times. Growth parameters, including plant height and number of leaves, and yield parameters, including number of bulbs per plant, cluster weight, fresh bulb mass, and bulb weight per plot, were recorded. ANOVA was performed by using the SAS 9.4 package, and the means were separated by using Duncan's Multiple Range Test (DMRT) at $p \leq 0.05$. Results revealed that *Tephrosia* (T₅) and Azolla (T₄) significantly improved vegetative growth and yield attributes of Onion compared to other treatments. The highest cluster weight (73.3 g/cluster) and bulb yield (51 tons/ha) were observed in the *Tephrosia* treatment, followed by Azolla, indicating their superior contribution to soil fertility and nutrient availability. The study concludes that the incorporation of *Tephrosia* as green manure enhances onion growth and yield while promoting sustainable soil management practices.

Keywords: Green manure, Onion, Organic nutrient management, *Tephrosia*, Yield

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IDENTIFICATION OF THE PATHOGEN CAUSING LEAF SPOT DISEASE IN *Terminalia catappa* IN SRI LANKA

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Abstract

Terminalia catappa (tropical almond) is an ecologically and economically important coastal tree valued for its ornamental, shade-providing, and medicinal properties. Despite its significance, it is susceptible to foliar diseases, including leaf spot, which reduces aesthetic value and may impair plant health. This study aimed to isolate, identify, and assess the pathogenicity of fungal pathogens associated with leaf spot disease in *T. catappa* from Batticaloa, Sri Lanka. Diseased leaves were collected from Batticaloa district (Eravur and Batticaloa) during January-February 2025. Fungal isolation was carried out on Potato Dextrose Agar (PDA) supplemented with amoxicillin, followed by single spore isolation. Morphological characterization of pure cultures revealed darkly pigmented, filamentous colonies exhibiting cottony to velvety aerial mycelium. Colonies initially appeared gray to olive-brown and turned black upon maturation, with prominent dark pigmentation on the reverse side. The pathogen produced crescent-shaped, 3-septate conidia measuring 15-25 $\mu\text{m} \times 7-13 \mu\text{m}$, with a distinctly swollen, pigmented central cell and tapered terminal cells. Conidiophores were brown, septate, unbranched, and geniculate at the conidial attachment point, confirming the identity as *Curvularia lunata*. Pathogenicity tests following Koch's postulates showed that water-soaked brown lesions developed 3 Days After Inoculation (DAI) on wounded leaves and 4-5 DAI on unwounded leaves. Lesions expanded, turned necrotic, and resembled natural infections. No symptoms were observed in control leaves (leaves treated with sterile water). The pathogen was successfully re-isolated from symptomatic tissues, and its morphology matched the original isolate, confirming *C. lunata* as the causal organism. Previous research and reviews indicate that *C. lunata* has not previously been reported as the causal agent of leaf spot disease on *T. catappa* in Sri Lanka; therefore, to the best of our knowledge, this study represents the first record of this foliar disease on *T. catappa* in Sri Lanka. Such information is critically important for making evidence-based decisions on the control of these emerging diseases in Sri Lanka.

Keywords: *Curvularia lunata*, Emerging foliar disease, Pathogenicity, Sri Lanka, *Terminalia catappa*

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EFFECT OF SPLIT NITROGEN APPLICATION ON GROWTH, AND GRAIN YIELD OF RICE (*Oryza sativa* L.)

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Abstract

Nitrogen is an essential nutrient for rice (*Oryza sativa* L.) growth and yield, and its efficiency largely depends on both the rate and timing of application. This study evaluated the effect of split nitrogen applications on rice growth and yield under a pot experiment conducted in Trincomalee, Sri Lanka, from July to November 2025. The experiment followed a Completely Randomized Design (CRD) with four treatments and six replicates using the rice variety Bg366. The treatments consisted of different nitrogen management regimes: T1 - control with phosphorus and potassium only (TSP + MOP, no nitrogen), T2 - Department of Agriculture (DOA) recommended nitrogen rate (225 kgNha⁻¹) applied in four equal splits at two-week interval, T3 - the same recommended nitrogen rate applied in weekly splits, and T4 - a reduced nitrogen rate (150 kgNha⁻¹) applied in weekly splits. Phosphorus and potassium were applied at sowing, while nitrogen was applied according to the respective schedules at key crop growth stages. Plant height, tiller number, and leaf area were measured at appropriate stages, and grain yield was recorded at harvest. Data were analyzed using Minitab software, and mean comparisons were performed using Tukey's test at $\alpha = 0.05$. Significant differences were observed among treatments for all measured parameters. The recommended nitrogen rate applied in weekly splits (T3) produced the tallest plants (64.55 cm), the highest number of tillers (10.67), the largest leaf area (45.18 cm²), and the highest grain yield, representing an 8.67% increase over the standard recommended split application. The improved performance may be attributed to better synchronization of nitrogen supply with crop demand and enhanced nitrogen use efficiency. Although increased split applications may involve additional labor, the yield advantage suggests that this approach is agronomically effective and economically viable under similar agro-ecological conditions.

Keywords: Leaf area, Nitrogen use efficiency, Rice, Split application

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BIO-PRIMING WITH PLANT EXTRACTS: A SUSTAINABLE APPROACH FOR IMPROVING SEED GERMINATION AND FUNGAL MANAGEMENT IN *Oryza rufipogon*

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Abstract

Oryza rufipogon, the putative ancestor of Asian cultivated rice (*Oryza sativa* L.), is the most significant germplasm for rice breeding. This species has significantly lower seed fertility than other wild rice species found in Sri Lanka, hindering the application of its seeds in research. These seeds are highly impaired by low viability, strong dormancy, and fungal infections. This study aims to enhance seed germination and maximize seed use in research by breaking dormancy and reducing fungal infections through bio-priming with plant extracts. Aqueous extracts from fresh leaves of Wal-Iguru (*Zingiber zerumbet*), Guava (*Psidium guajava* L.), Cinnamon (*Cinnamomum verum*), Moringa (*Moringa oleifera*), and Attora (*Cassia alata*), with ratios of 1:1 (100 g leaf/ 100mL H₂O), 1:2 (100g leaf/200 mL H₂O) for 15 min, along with a standard fungicide with dehusk seeds (S) (2 g L⁻¹ of Manganese-ethylene-bis-dithiocarbamate) and a control using distilled water with dehusk seeds (C), were used for 22 treatments. The experiment was conducted using a completely randomized design (10 seeds, 3 replicates per treatment). After dormancy breaking (50°C, 48 h), seeds were soaked in plant extracts (24 h) and incubated at 36°C for 10 days; germination and fungal infection were recorded every 2 days. Data were analyzed by one-way ANOVA (p<0.05) with Tukey's HSD test. *Cinnamomum verum* 1:2 yielded the highest dehusked seed germination (8.33±0.667); *Moringa oleifera* 1:2 the lowest (0.33±0.333) with the highest fungal infection (8.67±0.333). *Zingiber zerumbet* showed the least fungal infection. Husked seeds failed to germinate, confirming dehusking as essential for germination. *Cinnamomum verum* 1:2 recorded the highest germination (8.33±0.667), surpassing *Zingiber zerumbet* 1:1 (7.00±0.000) and 1:2 (6.67±0.333), while *Zingiber zerumbet* showed lower fungal infection (1:1: 0.67±0.333; 1:2: 0.00±0.000) compared to *Cinnamomum verum* 1:2 (1.67±0.667). Overall, the *Cinnamomum verum* 1:2 treatment and both *Zingiber zerumbet* ratios could be recommended as the most effective bio-priming leaf extracts for minimizing fungal attack while increasing the germination ability of *O. rufipogon* seeds.

Keywords: Antifungal properties, Aqueous extracts, Breaking dormancy, Eco-friendly, Wild rice

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QUANTIFYING ANTIXENOSIS RESISTANCE IN SRI LANKAN WILD RICE (*Oryza nivara*) POPULATIONS AGAINST BROWN PLANTHOPPER (*Nilaparvata lugens*)

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Abstract

The brown planthopper (BPH), *Nilaparvata lugens*, is a destructive rice insect pest threatening food security in Sri Lanka. Wild rice species, particularly *Oryza nivara*, offer valuable genetic resources for developing durable BPH-resistant cultivars. This study evaluated antixenosis resistance in five *O. nivara* populations from diverse Sri Lankan natural habitats (Anuradhapura, Kilinochchi, Batticaloa, Mannar, and Katharagama), quantifying nymphal settling preference and oviposition preference, with comparing Ptb 33 (resistant check) and Bg 380 (susceptible check). A completely randomized design with four replicates was administered, data were analyzed using ANOVA, and means were separated by Duncan's Multiple Range Test at 5% significance level. Results revealed significant differences among populations ($p < 0.05$). Batticaloa and Mannar populations exhibited exceptionally superior antixenosis resistance with the lowest nymphal settling rates of 1.90 ± 0.80 and 1.80 ± 0.82 nymphs at 12 hours, declining to 1.00 ± 0.84 and 1.05 ± 0.81 nymphs at 72 hours, respectively, and minimal oviposition of 20.00 ± 1.40 and 21.00 ± 1.37 eggs. The susceptible check Bg380 showed 7.03 ± 1.51 to 16.03 ± 2.71 nymphs at 12 hours and 72 hours, respectively, counting 70.00 ± 4.38 eggs in the oviposition test. Both populations significantly outperformed than resistant check Ptb 33 (2.88 ± 0.76 to 2.00 ± 0.84 nymphs; 28.00 ± 1.37 eggs) in both parameters. Anuradhapura, Kilinochchi, and Katharagama populations showed intermediate resistance. The exceptional performance of Batticaloa and Mannar populations suggests highly effective antixenosis resistance mechanisms could be regulated by morphological barriers, biochemical defenses, and volatile-mediated deterrence. The findings demonstrate significantly high genetic diversity for BPH resistance within Sri Lankan *O. nivara* populations, identifying Batticaloa and Mannar as priority populations for resistance gene identification, introgression into cultivated varieties, and gene pyramiding strategies for sustainable BPH management.

Keywords: Antixenosis resistance, Brown planthopper, *Nilaparvata lugens*, *Oryza nivara*, Wild rice

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**ANTIFUNGAL ACTIVITY OF SOME SELECTED PLANT EXTRACTS
AGAINST THE CAUSAL AGENT OF ANTHRACNOSE DISEASE OF
BEANS, *Colletotrichum lindemuthianum***

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Abstract

Common bean anthracnose is a devastating fungal disease caused by *Colletotrichum* sp. in Sri Lanka. The aim of this study was to isolate and identify the bean anthracnose disease causing *Colletotrichum* species and evaluate the antifungal potential of selected plant extracts against the causal agent. The *Colletotrichum* isolate, obtained from bean anthracnose diseased bean pods, was identified as *Colletotrichum lindemuthianum* based on morphological features. Acetone extracts of seven plant species, viz. *Bacopa monnieri*, *Croton laccifer*, *Acalypha indica*, *Elephantopus scaber*, *Coriandrum sativum*, *Mentha aquatica*, and *Hygrophila schulli* were tested for their antifungal potential against the *Colletotrichum* isolate. When the pathogenicity of the fungal isolate was determined by an *in vivo* inoculation assay using healthy bean pods, characteristic symptoms of anthracnose were developed by the *Colletotrichum* isolate on bean pods. All seven plant extracts studied showed antifungal activity against the isolate. Among them, the acetone extract of *B. monnieri* showed (mean inhibition of 69.5%) the best antifungal activity against the *Colletotrichum* isolate. Recommended dosage of fungicide Homai (Thiophanate-methyl 50% + Thiram 30% WP) completely inhibited the mycelial growth of the isolate *in vitro*. The results suggest that natural plant extracts could serve as potential biofungicides for the eco-friendly management of common bean anthracnose. The potential of *B. monnieri* was found to be a promising botanical alternative for the management of bean anthracnose, providing baseline information for developing integrated disease management strategies in Sri Lanka.

Keywords: Anthracnose, *Bacopa monnieri*, Biofungicides, Common bean

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PHYTOCHEMICAL QUANTIFICATION, TLC FINGERPRINTING AND ANTIMICROBIAL ACTIVITY OF DIFFERENT PARTS OF *Hellenia speciosa* (THEBU)

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Abstract

Antimicrobial resistance is rapidly increasing, highlighting the need to explore plant-derived compounds as alternatives to conventional treatments. This study aimed to quantify the phytochemicals, to establish Thin Layer Chromatography (TLC) fingerprint, and compare the *in-vitro* antimicrobial potential of methanolic extracts derived from various parts of *H. speciosa* (rhizome, root, leaf, stem, and flower). Plant extracts prepared by cold maceration and sonication (for TLC). Methanolic root extract showed the highest flavonoid level (12.73 ± 0.49 mg/RE/g), followed by rhizome (10.83 ± 0.07), leaf (7.84 ± 0.50), flower (1.78 ± 0.01), and stem (0.08 ± 0.01), ($p < 0.01$). Methanolic root exhibited the highest concentration of glycosides (44.74 ± 0.08 mg/DE/g, $p < 0.01$), followed by rhizome (8.60 ± 0.09), flower (8.38 ± 0.70), leaf (8.26 ± 0.19), and stem (8.17), ($p > 0.05$). TLC fingerprint patterns of methanolic extracts exhibited four distinct bands, indicating the presence of several phytochemicals having different polarities. Sonication was comparatively effective than maceration for TLC to screen phytochemicals. Anti-microbial activity of methanolic extracts was performed using the well-diffusion method against bacteria: *Staphylococcus aureus* (ATCC 25923), *Escherichia coli* (ATCC 25922), *Klebsiella pneumoniae* (ATCC 1706), *Pseudomonas aeruginosa* (ATCC 27853), and Methicillin-resistant *Staphylococcus aureus* (MRSA) (clinical strain). *Candida albicans* (ATCC 10231), *C. tropicalis* (ATCC 13803), and *C. glabrata* (ATCC 90030) were the fungal cultures used. Gentamicin (10 mg/mL) and Fluconazole (600 µg/mL) were utilized as the positive controls. MRSA (flower: 22.0 ± 4.2 , leaf and stem: 19.0 ± 1.4 , rhizome: 16.5 ± 2.1 mm, $p < 0.001$), and *P. aeruginosa* (root: 13.5 ± 0.7 , rhizome: 12.5 ± 0.7 , stem: 12, leaf: 11.0 ± 2.8 mm, flower: 10.5 ± 0.7 mm, $p > 0.05$) showed greater sensitivity against respective plant parts. Other bacteria and *Candida* sp. were resistant to all plant extracts (300 mg/mL). TLC analysis showed distinct methanolic extract patterns across plant parts, highlighting the need for further studies on the mechanisms of phytochemical antimicrobial agents.

Keywords: Antimicrobial activity, *Hellenia speciosa*, Phytochemicals, Thin-layer chromatography

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**SHOOT AND ROOT GROWTH OF CAPSICUM (*Capsicum annuum* L.)
UNDER MONOCROPPING AND INTERCROPPING SYSTEMS WITH
SELECTED GRAIN LEGUMES IN POLYBAG CULTIVATION**

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Abstract

Understanding vegetative growth responses of capsicum (*Capsicum annuum* L.) under different cropping systems is important for optimizing productivity in confined cultivation. With increasing land limitations, polybag cultivation provides an efficient approach for crop production in small or residential areas while allowing diversification through intercropping. A polybag experiment was conducted in 2024 at the Faculty of Agriculture, Eastern University, Sri Lanka, to evaluate shoot (leaves and stem) and root growth of capsicum under monocropping and legume intercropping systems. Seven treatments were arranged in a completely randomized design with seven replicates: T1 (capsicum monocropping), T2 (capsicum + black gram), T3 (capsicum + green gram), T4 (capsicum + groundnut), T5 (capsicum + black gram + green gram), T6 (capsicum + black gram + groundnut), and T7 (capsicum + green gram + groundnut). Legume seeds were sown at 10 cm apart prior to capsicum transplanting in polybags filled with sandy regosol soil. Growth parameters were recorded at two weeks interval upto 10 weeks after transplanting (WAP), and biomass was measured at 10 WAP. Significant differences ($p < 0.001$) were observed in plant height, leaf number, and shoot and root biomass. Monocropped capsicum (T1) recorded the highest growth, and it was significantly superior to all intercropping treatments. Compared to the least-performing treatment (T4), monocropping treatment increased plant height by 56.6%, leaf number by 65.2%, shoot dry weight by 83.9%, and root dry weight by 69.2%. Intercropping with black gram and green gram (T2, T3, and T5) showed significantly greater growth than groundnut-based systems (T4, T6, and T7), although values remained lower than T1. These results indicate that black gram and green gram can be grown as intercrops with capsicum in a polybag planting system.

Keywords: Biomass, Black gram, Capsicum, Green gram, Groundnut, Intercropping, Legumes, Monocropping, Vegetative growth

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**BIOSTIMULATORY AND PHYTOTOXIC EFFECTS OF ALGAE FROM
BATTICALOA LAGOON ON GERMINATION AND EARLY SEEDLING
VIGOR OF RICE (*Oryza sativa*), BEAN (*Phaseolus vulgaris*), AND BRINJAL
(*Solanum melongena*)**

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Abstract

The rising need for sustainable agriculture has increased interest in seaweed-based products as eco-friendly alternatives to synthetic fertilizers and bio-stimulants. This study examined the dual-phase effects of algal powder from *Spirogyra* collected in Batticaloa Lagoon, Sri Lanka, on the germination and early growth of rice, bean, and brinjal. The algal material was characterized taxonomically and biochemically, revealing a rich nutrient profile with substantial nitrate ($14.2 \pm 0.5 \text{ mg g}^{-1}$) and phosphate ($5.1 \pm 0.3 \text{ mg g}^{-1}$) content. To better simulate agronomic conditions, a soil-based germination assay was conducted using seedling trays filled with a sterile sandy-loam medium. Seeds were treated via soil drench with aqueous extracts at concentrations of 1% and 5% (w/v), alongside a distilled water control, in a completely randomized design with six replicates per treatment. Emergence and growth were monitored over 14 days. Parameters assessed included daily emergence percentage (EP), shoot and root length, and the derived seedling vigor index (SVI). Results demonstrated a significant ($p < 0.01$) and species-specific hermetic response. The 1% algal extract functioned as a potent bio-stimulant, significantly enhancing EP by up to 18%, increasing shoot and root elongation by 48% and 52%, respectively, and elevating SVI by 40–68% across all crops compared to the control. In contrast, the 5% treatment induced clear phytotoxic effects, particularly in rice and brinjal, suppressing EP, stunting root and shoot development, and reducing SVI, a pattern indicative of concentration-dependent inhibition. The findings underscore the importance of dosage optimization and crop-specific calibration when using raw algal amendments. This study conclusively identifies a 1% application of locally sourced *Spirogyra* powder as an effective, low-cost, and sustainable soil treatment for enhancing seedling establishment and early vigor, offering a practical pathway for making productive use of lagoon algal biomass in support of region-specific organic farming systems. Additional field trials and detailed studies are needed before applying these findings in agriculture.

Keywords: Hormesis, Nutrient analysis, Phytotoxicity, Seedling growth rate, Sustainable horticulture

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**EFFECT OF DIFFERENT LEVELS OF NITROGEN FERTILIZER AND
AMIRTHAKARAI SAL ON GROWTH AND YIELD OF YARD LONG BEAN
(*Vigna unguiculata*) var. Bushita BS1**

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Abstract

Yard-long bean (*Vigna unguiculata* L.) is an important leguminous vegetable crop widely cultivated in the tropical and subtropical regions for its long, tender pods and high nutritional value. This study evaluated the effect of different levels of nitrogen fertilizer in combination with *Amirthakaraisal* (i.e., a liquid organic fertilizer) on the growth and yield of potted *V. unguiculata* (var. Bushita BS1). The experiment was carried out at the University Farm, Faculty of Agriculture, Eastern University, Sri Lanka, from July to September 2025, using a Completely Randomized Design with five treatments and six replicates. The treatments consisted of T1 (Control, 100% of the Department of Agriculture recommendation), T2 (75% of recommended urea + 25% of *Amirthakaraisal*), T3 (50% of recommended urea + 50% of *Amirthakaraisal*), T4 (25% of recommended urea + 75% of *Amirthakaraisal*), and T5 (100% of *Amirthakaraisal*). *Amirthakaraisal* was applied as a soil application. All treatments were supplied with recommended levels of phosphorus and potassium. Growth and yield parameters were regularly measured, and the data were analyzed statistically using one-way ANOVA in Minitab 17. The results revealed significant ($p < 0.05$) improvements in plants treated with T4, which exhibited superior performance in the number of branches (37%), leaf area (67%), number of pods (111%), and total yield (34%) compared to T1 (Control). These findings indicate that the combined application of 25% recommended urea and 75% *Amirthakaraisal* promotes superior vegetative growth and pod yield of yard-long bean.

Keywords: *Amirthakaraisal*, Liquid fertilizer, Nitrogen fertilizer, Yard-long bean

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EVALUATION OF HORMONAL SEED PRIMING ON GERMINATION OF RICE VARIETIES UNDER SALINE SOIL

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Abstract

Salinity is a major abiotic stress limiting rice production in salt-affected soils, by reducing seed germination and seedling establishment. Most of the rice varieties are highly sensitive to salinity, though the degree of sensitivity varies across their growth stages. The present study was conducted to evaluate the effects of hormonal seed priming using Gibberellic acid (GA3) and Salicylic acid (SSA) on germination and emergence of selected rice varieties under saline soil. A pot experiment was carried out at the Rice Research and Development Institute, Bathalagoda, Sri Lanka, during the period of July to October 2025, using saline soil with a salinity level of 4 ds/m. The experiment was conducted in a two-factor factorial completely randomized design, with three replicates. The factor one was five different rice varieties (Bg369, Bg366, Bg360, Bg352, and At362), and factor two was five different priming methods (100mgL⁻¹ GA3, 150mgL⁻¹ GA3, 0.5mM SSA, 1.0mM SSA, and hydro priming as a control). The data were collected from sowing to 40 days, and the data were subjected to 5% ANOVA using Minitab 17. The results revealed that both GA3 and SSA hormones priming significantly influenced the emergence percentage, mean germination time, time to 50% emergence, and emergence energy more than the hydro priming. Varietal differences were also evident with At362, Bg369 and Bg366 exhibiting better performance in saline soil conditions than the susceptible varieties when they were primed with hormones. The finding indicates that hormonal priming is an effective, low-cost strategy to enhance the early establishment of rice under saline soil.

Keywords: Gibberellic acid, Rice, Salicylic acid, Salinity stress, Seed priming

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EFFECT OF CROWN FLOWER (*Calotropis gigantea*) LEAF EXTRACT AND BANANA PSEUDO STEM SAP AS FOLIAR SPRAY WITH BASAL FERTILIZER ON NODULATION AND ROOT GROWTH OF COWPEA (*Vigna unguiculata* L.)

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Abstract

The study was conducted to evaluate the effects of integrating *crown flower* (*Calotropis gigantea*) leaf extract and banana pseudo stem sap as foliar applications with different basal fertilizer combinations on nodulation and root growth of cowpea (*Vigna unguiculata*) Waruni variety. The experiment was laid out in a factorial completely randomized design with 12 treatment combinations and five replicates. Basal treatments consisted of 100% inorganic fertilizer (B1), 50% inorganic fertilizer + 50% cattle manure (B2), and 100% cattle manure (B3). Foliar treatments included no foliar application (F1), *crown flower* leaf extract (F2), banana pseudo stem sap (F3), and *crown flower* leaf extract + banana pseudo stem sap at 1:1 ratio (F4). Results revealed that the combined application of 50% inorganic fertilizer + 50% cattle manure with the foliar spray of *crown flower* leaf extract and banana pseudo stem sap (B2F4) significantly enhanced most of the nodulation and root growth parameters. Growth parameters including plant height, number of branches, number of nodules, total root length as well as root and shoot biomass were recorded and statistically analyzed. The results showed that there were significant differences ($p < 0.001$) in plant height and number of branches at 4th, 6th and 8th week after planting by both applications, the basal and foliar spray. Among basal fertilizer treatments, plants that received half dosage of inorganic fertilizer and organic manure generally produced higher number of nodules than those with inorganic fertilizer alone or organic manure alone at harvesting time. Similarly, foliar spray of the combined *Crown flower* leaf extract and banana pseudo stem sap (1:1 v/v) resulted in the highest nodulation across basal treatments. The F-test indicated that basal ($p = 0.007$), foliar ($p < 0.001$), and their interaction ($p = 0.004$) had highly significant effects on nodulation, confirming a synergistic influence of soil organic amendments and foliar biostimulants on rhizobial activity. Statistical analysis also indicated that basal fertilizer, foliar spray and their interaction significantly influenced root length and root dry weight ($p < 0.001$), demonstrating that the combination of basal nutrient sources and foliar spray was more effective in enhancing root development than single treatments. The combined use of organic and inorganic fertilizers with a foliar biostimulant sustainably improves cowpea growth while reducing chemical fertilizer use.

Keywords: Cowpea, Foliar spray, Inorganic fertilizer, Nutrient management, Organic fertilizer

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**EFFECT OF SEED PRIMING WITH DIFFERENT ORGANIC SOLUTIONS
ON GERMINATION, GROWTH AND YIELD OF OKRA
(*Abelmoschus esculentus* L.)**

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Abstract

Seed priming is a pre-sowing treatment that modifies the physiological state of seeds to improve germination efficiency. Chemical seed priming affects both the seed and soil environment, whereas organic seed priming is safe, eco-friendly, inexpensive and easy to perform on farms. This study aims to assess the effect of seed priming with different organic solutions on germination, growth and yield of okra (*Abelmoschus esculentus* L.). A pot experiment was conducted at the University Farm, Faculty of Agriculture, Eastern University, Sri Lanka, from June to October, 2025. The experiment was carried out in a Complete Randomization Design (CRD) with five treatments with six replicates, which were T1 (50% Neem leaf extract solution), T2 (3% Cow urine solution), T3 (20% Coconut water solution), T4 (5% Garlic extract solution), and T5 (Control). Seedling parameters were measured regularly; growth parameters were measured once a week and yield parameters were measured at each harvesting time. The data were analyzed statistically using one-way ANOVA in Minitab 17. Results revealed that T2 was the most effective treatment, recording the highest germination percentage (100%) and the increasing percentage of radicle length (50.57%), plant height (27.71%), shoot weight (21.94%), average pod weight (18.76%) and total yield (82.14%) compared to the control. These findings demonstrate that 3% Cow urine solution is an efficient, eco-friendly and low-cost organic priming agent that can enhance seedlings' performance, growth and yield of okra.

Keywords: Germination, Growth, Okra, Organic seed priming, Seedling performance, Yield

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**EFFECTS OF ORGANIC MANURES, INORGANIC FERTILIZERS AND
COCONUT SHELL BIOCHAR ON GROWTH AND YIELD
PERFORMANCE OF *Vigna mungo* L.**

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Abstract

Organic and inorganic fertilizers play an important role in improving crop growth, yield, and soil fertility. A pot experiment was conducted at the University Farm, Faculty of Agriculture, Eastern University, Sri Lanka, from July to October 2025, to evaluate the effects of organic manures, inorganic fertilizers, and coconut shell biochar on the growth and yield performance of *Vigna mungo* L. The experiment was arranged in a Completely Randomized Design with ten treatments and five replicates. Treatments included 100% inorganic fertilizer (T1, control), 100% poultry manure (T2), 100% vermicompost (T3), 75% biochar + 25% inorganic fertilizer (T4), 75% poultry manure + 25% inorganic fertilizer (T5), 75% vermicompost + 25% inorganic fertilizer (T6), 50% biochar + 50% inorganic fertilizer (T7), 50% poultry manure + 50% inorganic fertilizer (T8), 50% vermicompost + 50% inorganic fertilizer (T9), and an integrated mixture containing equal proportions of biochar, poultry manure, vermicompost, and inorganic fertilizer (25% each) (T10). Growth and yield parameters were measured, and data were analyzed using one-way ANOVA in Minitab 17 statistical software. T10 significantly ($p < 0.05$) improved shoot dry weight (115%), leaf area (53.6%), 100-seed weight (41%), and total yield (121.7%) compared to the control (T1). The study concludes that T10 is the most effective strategy for improving growth, yield, and overall productivity of *Vigna mungo* L.

Keywords: Biochar, Growth parameters, Poultry manure, Vermicompost, *Vigna mungo* L., Yield parameters

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OPTIMIZATION OF INCORPORATION TIME FOR DIFFERENT GREEN MANURE CROPS BASED ON NUTRIENT ACCUMULATION AT DIFFERENT GROWTH STAGES

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Abstract

Green manuring plays a vital role in improving soil fertility, enhances nutrient availability, and supports sustainable organic farming in dry zone regions. A field experiment was conducted during the *Maha* season of 2023 in the Jaffna Peninsula, Sri Lanka, to determine the optimum timing for incorporating selected green manure crops based on the impact of growth stages on nutrient content. Four commonly cultivated leguminous green manure crops: Sunn hemp (*Crotalaria juncea*), Black gram (*Vigna mungo*), Green gram (*Vigna radiata*), and Cowpea (*Vigna unguiculata*) were evaluated under rainfed conditions without the application of chemical fertilizers and pesticides. The experiment was laid out in a Randomized Complete Block Design with three replicates. Green manures were collected at four distinct growth stages: end of rapid growth, 50% flowering, 100% flowering, and seed formation. Plant samples were analyzed for nitrogen (N), phosphorus (P), and potassium (K) contents to assess nutrient accumulation patterns. The results revealed that both crop species and growth stage had a significant influence on nutrient concentrations ($p < 0.05$). Across all crops, N, P, and K contents increased from the rapid growth stage and reached peak levels at the 50% flowering stage, followed by a gradual decline during 100% flowering and seed formation. Among the tested species, Sunn hemp recorded the highest nutrient concentrations at the 50% flowering stage, with maximum values of 3.36% N, 0.42% P, and 1.98%. Green gram ranked second, followed by Black gram and Cowpea, which showed comparatively lower nutrient contents. The consistent peak of nutrient accumulation at the 50% flowering stage across all crops suggests that this stage is optimal for green manure incorporation. Overall, the study highlights Sunn hemp incorporated at 50% flowering as the most effective green manure strategy for improving soil fertility and nutrient cycling in the dry zone conditions of the Jaffna Peninsula.

Keywords: Green manuring, Jaffna Peninsula, Soil fertility, Sunn hemp

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**EFFECT OF DIFFERENT ORGANIC AND INORGANIC FERTILIZERS
ON THE GROWTH AND YIELD OF *Vigna unguiculata* L. (var. *Waruni*)**

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Abstract

Cowpea (*Vigna unguiculata* L.) is one of the most important food legumes cultivated in tropical and subtropical regions. This study evaluated the effects of different organic and inorganic fertilizer treatments on the growth and yield of *Vigna unguiculata* L. (var. *Waruni*) through a pot experiment conducted at the Faculty of Agriculture, Eastern University, Sri Lanka, which is part of the Low Country Dry Zone agro-climatic region of Sri Lanka, during the period from July to October 2025. The experiment was laid out in a Completely Randomized Design (CRD) with ten treatments and four replicates, with one plant maintained per replicate. The experiment consisted of ten fertilizer treatments (T1–T10), including the recommended inorganic fertilizer (DOA) (T1) and reduced inorganic fertilizer levels integrated with organic amendments: Jeewamrutha (75:25, 500 L/ha; 50:50, 500 L/ha; 25:75, 500 L/ha; T2–T4), poultry manure (75:25, 5 t/ha; 50:50, 5 t/ha; 25:75, 5 t/ha; T5–T7), and cow dung (75:25, 10 t/ha; 50:50, 10 t/ha; 25:75, 10 t/ha; T8–T10). Growth and yield parameters were collected at two-week intervals, with final measurements recorded at the 8th week after planting, and the data were analyzed statistically using one-way ANOVA in Minitab 17. The results revealed significant ($p < 0.05$) improvements in plants treated with T6, which exhibited superior performance in leaf area (79.02%), shoot dry weight (77.61%), number of pods per plant (150.49%), and total yield (226.35%) in comparison to T1. The findings suggest that T6 has potential as an effective nutrient management strategy for cowpea, but field-level validation under diverse agro-ecological conditions is necessary before large-scale adoption. Further field experiments are recommended to confirm the applicability of these results under farmer field conditions.

Keywords: Growth and yield, Inorganic fertilizer, Organic fertilizer, Poultry manure, *Vigna unguiculata*

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FOOD PROCESSING & NUTRITION

**NUTRITION KNOWLEDGE, NUTRITIONAL STATUS AND PHYSICAL
ACTIVITY PATTERN AMONG 15-16-YEAR-OLD ADOLESCENT
SCHOOL CHILDREN IN THE KEGALLE DISTRICT OF SRI LANKA**

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Abstract

Adolescence is a crucial period of rapid physical growth. During this phase, having good nutrition and staying physically active are important for reaching optimal nutritional status and maintaining long-term health. This study aimed to evaluate nutrition knowledge, nutritional status, and physical activity patterns among adolescent school children in the Kegalle District of Sri Lanka. A descriptive cross-sectional study was conducted with 380 adolescents from two Sinhala and two Muslim secondary schools in the Mawanella Education Zone. Data were gathered using a validated nutrition knowledge questionnaire and the International Physical Activity Questionnaire. Height and weight measurements were done following standard procedures, and the nutritional status was assessed using Body Mass Index-for-age criteria. Data analysis was performed with SPSS version 26 software. The findings showed significant gaps in nutrition knowledge among adolescent school children, with only 20.3% of them knowing the primary function of protein. Nutritional status assessment showed a high rate of protein-energy undernutrition in the study group, with 44.6% of adolescents classified as thin and 36.0% as severely thin. Only 14.2% adolescents in the study were normal, while 5.2% were overweight or obese. Assessment of physical activity revealed that 61.8% of adolescents were physically inactive, 26.1% were minimally active, and only 12.1% met the recommended physical activity levels. Chi-square analysis showed no significant link between gender and nutritional status ($p=0.973$). The combination of poor nutrition knowledge, undernutrition, and physical inactivity demonstrates the need for effective, school-based nutrition education and physical activity programs to promote healthy growth in adolescents and develop this future human capital.

Keywords: Adolescents, Nutrition knowledge, Nutritional status, Physical activity, School children, Sri Lanka

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DEVELOPMENT OF *Capsicum chinense* BASED SHELF STABLE READY-TO-EAT CURRY USING RETORT TECHNOLOGY

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Abstract

Thai curry is a traditional Southeast Asian dish characterized by its complex flavor profile and potential nutritional value, making it a promising candidate for functional food development. This study was conducted to develop and evaluate the nutritional quality and shelf-life stability of two traditional Thai curry variants, Green and Red Thai curry, processed as shelf-stable, ready-to-eat curry. The goal was to formulate flavorful, shelf-stable curry using authentic Thai ingredients while maintaining consumer safety and convenience. Both Green and Red Thai curries were formulated based on *Capsicum chinense* (Scotch Bonnet) and other traditional ingredients, including *Alpinia galanga* (Galangal), leaves of *Citrus hystrix* (Kaffir lime), and *Cymbopogon citratus* (Lemongrass). The mixtures were canned and thermally processed using a retort sterilization method at 123°C for 17 minutes, ensuring commercial sterility and prolonged shelf life under room temperature. The Green Thai curry exhibited a lower energy profile of 74.81 kcal/100 g, with 3.36 % protein, 0.46 % fat, and 9.70 % carbohydrate. Total soluble solids were 15.76 °Brix and moisture content at 77.45 %, indicating appropriate consistency for ready-to-eat curry. In contrast, the Red Thai curry had a higher caloric value of 139.5 kcal/100 g, largely due to increased fat levels (12.7 %), along with 6.1 % carbohydrates, 1.7 % protein, 3.4 % sugar, 0.98 % salt, and 1.5 % dietary fiber. Accelerated shelf life tests at 25°C and 37°C for 28 days showed no significant changes in sensory quality or microbial growth. Microbiological parameters such as total plate count and yeast and mold remained within safe limits (<10⁵ cfu/g), confirming the products' shelf stability up to 12 months. In conclusion, the developed Green and Red Thai curries show strong potential as shelf-stable, nutritious, and flavorful ready-to-eat products.

Keywords: Retort, Shelf stable curry, Scotch Bonnet, Traditional, Thai Curry

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DEVELOPMENT OF FUNCTIONAL BIODEGRADABLE FOAM CUPS FROM MANGO PEELS AND BANANA STEM FIBER USING BAKING MOLD TECHNOLOGY

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Abstract

Petroleum-based plastics are poorly biodegradable, and their widespread use has caused serious environmental pollution. Agro-industrial residues containing cellulose, hemicellulose, and pectin offer a promising alternative for sustainable packaging materials. This study aimed to develop biodegradable foam cups from mango peel and banana stem fiber using baking mold technology. Three formulations were prepared with different mango peel-cassava starch fiber ratios: T1 (2:1), T2 (1:1), and T3 (2:3), with a constant amount of banana fiber, glycerol, and citric acid. The ingredients were mixed with warm water to form slurries, poured into molds, and baked at 120°C for 40 minutes. Physical properties, including thickness, moisture content, and water absorption, were evaluated, while mechanical properties (hardness, adhesiveness, and springiness) were measured using a texture profile analyzer. Results showed significant differences among the treatments. Thickness increased with starch content, with T3 exhibiting the highest (2.99±0.20mm) and T1 the lowest (1.57±0.08mm). Moisture content (9.73%-5.63%) and water absorption (28.0%-40.33%) also increased with starch due to enhanced gelatinization and hydrophilicity. Hardness ranged from 5.0 N (T3) to 19 N (T1), indicating a stronger structure in T1, while adhesiveness remained low (0-0.5 mJ) and springiness slightly decreased in harder foams (0.77-0.86). Overall, T1 produced harder, thinner, and less water-absorbing cups, T3 produced softer, thicker, and highly hydrophilic cups, and T2 provided a balanced combination of structural integrity and water resistance, indicating potential suitability for functional applications. These findings suggest that mango peel powder and banana stem fiber can be effectively valorized for biodegradable packaging.

Keywords: Baking mold technology, Banana stem fiber, Biodegradable packaging, Biopolymer, Mango peel

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ENHANCING THE QUALITY OF COMMERCIAL PALMYRAH FRUIT CORDIAL THROUGH PRODUCT REFORMULATION

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Abstract

A tropical palm, Palmyrah (*Borassus flabellifer* L.), is a feature of north-east Sri Lanka. Palmyrah fruit cordial is one of the fruit-based products produced commercially primarily by the Palmyrah Development Board. Enhancing the quality of palmyrah cordial available in Jaffna is crucial to capture the national and international market. Hence, cordial was reformulated through a scientific approach to reach the quality as per the Sri Lanka Standards, SLS214:2010, and to find the optimum temperature and time combination to keep bottled cordial for six months. Firstly, the amount of water extracted from preheated (up to 80 °C) fruit pulp with Brix 12° and cane sugar was optimized as a combination, since pulp has a bitter compound, *flabelliferin*. Then, one ingredient's amount was optimized at a time. The contents were mixed and pasteurized at 90 °C for one minute, and sodium metabisulfite was added at 70 °C at its optimization before bottling. The amount (%w/w) of pectin, suitable acid with best concentration, and concentration (ppm) of Sodium metabisulphite were selected through sensory evaluation, which was conducted with untrained 30 panelists using 5 point hedonic scale method. Data were analyzed by Minitab 16.0 software and Friedmann non- parametric test. Mean separation was done by Tukey's test at $p=0.05$. Based on the results, optimum levels of cane sugar, palmyrah fruit pulp, water, pectin, citric acid, and sodium metabisulphite were found as 40%, 30%, 29.15%, 0.05%, 0.80%, and 200 ppm, respectively. Acidity as citric acid percentage and brix of reformulated cordial were found as 0.38% and 13.2° which complied with SLS214:2010. Six different heat treatments of temperature and time combinations, such as 70 °C, 80 °C, and 90 °C for 10 and 20 minutes each, were given for bottling. According to the values obtained for chemical and microbial parameters stated in standards for all heat treatments, 80°C for 20 minutes could be selected for bottling to maintain shelf life for six months.

Keywords: Acidity, Brix, Pulp, Sri Lanka Standards

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DEVELOPMENT AND QUALITY EVALUATION OF FUNCTIONAL HERBAL RTS-BEVERAGE FROM MUNG BEAN (*Vigna radiata*) BOILED WATER

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Abstract

Functional beverages are increasingly popular due to their health-promoting properties beyond basic nutrition. Mung bean (*Vigna radiata*) boiled water, a nutrient-rich by-product containing soluble proteins, antioxidants, and bioactive compounds, provides a promising base for sustainable beverage development. This study aimed to formulate and assess a functional herbal drink using mung bean boiled water enriched with sugar syrup, lime juice, and selected herbal extracts of Mint, Tulsi, and ginger. Five treatments were prepared, consisting of T1 (Control: mung bean boiled water + 20 ml sugar syrup + 3.6 ml lime juice), T2 (with mint extract), T3 (with Tulsi extract), T4 (with ginger extract), and T5 (a blend of ginger, mint, and Tulsi of 6 ml each). The beverages were pasteurized in 190 ml glass bottles and stored at 4°C for 30 days. Analyses were performed weekly to assess nutritional parameters, functional quality, sensory characteristics, and microbial safety. Incorporation of herbal extracts enhanced both the antioxidant activity and sensory quality of the beverages. The best formulation, T2 showed an antioxidant activity of 71.33±0.17%. Among all formulations, T2 (mint extract) achieved the highest overall sensory acceptability and functional performance, while T4 scored the lowest. During storage, pH slightly increased, whereas the total soluble solid content slightly decreased. The best formulated treatment, T2 had protein and iron contents of 0.064% and 0.47mg/100ml, respectively. Microbial analysis confirmed that all treatments were safe for one month under refrigerated conditions. The results revealed that the formulated functional beverage could be stored at 4°C for 4 weeks without any significant changes in the quality characteristics, and this technology could be used for the development of a nutritious, preservative-free functional beverage. The formulation containing mint extract (T2) demonstrated superior sensory and functional properties, indicating its potential for sustainable and health-promoting beverage innovation.

Keywords: Herbal extract, Mint, Mung bean, Ready-To-Serve, Tulsi

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EFFECT OF GARLIC, BLACK PEPPER, AND GINGER POWDER ON THE NUTRITIONAL, MICROBIAL, AND SENSORY PROPERTIES OF CHICKEN MEAT SAUSAGE

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Abstract

Natural plant powders such as garlic (*Allium sativum*), ginger (*Zingiber officinale*), and black pepper (*Piper nigrum*) consist of antioxidant and antimicrobial properties, making them possible natural additives in processed meat products. The aim of the present study was to evaluate the physico-chemical properties of chicken sausage incorporating natural plant powders, namely 0.15% black pepper, 0.15% ginger, and 0.15% garlic during storage at -10 °C for four weeks. The nutritional, physical, microbiological, and sensory parameters were evaluated in each week during storage. Moisture, ash, fat, protein, pH, and spoilage rate, and microbial activity showed significant differences ($P < 0.001$) between treatments, but fat content showed no changes ($p > 0.001$). By Week 2, sausages treated with ginger had more protein (29.95%), ash ($4.33 \pm 0.12\%$), and moisture ($38.26 \pm 1.14\%$); by Week 4, the control group had the highest pH (6.76 ± 0.02). Although garlic had the lowest microbial count in Week 2 (7.80 log CFU/g), sausages treated with black pepper and garlic showed higher spoilage indicators by Week 3. The most favoured additive, according to sensory evaluation, was black pepper (0.15%), which produced better flavour, texture, and general acceptability. Black pepper offered the best sensory performance among the natural plant powders in terms of quality and storage stability overall.

Keywords: Black pepper powder, Broiler meat, Garlic powder, Ginger powder, Natural plant powders

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**LOW-INPUT CROPS FOR SUSTAINABLE NUTRITION:
DEVELOPMENT OF A SEMI-INSTANT, NUTRIENT-RICH HERBAL
PORRIDGE TO ADDRESS FOOD INSECURITY AND MALNUTRITION
IN SRI LANKA**

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Abstract

Sri Lanka is well known for the availability of plant species with exceptional nutritional, medicinal, and economic value. These crops thrive naturally or in home gardens with minimum or zero external inputs. Modern dietary patterns and lifestyle changes have contributed to the underutilization of these crops despite their potential. Food insecurity is a major concern in the country, as approximately 3.9 million people, with over 10,000 households, were experiencing severe shortages by May 2023. In this study, a semi-instant herbal porridge was developed incorporating four nutrient-dense, low-input species: *Psychotria sarmentosa* (Gonika), *Moringa oleifera* (Moringa), *Atalantia ceylanica* (Yaki Naran), and *Osbeckia octandra* (Heen Bovitiya). Optimal ratios were determined through formulation trials informed by literature. Four bases: rice, pumpkin, proso millet, and horse gram were evaluated. A proximate analysis was conducted to assess the nutritional composition of the porridge mixture. Additionally, the total phenolic content (TPC) as gallic acid equivalent (GAE) and flavonoid content (TFC) as quercetin equivalent (QE) were quantified to characterize the bioactive profile, while 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging activity was measured to evaluate the mixture's antioxidant potential. A sensory evaluation was conducted to determine the most preferred porridge mixture out of four different formulations. The results indicated that rice-based formulation was most preferred by younger consumers (20-25 years), whereas pumpkin-based formulation was most preferred by the general consumer group (>25 years). According to the proximate analysis, the selected herbal mixture contains 21% protein and 8% ash along with other components. Measured antioxidant values are 45.2% inhibition (DPPH), 1.16 mg GAE/g TPC, and 5.29 mg QE/g flavonoids, indicating comparably good antioxidant activity. The findings highlighted the potential of this porridge as a nutrient-rich, convenient food suitable for incorporation into daily diets.

Keywords: Antioxidant activity, Food security, Functional food, Herbal porridge, Underutilized crops

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EVALUATION OF IMPORTED WHOLE LENTILS: QUALITY PARAMETERS AND COMPLIANCE WITH SRI LANKA STANDARDS

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Abstract

Lentils (*Lens culinaris* Medik.) are a nutritionally important pulse crop, rich in protein and essential micronutrients. Sri Lanka depends entirely on imports to meet its annual demand, which exceeds 100,000 metric tons. This study evaluated the quality of imported whole lentils for compliance with the Sri Lanka Standard SLS 1573:2017. Thirty-five samples from different consignments were analyzed for physical, microbiological, and toxicological parameters. Physical analysis included moisture content, percentage of defective seeds, foreign material, 1000-seed weight, presence of live insects, colour, and protein content. Microbiological quality was assessed via yeast and mould counts, and toxicological analysis measured lead, cadmium, and total aflatoxin levels. Results showed that moisture content (8.42-13.31%) was within the permissible limit of 14%. However, defective seeds ranged from 0.66% to 15.29%, with some samples exceeding the 10% standard. Foreign material was mostly below the 5% limit. The 1000-seed weight (30.77-56.87 g) exceeded the minimum requirement of 20 g. Live insects were observed in some samples. Microbiological counts were low (<10 CFU/g), and levels of toxic elements and aflatoxins were below regulatory limits. A significant negative correlation was observed between colour parameters (L^* , a^* , b^*) and the percentage of defective seeds. The findings indicate that while most imported whole lentils meet the SLS safety requirements, continuous monitoring is necessary to ensure consistent quality and consumer protection.

Keywords: Compliance, Quality, Safety, Sri Lanka Standard, Whole lentil

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EFFECT OF HEAT ON THE UNSATURATION OF FATTY ACIDS IN COCONUT OIL

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Abstract

The most preferred and widely used cooking oil in the Sri Lankan market is coconut oil. Coconut oil is heated at various temperatures in cooking, and sometimes the oil is heated repeatedly without considering the possible adverse health effects. In this research, the iodine value of a coconut oil sample was determined using Wij's method to evaluate the impact of heat and excessive heating time on the unsaturation of coconut oil. The coconut oil samples, collected from the Matara area, were heated for three hours at a temperature range of 160-170°C, 180-190°C, 200-210°C, 220-230°C, 240-250°C, and 260-270°C, and the iodine values were measured. The trends indicate that the mean iodine values were reducing from 7.57 to 7.51 at a slow rate up to 210°C, and then a rapid loss of unsaturation from 7.57 to 7.22 was observed up to 270°C. The six-hour heating with hourly iodine value monitoring at 160-180°C indicates a decrease in iodine value from (7.57 to 7.49), 180-200°C (7.56 to 7.41), and 200-220°C (7.43 to 7.38), 220-240°C (7.40 to 7.30), respectively. Repeated heating for consecutive six days at 160-180°C and 200-220°C showed the decrease in iodine value from 7.56 to 7.37 and 7.42 to 7.12, respectively. Subsequently, Fourier transform-infrared (FT-IR) spectroscopy observations reveal chemical alterations occurred at the process of repeated heating, such as the formation of hydroperoxides (appear at 3471 cm⁻¹), carbonyl groups (appear at 1730 cm⁻¹), and the breakdown of triglyceride ester bonds (decreases at 1744 cm⁻¹). According to the results obtained, an unsaturation loss upon heating is significant. Further heating in long periods and repeated heating of coconut oil make the oil unsafe to use, as higher loss of unsaturation is observed. The decrease in unsaturation diminishes nutritional quality and accelerates the formation of toxic compounds upon degradation.

Keywords: Coconut oil, Iodine value, Unsaturation, Wij's method

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FORMULATION AND QUALITY ASSESSMENT OF SWEET POTATO (*Ipomoea batatas*) PASTE INCORPORATED BROWNIE

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Abstract

This research was conducted to prepare brownies by substituting wheat flour with sweet potato paste and assess their nutritional composition and sensory acceptability. The general objective is to formulate brownies by partially substituting wheat flour with sweet potato paste and to evaluate their nutritional composition and sensory acceptability. Specific Objectives are to determine the proximate composition of brownies formulated with different levels of sweet potato paste and to evaluate the sensory attributes (appearance, texture, taste, aroma, and overall acceptability) of the developed brownies. Sweet potato flour paste was made and incorporated into brownie formulations at replacement levels of 25%, 50%, 75%, 100% and with a control 100% wheat flour. Standard AOAC (2019) methods were used to evaluate the proximate composition moisture (11.03 ± 0.21), ash (2.89 ± 0), protein (8.00 ± 0.24), fat (12.0 ± 0.30), and fiber (2.50 ± 0.05), total sugar (28000 ± 420), antioxidant activity ($26,500 \pm 580$) and mineral content (Na 120.43 ± 4.21), K (450.22 ± 12.88), Ca (40.11 ± 1.95) of the mixed brownies. The sensory evaluation was conducted using 20 semi-trained panellists. The results showed that there was a significant difference between treatments for brownie flavour, colour, texture, hardness, and overall acceptability at the 5% significance level. Research findings indicate that brownies with 100% replacement of wheat flour by sweet potato paste obtained higher scores in organoleptic evaluation compared to the control. The results of nutritional and organoleptic properties were statistically analyzed using ANOVA, and means were compared using Tukey's test at $p < 0.05$. In the sensory evaluation of brownies made from 100% sweet potato paste, the highest priorities were colour (6.10 ± 0.28), flavour (6.10 ± 0.27), texture (6.00 ± 0.29), taste (6.05 ± 0.26), hardness (6.00 ± 0.30), and overall acceptability (6.05 ± 0.28). Nutritional analysis revealed that the 100% replacement sample contained high ash (2.89 ± 0), fiber (2.50 ± 0.05), total sugar ($28,000 \pm 420$ mg/100 g), and antioxidant activity ($26,500 \pm 0.580$), high moisture (24.00 ± 0.37), and low protein (4.50 ± 0.20) and low fat (9.50 ± 0.27) compared to the control. Based on health benefits, Brownies with 100% sweet potato paste gave the best results.

Keywords: Hedonic scale, Organoleptic evaluation, Sweet potato paste

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COMPARATIVE STUDIES OF RAW AND PROCESSED SRI LANKAN SPICES IN SELECTED GLOBAL MARKETS

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Abstract

Despite Sri Lanka's established reputation as a producer of high-quality spices, export earnings continue to be dominated by raw products, resulting in limited value realization in global markets. Improving export competitiveness depends increasingly on value addition through processing rather than expansion of production volumes. This study examines the comparative analysis of raw and processed Sri Lankan spices in selected global markets and evaluates constraints affecting market access for value-added products. An exploratory and analytical research approach was adopted using secondary trade data obtained from Sri Lanka Customs, the Department of Export Agriculture, and ITC Trade Map, supported by primary data collected through structured questionnaires administered to fourteen leading spice export companies in Sri Lanka. Export trends were analyzed using Harmonized System (HS) code classifications, compound annual growth rates, market share indicators, and unrealized export potential measures. Regulatory and food safety requirements relevant to major importing regions, including Europe, the United States, Australia, China, India, and Gulf Cooperation Council countries, were also examined. The results show that raw spice exports account for a substantially larger share of export volumes across most spice categories, while processed and semi-processed products demonstrate stronger growth dynamics. Pepper, mace, and vanilla recorded compound annual growth rates of 12.59%, 7.36%, and 33.18%, respectively, whereas cinnamon exhibited stable growth at 3.63%. Sri Lanka accounted for approximately 18% of Australia's cinnamon imports and 28% of India's pepper imports during the study period. However, products such as fresh cinnamon (*Cinnamomum zeylanicum* Blume) and non-crushed pepper remain underrepresented in premium markets due to microbiological contamination risks, mycotoxin limits, and stringent certification and labelling requirements. The findings indicate that strengthening processing capacity, improving compliance with food safety standards, and aligning value-added spice processing with market-specific regulatory requirements are essential for enhancing export competitiveness while maximizing returns from existing agricultural outputs.

Keywords: Export competitiveness, Food safety standards, Spice processing, Sri Lankan spices, Value addition

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**PRODUCTION AND QUALITY EVALUATION OF YOGURT
ENRICHED WITH BLUE BUTTERFLY PEA FLOWER (*Clitoria ternate* L.)**

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Abstract

The blue butterfly pea (*Clitoria ternate* L.) is a source of anthocyanins and serves as a potential natural blue colourant. Production of blue butterfly pea flower (BBPF) enriched yoghurt enhances both the functional and aesthetic properties of the yoghurt, imparting a distinctive natural blue colouration. The study was conducted by incorporating extracts of butterfly pea by the fermentation process using *Lactobacillus bulgaricus* and *Streptococcus thermophiles* by following the standard method of yoghurt production. The research design applied a Completely Randomized design. This present study was conducted with five treatments with the addition of BBPF extracts as: 5%, 10%, 15%, 20% (w/w) and the control sample without blue BBPF for comparison. The developed yoghurt samples were analyzed for physicochemical and sensory properties during refrigerated storage at 4 °C. The physicochemical parameters, such as (ash, dry matter, moisture, fat, titratable acidity, pH) and sensory characteristics as (colour, taste, smell, texture, appearance and overall acceptability) were also analyzed at day 1, week 1, week 2, week 3 and week 4 of storage. Organoleptic properties were evaluated through a panel of 20 members using a 5-point hedonic test. The results of this study revealed that ash ($0.85\pm 0.07\%$), moisture ($83.03\pm 0.40\%$), fat ($3.60\pm 0.11\%$) and pH (6.41 ± 0.1) were significantly ($p<0.05$) higher in yoghurt with 5% (w/w) BBPF mixture compared to other treatments. During storage, ash and fat contents were increased significantly ($p<0.05$), whereas the pH value was significantly ($p<0.05$) decreased while the titratable acidity was increased with the storage period. Based on the evaluation of organoleptic characteristics, the yoghurt sample incorporated with 5% (w/w) BBPF extract obtained the highest mean score for overall quality among all the sensory attributes tested. Hence, the addition of 5% (w/w) BBPF extract is recommended to improve both sensory and nutritional properties of yoghurt.

Keywords: Blue butterfly pea flower, Physicochemical characteristic, Sensory characteristic, Storage, Yoghurt

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EFFECT OF VARIOUS COAGULANT - COAGULATION TEMPERATURE INTERACTIONS ON THE QUALITY OF PANEER

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Abstract

This study was conducted to identify the most effective coagulation method and temperature for producing high-quality paneer with improved nutritional value, texture, safety, and consumer acceptability by evaluating the effects of three coagulants (citric acid, lime juice, and vinegar) and three coagulation temperatures (65°C, 70°C and 75°C) on the physicochemical and sensory attributes of paneer prepared from buffalo milk, in which nine treatments (T₁-T₉) were formulated and analyzed. Physicochemical parameters (ash, dry matter, moisture, protein, fat, titratable acidity, pH, and texture), and sensory characteristics (colour, taste, smell, texture, appearance, and overall acceptability) were analyzed on day 1, week 1, 2, 3, and 4 of refrigerated storage. Organoleptic evaluation was carried out by a panel of 30 members using a 7-point hedonic scale. Paneer prepared with citric acid consistently showed superior nutritional characteristics, including higher protein, fat, and ash contents, compared to lime juice and vinegar. Higher coagulation temperatures enhanced protein aggregation, resulting in lower moisture content and a firmer, compact structure. During storage, all samples exhibited gradual increases in protein, fat, and ash contents due to moisture loss, while pH values declined slightly due to mild post-acidification. On day 1, citric acid at 75°C produced the lowest pH (5.64±0.04), whereas vinegar at 65°C showed the highest (6.03±0.06). Moisture content ranged from 41.32 ± 0.02% in lime at 65°C to 34.4 ± 0.05% in citric acid at 75°C. Texture hardness increased from 5.50 N in lime at 65°C to 12.12 N in citric acid at 75 °C. Yield was highest in vinegar at 75°C (179.63±0.76g) followed by citric acid at 70°C (177.62 ± 0.22g), indicating interactions between coagulant type and temperature. Overall, citric acid at 75°C was identified as the most effective treatment for producing nutritionally rich, firm, safe, and sensory-preferred paneer with improved shelf stability.

Key words: Coagulants, Coagulation temperature, Nutritional characteristics, Sensory quality, Storage

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DEVELOPMENT AND QUALITY ASSESSMENT OF VANILLA ICE CREAM INCORPORATED WITH PUMPKIN (*Cucurbita maxima*) SEED POWDER

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Abstract

This study was carried out to formulate and assess vanilla ice cream enriched with pumpkin seed powder. Pumpkin seed powder has anticancer properties and offers protection against cardiovascular diseases. Four different formulations of ice cream containing 0%, 2%, 4%, and 6% pumpkin seed powder were made. These were then stored in a deep freezer and kept at -18° C for four weeks. The ice cream product was then evaluated weekly for its moisture content, total solids content, fat content, protein content, pH, titratable acidity, taste, flavour, colour, texture, and overall acceptability. The moisture content of the ice cream samples decreased over time in all formulations. In contrast, there was a significant increase in total solids content, fat content, and titratable acidity. The formulation containing 6% pumpkin seed powder showed maximum improvement in nutritional content. Its fat content increased to 10.54%, protein content recording 11.82% in one week and remained constant at 11.16% till the end of storage. This compares with 2.92% protein content in the control sample. Its total solids content then increased to 39.21%. Moreover, the values of the pH levels were noted to be higher for the pumpkin seed powder–fortified samples, as the values increased with the treatments from 5.21 for the control to 6.72 for the 6% pumpkin seed powder–fortified treatment. Sensory evaluation of the product showed that although the 6% pumpkin seed powder–fortified product was noted as the most acceptable initially in terms of flavor and product color, the 4% pumpkin seed powder–fortified product was noted as the most acceptable with regards to texture, flavor, and acceptability over the entire storage period, with the greatest deterioration noted for the control sample. Therefore, the use of pumpkin seed powder in the formulation of the frozen dairy product is seen to improve the nutraceutical value of the product.

Keywords: Anticancer potential, Cardiovascular health, Functional ice cream, Pumpkin seed powder, Storage stability

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EXTRACTION & CHARACTERIZATION OF CHITOSAN FROM BLUE SWIMMING CRAB (*Portunus pelagicus*) CARAPACE FROM THE NORTHERN COSTAL OF SRI LANKA

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Abstract

Chitosan extraction represents an effective waste-valorization strategy that converts crustacean shell biomass into a biodegradable and non-toxic biopolymer with desirable solubility and film-forming properties. Blue swimming crab (*Portunus pelagicus*) shells, which are abundantly discarded along the northern coast of Sri Lanka, are rich in chitin and therefore constitute a promising raw material for biopolymer production. This study aimed to extract and characterize chitosan from *P. pelagicus* shell waste using an optimized sequential chemical extraction process. The extraction protocol involved four main steps: deproteinization using 4% NaOH at 90°C, demineralization with 2.5% HCl at 27°C, acetone-assisted decolorization, and controlled drying at 60°C to obtain purified chitin. The resulting chitin was subsequently subjected to alkaline deacetylation with 50% NaOH at 105°C to produce chitosan. Fourier Transform Infrared (FTIR) spectroscopy confirmed the formation of characteristic chitosan functional groups, with prominent absorption peaks at 3457.78 cm⁻¹, 1550.75 cm⁻¹, and 1643.42 cm⁻¹. The degree of deacetylation was approximately 83.8%, indicating efficient conversion of chitin to chitosan. The extracted chitosan exhibited a solubility of 80.15% in 1% food-grade acetic acid, demonstrating strong film-forming potential. In addition, a whiteness index of 74.85%, comparable to that of commercial chitosan, further confirmed the high quality of the final product. The extraction process yielded 43.50 g of chitin (21.75%), which was converted into 28.77 g of chitosan, corresponding to a conversion efficiency of 66.12%. Overall, this study presents a simple, low-cost, and scalable approach for producing high-quality chitosan from blue swimming crab carapace, highlighting its potential for sustainable resource utilization and industrial applications in Sri Lanka.

Keywords: Biopolymer, Chitosan, FTIR, *Portunus pelagicus*, Solubility, Waste-valorization

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DEVELOPMENT AND EVALUATION OF EDIBLE FILM FROM BANANA PEEL AND CASSAVA STARCHES INCORPORATED WITH MORINGA LEAF POWDER FOR PANEER PRESERVATION

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Abstract

The development of biodegradable packaging has gained increasing importance due to the environmental concerns associated with synthetic plastics. The present study aimed to develop and evaluate the effectiveness of edible film coating in extending the shelf life and sensory quality of paneer during refrigerated storage at $4 \pm 1^\circ\text{C}$. The edible film was prepared by combining banana peel starch and cassava starch with distilled water and glycerol. Two formulations were prepared: T1 {banana peel starch (50%) + cassava starch (50%) + Glycerol (1%) + Distilled water (100 ml)} and T2 {banana peel starch (60%) + cassava starch (40%) + Glycerol (1%) + Moringa leaf extract with distilled water (100ml)}. The films were characterized for thickness, moisture content, water solubility, and pH. Results showed increased thickness and reduced moisture content in moringa-incorporated film (T2) compared to T1 film. Paneer samples coated with T1 and T2 films, along with an uncoated control, were stored at $4 \pm 1^\circ\text{C}$ and evaluated for physicochemical parameters and sensory attributes. During storage, coated samples showed significantly lower moisture loss (41.62% to 40.43%) and slower pH decline (5.86 to 5.68) compared to the control, with T2 indicating superior stability. Titratable acidity increased (0.29 to 0.60) across all samples; however, the coated paneer samples exhibited a markedly slower rise in acidity compared to the control. Sensory evaluation indicated that T2 maintained higher scores for appearance, texture, colour, and overall acceptability up to 10 days, whereas the control became unacceptable by day 10. The incorporation of moringa leaf powder enhanced both the functional properties of the film and the preservation quality of paneer. Overall, moringa-incorporated edible films indicated potential as a natural, biodegradable packaging material for extending the shelf life and improving the quality of paneer.

Keywords: Banana peel starch, Cassava starch, Edible film, Moringa Leaf powder, Paneer preservation

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DEVELOPMENT OF MICROGEL-BASED FAT REPLACERS FROM CHICKPEA AND BLACK GRAM PROTEINS: EXTRACTION, FORMULATION AND FUNCTIONAL ANALYSIS

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Abstract

The development of effective fat replacers is essential due to the growing demand for healthier food alternatives. This demand has increased interest in plant-derived ingredients that mimic the sensory and functional properties of fats, enabling the reduction of dietary fat intake. Protein-based microgels represent a promising strategy due to their ability to mimic the structural and interfacial roles of fat. This study investigated the production and functional performance of protein microgels derived from locally available chickpea (*Cicer arietinum*) and black gram (*Vigna mungo*) as potential plant-based fat replacers. Protein isolates were extracted using alkaline solubilization followed by isoelectric precipitation. The microgels were prepared through thermal gelation and mechanical homogenization. Both protein sources yielded high extraction efficiencies, with protein recovery exceeding 85%. The resulting microgels exhibited high moisture contents (76.5–79.7%) and negligible detectable fat, confirming their suitability for low-fat applications. Black gram microgels contained significantly higher protein (22.8%) than chickpea microgels (19.8%), while ash contents ranged from 0.51–0.66%. Functional evaluation revealed that black gram microgels exhibited a superior emulsifying activity index (50.1%) compared to chickpea microgels (30.4%), indicating a stronger interfacial adsorption capacity. In contrast, chickpea microgels demonstrated higher emulsion stability, maintaining values above 84% after 60 minutes, compared to 80.6% for black gram microgels. Water holding capacity was high for both microgels, measuring 8.3 g/g for black gram and 7.6g/g for chickpea, while oil holding capacity reached 5.8 g/g and 4.6 g/g, respectively. Protein solubility differed significantly between the samples, with chickpea microgels exhibiting higher solubility (54.2%) than black gram microgels (46.9%). These results revealed that chickpea and black gram proteins can be successfully structured into multifunctional microgels with strong hydration, emulsification, and lipid-binding properties, supporting their potential application as sustainable, clean-label fat replacers in reduced-fat food systems.

Keywords: Black gram, Chickpea, Fat replacer, Functional property, Microgel

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INFLUENCE OF INCORPORATING WHITE OYSTER MUSHROOM (*Pleurotus ostreatus*) POWDER ON THE QUALITY OF YOGHURT DURING STORAGE

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Abstract

Mushrooms are rich in proteins, vitamins and minerals and are popularly called as the vegetarian meat. Due to the therapeutic value of mushrooms, it is also considered as a functional food with the property of disease prevention in humans. Therefore, this present study was conducted to develop a nutritionally-enriched yoghurt through fortification with oyster mushroom (*Pleurotus ostreatus*) powder and to evaluate its physico-chemical, sensory and storage characteristics. Yoghurt samples were prepared using a CRD with five treatments containing different levels of dried mushroom powder (0.0, 0.1, 0.2, 0.3, and 0.4 g per 80 mL of cow's milk). Milk was pasteurized, fortified with mushroom powder, inoculated with starter culture, incubated (42-43°C) until coagulation, and stored under refrigerated conditions at 4°C. The prepared yoghurt samples were analyzed for pH, total soluble solids, protein, fat and moisture content using standard AOAC analytical methods. Sensory evaluation was conducted using a seven-point hedonic scale to assess colour, taste, texture, aroma, and overall acceptability. A four-week storage study at 4°C was performed to assess product stability and shelf life. The results showed that increasing levels of mushroom powder from 0 to 0.4%, slightly reduced pH from 4.62 to 4.45 while increasing total soluble solids from 16.1 to 16.7° Brix and protein content from 3.48 to 3.75%. Fat and moisture contents were not significantly changed by mushroom powder supplementation. Among the treatments, yoghurt fortified with 0.2 g mushroom powder exhibited the highest protein content and achieved the best sensory acceptability scores, indicating an optimal balance between nutritional enhancement and consumer preference. Higher incorporation levels resulted in reduced sensory acceptance due to stronger mushroom flavour and a darker appearance. Overall, the findings demonstrate that oyster mushroom powder can be effectively incorporated into yoghurt to produce a value-added functional dairy product with improved nutritional quality and acceptable sensory properties.

Keywords: Functional foods, Mushroom-enriched yoghurt, Protein fortification, Sensory quality

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WEIGHT STATUS OF ADOLESCENTS IN JAFFNA DISTRICT BASED ON BMI-FOR-AGE Z-SCORES

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Abstract

Adolescence is a developmental stage that bridges childhood and adulthood. This period is marked by significant biological, psychological and social transformations. Early detection of malnutrition during adolescence period is crucial for preventing long-term health problems. BMI for Age Z scores (BAZ) recommended by the World Health Organization (WHO) provide an age and sex specific measure for evaluating adolescent weight status. This study was aimed at evaluating the weight status of adolescents (17-19 years) from Jaffna District using BAZ. The ethical approval for the study was obtained from the ethics review committee, Faculty of Medicine, University of Jaffna. A community-based cross-sectional study was conducted among 864 adolescents aged from 17 to 19 years old in Jaffna district. An interviewer-administered questionnaire was used to find the socio-demographic information of the participants during household visits. Weight and height were measured using standardized procedures. BAZ values were calculated using WHO growth reference standards in the WHO Anthroplus software. Weight status was classified as severe thinness (< -3 SD), thinness (-3 SD to < -2 SD), normal nutritional status (-2 SD to $+1$ SD), overweight ($> +1$ SD to $+2$ SD) and obesity ($> +2$ SD). Mean age of the males ($n=420$) and females ($n=444$) were 18.01 (± 0.04) and 18.07 (± 0.04) years respectively. Based on BAZ, most adolescents had normal weight (81.5%, $n = 704$). However, 2.4% ($n=21$) of adolescents were severely thin and 8.8% ($n=76$) were thin. Overweight and obesity were observed in 5.2% ($n=45$) and 2.1% ($n=18$) of adolescents, respectively. Chi-square analysis showed no statistically significant association between gender and BAZ ($p = 0.445$). BAZ scores revealed a double burden of malnutrition and its use in strengthening adolescent nutritional screening and guide targeted public health interventions.

Keywords: Adolescents, BAZ, BMI, Jaffna, Nutritional status

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**AN ASSESSMENT OF DRIVERS AND BARRIERS TO ADOPTING
PLANT-BASED PROTEINS OVER MEAT AMONG
UNDERGRADUATES AT EASTERN UNIVERSITY, SRI LANKA**

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Abstract

Rising sustainability concerns within global food systems have intensified attention toward reducing meat consumption and promoting alternative dietary choices. This study investigates the drivers and limiting factors shaping the transition from meat consumption to plant-based protein alternatives among undergraduates at Eastern University, Sri Lanka. A quantitative cross-sectional survey was conducted among 200 students selected through convenience sampling. Data were collected using a structured online questionnaire and analyzed using SPSS Version 26.0. Descriptive statistics summarized demographics, dietary habits, and awareness, while Pearson's correlation assessed associations between motivations, barriers, and dietary behaviours. Results revealed that 94.5% of students regularly consume meat despite basic awareness of plant-based proteins. Health considerations encouraged 37.5% of students to reduce meat intake, while environmental concern and social influence also motivated interest. However, major barriers persisted: 51.0% preferred the taste of meat, 35% reported cultural expectations, and 34.5% expressed concerns about protein sufficiency. Limited availability, higher cost, and lack of cooking knowledge further restricted adoption. Socio-demographic influences were evident, with income levels and faculty of study showing variation in consumption patterns. Pearson's correlation analysis revealed significant relationships: a negative correlation between affordability and plant-based protein consumption ($r = -0.233$, $p < 0.01$) indicated that higher costs hinder regular intake, while cultural norms also showed a negative correlation ($r = -0.190$, $p < 0.01$), suggesting stronger cultural resistance among students with meat-dominant diets. Overall, findings highlight a clear gap between awareness and behavior, underscoring the need for improved accessibility, affordability, and education to support healthier, more sustainable food choices among university students.

Keywords: Awareness, Barriers, Meat reduction, Plant-based proteins, Sustainability,

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LIVESTOCK, FISHERIES & AQUACULTURE

**THE EFFECT OF SUPPLEMENTING A POLYPHENOL-RICH
SUGARCANE EXTRACT THROUGH DRINKING WATER ON THE
PERFORMANCE OF COMMERCIAL LAYERS AGED BETWEEN 14 TO
23 WEEKS**

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Abstract

Polyphenols are a diverse group of naturally occurring compounds found in plants and recognized for their potential to protect living cells. The objective was to evaluate the effect of Polyphenol-rich sugarcane extract (PRSE) through drinking water on the production performance of commercial layers aged 14 to 23 weeks. A total of 48 H and N White hens, aged from 14 weeks, were randomly allocated to 8 litter-floor pens in an open-sided poultry house. The pens were divided into two treatment groups: one receiving 0% of PRSE (control) and the other group receiving 0.05% PRSE in drinking water throughout the study period. The treatments were prepared by adding PRSE manually into the drinking water daily, and water was given *ad libitum*. Birds were given commercial layer feed in crumble form from week 14 to 18 weeks and in pellet form from 18 to 23 weeks. The number of eggs produced, feed intake, water intake, and mortality were recorded daily. Body weights and body weight uniformity were calculated biweekly at 15 and 23 weeks of age. Supplementation of 0.05 % polyphenol-rich sugarcane extract (PRSE) in the drinking water of laying hens showed a significant improvement in egg weight ($p=0.04$) and egg mass ($p=0.05$) at week 23. Although there was a slight indication of significance in hen-day egg production and feed conversion ratio during week 23 ($p=0.06$). The supplementation of 0.05% PRSE in drinking water did not lead to a significant impact on body weight uniformity, feed intake, and water intake throughout the study period. In conclusion, 0.05% PRSE supplementation showed a significant improvement in layer hen performance, and the potential benefits of polyphenols in poultry nutrition.

Keywords: Laying hens, Polyphenols, Poultry nutrition, Production performance, Sugarcane extract

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EFFECT OF GINGER-GARLIC POWDER SUPPLEMENTATION ON GROWTH PERFORMANCE OF NILE TILAPIA (*Oreochromis niloticus*) FRY

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Abstract

A well-balanced diet, which is prepared with multiple ingredients, is essential for intensive Nile tilapia farming. Among those several ingredients, the use of feed additives helps to improve the physiological and dynamic functions of fish. This study investigated the effect of dietary supplementation of ginger-garlic powder on growth performance, survival, and feed efficiency of Nile tilapia fry. A feeding trial was conducted for 35 days with a control and four experimental diets, supplemented with ginger-garlic powder mixture at 1%, 1.5%, 2% and 2.5% of ingredients. Two-day-old Nile tilapia fry were purchased from the Sewanapitiya Fish Breeding Centre and acclimatized for four weeks. A total of 150 fry were randomly allocated to 15 aquaria (30 L each) in a completely randomized design, with a stocking density of ten fry per tank. Water pH, temperature and dissolved oxygen levels were monitored. Fry were fed to satiation twice per day. Results indicated significant differences ($p < 0.05$) in weight gain, length gain and specific growth rate. Fish fed 2% inclusion level showed higher ($p < 0.05$) weight gain ($198.4 \pm 6.5\%$), length gain ($51.8 \pm 1.6\%$) and specific growth rate ($3.12 \pm 0.06\% \text{ day}^{-1}$) than the control group. However, the survival ($26.7 \pm 3.3\%$) was lower ($p < 0.05$) at 2% supplementation level. Daily feed intake ($3.0 - 4.5\% \text{ BW d}^{-1}$) and feed conversion ratio ($1.5 - 1.8$) were within the allowable range. Fish fed 2.5% ginger-garlic powder showed no significant difference ($p > 0.05$) in growth performance compared to 2%, but the survival ($70 \pm 10\%$) was higher ($P < 0.05$) than 2%. Therefore, this study suggested that 2.5% dietary ginger-garlic powder is the most suitable for enhancing the growth and survival of Nile tilapia fry. Further studies are recommended to evaluate the effects of 2.0 to 2.5% ginger-garlic inclusion levels on the growth performance of Nile tilapia fry.

Keywords: Dietary inclusion, Feed utilization, Specific growth rate, Survival rate, Weight gain

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**MORPHOLOGICAL CHARACTERISTICS AND NUTRIENT
COMPOSITION OF TWO EDIBLE CLAM SPECIES IN RALKULI,
TRINCOMALEE**

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Abstract

The economic and nutritional importance of clams increases attention on their role as a high-quality food source. The aim of this study was to analyze the morphological, biometric and nutrient characteristics of two economically important edible clam species, *Marcia opima* and *Geloina coaxans* from Ralkuli, Trincomalee, Sri Lanka. A total of 60 *M. opima* and 55 *G. coaxans* were randomly collected from Ralkuli during August 2025 and brought to the laboratory to analyze morphometric, biometric traits, and nutrient profiles. The results showed significant interspecific differences ($p < 0.05$) between the two species. Morphological analysis revealed that the shell of *G. coaxans* was 24% taller ($p < 0.05$), and 12% longer ($p < 0.05$) than that of *M. opima*. The edible tissue of *G. coaxans* was 83% more ($p < 0.05$) than that of *M. opima* (5.3 ± 1.1 g), despite both species having similar ($p > 0.05$) total body weights (52.6 ± 2.2 g). Conversely, *M. opima* possessed 40% heavier ($p < 0.05$) shell weight, indicating a different biomass allocation strategy. Proximate composition significantly varied ($p < 0.05$) across anatomical parts. The gills of *G. coaxans* had 62% more ($p < 0.05$) crude protein ($43.43 \pm 3.72\%$) than those of *M. opima*. In terms of lipid content, the visceral mass of *M. opima* contained 378% more ($p < 0.05$) fat ($14.76 \pm 1.25\%$) than *G. coaxans*. Ash content was 37% higher ($p < 0.05$) in the gills of *G. coaxans* than *M. opima*. These findings suggested that *G. coaxans* was comparatively a bulk edible clam and a rich source of protein, whereas *M. opima* was a rich source of lipids. These findings provide crucial information for sustainable harvesting and targeted utilization by the aquaculture and food industries.

Keywords: Aquaculture, Biometric traits, *Geloina coaxans*, *Marcia opima*, Proximate profile

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SHRIMP FARMING AND SOCIO-ECONOMIC STATUS OF SHRIMP FARMERS IN BATTICALOA DISTRICT OF SRI LANKA

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Abstract

Litopenaeus vannamei (shrimp) plays a vital role in the socio-economic development of Sri Lanka. This research study focuses on shrimp farming practices and the socio-economic status of shrimp farmers in the Batticaloa District of Sri Lanka. The main objectives were to analyze the farming practices adopted by shrimp farmers, understand their social and economic conditions, and identify the major problems they face in shrimp culture. Data were collected from 40 shrimp farmers through personal interviews and structured questionnaires. The data were analyzed by using SPSS software and socio-economic status was described by percentage and frequencies. The study revealed that all shrimp farmers were male, with the majority (72.5%) belonging to the middle-aged group between 36 and 55 years. The majority of farmers (77.5%) had primary-level education, and 65% of the farmers operated medium-sized farms ranging from 1 to 2 hectares. The farmers mainly practiced *Litopenaeus vannamei* culture, using lagoon water sources such as Batticaloa and Valaichenai lagoons. All farmers followed similar management practices, including pond preparation, seed stocking, regular feeding, and water quality management. Shrimp were cultured for a period of 60 to 90 days, with two harvests per year. Shrimp farming served as an important source of income (Rs. 900,000 ± 234,780 per year) and contributed to improving the living standards of farmers and their families. Despite these benefits, several constraints were identified. All farmers (100%) faced unavailability of quality seed at the required time, absence of hatcheries within the district, seed mortality during transportation, 85% of the farmers faced a lack of insurance facility for shrimp culture, and 82.5% of farmers faced flooding. The study suggests that establishing local hatcheries, providing subsidies for feed and electricity, and conducting regular training programs could help improve productivity and profitability. In addition, support from government and private organizations through financial assistance, insurance schemes, and awareness programs is essential. Addressing these challenges would enhance the sustainability of shrimp farming and strengthen rural livelihoods in the Batticaloa District.

Keywords: Aquaculture, *Litopenaeus vannamei*, Shrimp farming, Socio-economic status

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EFFECT OF TAMARIND LEAF MEAL ON COLORATION AND STRESS RESISTANCE IN GUPPY (*Poecilia reticulata*)

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Abstract

Successful intensive guppy farming depends on a nutritionally balanced diet consisting of the essential nutrients, supplemented with carotenoid-rich ingredients. Such diets facilitate the physiological functions, coloration, and stress resistance in fish. This study investigated the impact of dietary tamarind leaf meal (TLM) supplementation on the growth performance, coloration, feed efficiency, and stress tolerance of the red-blond guppy (*Poecilia reticulata*). A 35-day feeding trial was conducted with five diets: a control (T0, 0% TLM) and four experimental diets replacing soybean meal with TLM at 0.8% (T1), 1.0% (T2), 1.2% (T3), and 1.4% (T4). Thirty-day-old male guppy fry (0.30 ± 0.01 g) were purchased from Serendib Aqua in Ja-Ela and acclimatized for two weeks. The fish were randomly allocated to 15 aquaria (20 L each) in a completely randomized design with three replicates at the rate of eight fish per tank. Water quality was monitored daily (temperature 26.6-26.8 °C, pH 7.1-7.2, DO 4.1-5.1 mg/L). Fish were fed to satiation twice daily. Results showed no significant differences ($p > 0.05$) in weight gain (24.2-43.8%), specific growth rate (0.62 - 1.04 day⁻¹), and length gain (9.6-14.9%) across the treatments. However, daily feed intake was significantly higher ($p < 0.05$) in T3 (2.27 % BW d⁻¹) and T4 (2.29 % BW d⁻¹) than in the control. Feed conversion ratio (2.2 to 3.5) and the survival (>75%) were within the acceptable ranges. Colouration significantly improved ($p < 0.05$) at T3 and T4, with higher redness and yellowness due to TLM's carotenoids like β -carotene. Stress resistance under 30 ppt salinity showed no significant difference ($p > 0.05$). In conclusion, this study suggests that a 1.4% dietary TLM is optimal for enhancing guppy colouration without compromising growth and survival. Further studies are recommended to evaluate the effects of 1.2-1.4% TLM inclusion levels on long-term performance.

Keywords: Aquaculture, Feed supplementation, Natural pigments, Red-blond guppy, Salinity tolerance

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**FERMENTED RICE WATER AS A NATURAL PROBIOTIC FOR GROWTH
ENHANCEMENT IN GOLDEN TUXIDO GUPPY (*Poecilia reticulata*)**

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ABSTRACT

Fish feed additives play a vital role in enhancing growth performance, health, and colouration in ornamental fish species, among which probiotics have gained widespread acceptance; however, commercial probiotics are often expensive and limit their adoption by small-scale producers. Therefore, this study evaluated the effect of fermented rice water (FRW) with an average total bacterial count of 1×10^8 CFU/ml as a natural, low-cost probiotic on growth performance, feed utilization, survival, and colouration of Golden Tuxedo guppy (*Poecilia reticulata*). A 35-day feeding trial was conducted using five dietary treatments, in which feed was supplemented with FRW at 0%, 25%, 50%, 75%, and 100% levels. The percentages represent the proportion of feed sprayed with FRW at a rate of 0.1 ml/g feed and followed by air-drying at room temperature for 24 h. Twenty-eight-day-old guppy juveniles were randomly stocked in fifteen tanks (15 L) under a completely randomized design. Growth parameters, feed conversion ratio, survival rate, and body colouration were evaluated at weekly intervals for five weeks. Results indicated that there were no significant differences ($p > 0.05$) in water quality parameters among the treated groups throughout the experimental period. Fish fed 50% FRW level showed higher ($p < 0.05$) weight gain (54.3 ± 7.93 %), specific growth rate (2.38 ± 0.08 % d^{-1}) and body length gain (25.6 ± 0.0 %) than the control group. The survival (93.3 ± 6.7 %) was higher ($p < 0.05$) at the 50% FRW supplementation level. Daily feed intake (3.4 ± 0.1 % BW d^{-1}) and feed conversion ratio (2.9 ± 0.4) were within the acceptable range. Fish fed 0% FRW showed no significant difference ($p > 0.05$) in growth performance and survival compared to those fed 50% FRW. Furthermore, body colour analysis demonstrated increased ($p < 0.05$) lightness in fish fed 50% FRW than those fed other levels of FRW. In conclusion, a 50% FRW sprayed diet could be a cost-effective natural probiotic to enhance growth and colouration in Golden Tuxedo guppies. Further studies are recommended to evaluate long-term effects and optimize inclusion levels for commercial ornamental fish production.

Keywords: Feed efficiency, Fermented feed additive, Microbial supplementation, Ornamental livebearer, Survival

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CHARACTERISTICS AND FACTORS INFLUENCING REPRODUCTIVE EFFICIENCY OF DAIRY CATTLE IN THE JAFFNA DISTRICT OF SRI LANKA

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Abstract

The purpose of this study was to explore the key factors affecting the reproductive efficiency of cattle, including conception rate and breeding methods. It also seeks to understand some basic aspects of cattle management in the Jaffna district of Sri Lanka. Out of the fourteen veterinary divisions, five veterinary divisions, viz. Nallur, Chavakachcheri, Vaddukoddai, Point Pedro, and Kopay were selected for the study, where AI was performed at a higher rate than the rest of the divisions. Data was collected through primary and secondary sources using questionnaires, personal interviews, and veterinary records. Results revealed that majority of the dairy farmers were males, middle aged with primary education level. Major sources of animals were bred on the farm or other sources such as neighbours and private farms. Cattle were mainly managed under an extensive system of management. Predominantly men managed the herds. The majority of farmers (90%) possessed Jersey, Jersey crosses and indigenous cattle. Age at first calving of most of the breeds relied within the optimum range of 2 to 2.5 years except Sahiwal which had the longest age at first calving. Indigenous cattle recorded the lowest milk yield. Except indigenous cattle all other breeds recorded longer calving interval than the optimum calving interval of 12 to 13 months. Higher conception rates were observed in cows aged 2–2.5 years across all veterinary divisions. Most of the farmers mentioned no seasonal differences pertaining to conception rate. Conception rate was high when inseminations were carried out during morning or afternoon hours. Demographic factors like gender, age, education level and family size influenced the number of animals served and breeding methods. It could be concluded that the reproductive performance is not up to the standard in the study area. There are factors which influence reproductive performance, conception rate, number of animals served and breeding methods. Action should be taken to improve the reproductive efficiency which will enhance the productive performance of cattle.

Keywords: Age at first calving, Artificial insemination, Calving interval, Conception rate.

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SOIL, WATER & ENVIRONMENT

EFFECT OF LIQUID BIOFERTILIZER PRODUCED FROM SLAUGHTERHOUSE BYPRODUCTS ON THE SOIL PROPERTIES AND PRODUCTION OF AMARANTHUS IN SANDY REGOSOLS

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Abstract

Cattle blood and paunch manure from slaughterhouses are economically, socially, and environmentally beneficial when they are transformed into liquid biofertilizer (LBF). A pot experiment was conducted from July to October 2025 to investigate the effect of LBF from slaughterhouse byproducts on soil properties and the production of Amaranthus in sandy regosol soils of the Batticaloa district, Sri Lanka. The study addressed the challenges of low nutrient retention, particularly nitrogen, in sandy soils, as well as the environmental hazards associated with excessive inorganic fertilizer use. The experiment was conducted using a completely randomized design with four treatments (T1, T2, T3, T4): 100% recommended chemical fertilizer (T1), 100% LBF (T2), nitrogen and phosphorus from LBF with balanced potassium from inorganic fertilizer (T3), and nitrogen from LBF with balanced phosphorus and potassium from inorganic fertilizer (T4) with four replicates (R1, R2, R3, R4). LBF was applied from the third leaf appeared and continued at two-week intervals as a soil application. Soil physical and biological properties, along with plant growth and yield parameters, were assessed. Data were analyzed using analysis of variance (ANOVA), and treatment means were compared using Tukey's Test at the 5% significant level. Results showed that LBF treatment (T2) significantly enhanced Bulk density, Porosity, and soil biomass carbon ($p < 0.05$). T3 recorded the significantly highest soil biomass carbon. T2 and T4 showed medium values, while T1 had the lowest. The treatment T2 recorded the significantly highest yield (12.27 ± 0.12 g/plant) followed by T1 (10.60 ± 0.40 g/plant) and T4 (6.71 ± 0.29 g/plant), while the lowest yield was observed in T3 (2.61 ± 0.19 g/plant), outperforming LBF than other treatments, indicating its superiority in promoting sustainable and productive agricultural practices in sandy soils. The findings reveal that LBF produced from slaughterhouse waste could effectively substitute or reduce the application of chemical fertilizer in promoting sustainable agriculture in nutrient-poor sandy regosols.

Keywords: Amaranthus production, Liquid biofertilizer, Sandy regosol, Slaughterhouse waste disposal, Soil fertility, Sustainable agriculture

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PERCEIVED VERSUS OBSERVED WEATHER PATTERN CHANGES: INSIGHTS FROM FARMERS IN SOUTHERN SRI LANKA

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Abstract

Climate variability and climate change pose significant challenges to agriculture in Sri Lanka. This study examines farmers' perceptions of changing weather patterns and compares these perceptions with observed rainfall records from selected locations in southern Sri Lanka. A structured questionnaire survey was conducted with over 100 farmers in *Kamburupitiya, Matara, Akuressa, Sooriyawewa, Deniyaya*, and *Hambantota* to capture local experiences related to temperature rise, irregular rainfall, and associated agricultural impacts. Most respondents reported noticeable climatic changes in recent years, particularly irregular rainfall, prolonged dry spells, and increased temperatures. However, analysis of rainfall and temperature data from seven meteorological stations did not reveal statistically significant long-term trends. Instead, the data indicated increased interannual variability and more frequent extreme rainfall events, especially in inland areas. Coastal and low-elevation stations such as *Bundala* and *Hambantota* recorded lower annual rainfall with occasional peaks, while inland stations like *Deniyaya* and *Goluwawatta* experienced consistently higher precipitation due to orographic effects. A high proportion of farmers (97.1%) agreed that weather patterns have changed. The mean perception score (4.50) indicates a very high level of awareness. Rainfall unpredictability also showed strong agreement (mean > 4.0). However, opinions on whether changing planting schedules is effective were mixed (mean \approx 3.2), suggesting uncertainty about adaptation strategies. Chi-square tests confirmed that perceptions of climate variability were statistically significant ($p < 0.05$). Furthermore, shifts in seasonal rainfall peaks were observed at several stations, suggesting subtle changes in monsoonal behavior. This divergence between farmers' perceptions and observed data indicates that farmers' impressions are strongly influenced by short-term climatic variability and livelihood sensitivity than long-term climatic trends. These findings highlight the importance of integrating local perceptions with empirical climatic data to design effective adaptation strategies and strengthen climate-resilient agricultural policymaking in Sri Lanka.

Keywords: Agriculture, Farmers, Rainfall, Southern, Temperature, Weather patterns

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FROM TRADITIONAL MODELS TO MACHINE LEARNING: A REVIEW OF PREDICTIVE APPROACHES FOR MANGROVE ECOSYSTEM HEALTH MONITORING

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Abstract

Mangrove ecosystems provide critical ecological services but are increasingly exposed to climate change and anthropogenic stressors, requiring reliable methods for health monitoring and prediction. A systematic review of predictive modelling approaches utilized in mangrove ecosystem health assessment, synthesizing traditional frameworks, remote sensing-based methods, and emerging artificial intelligence (AI) techniques, including machine learning (ML) and deep learning (DL), is presented by this study. A PRISMA-based literature selection and thematic synthesis were employed to compare modeling strategies, data sources, monitoring parameters, strengths, and drawbacks across selected studies. A clear methodological evolution from framework-based and index-driven models to data-driven predictive approaches is revealed by this review. Strong interpretability and ecological grounding are provided by traditional models but are limited by scalability and their capacity to represent nonlinear dynamics. Remote sensing techniques provide affordable, extensive monitoring but often rely on proxy indicators that oversimplify functional ecosystem health. Improved predictive performance through nonlinear analysis and multi-source data integration is demonstrated by more recent ML and AI-based models; however, their application is constrained by high data requirements, limited transferability across regions, and reduced interpretability. Overall, the lack of integrated predictive frameworks capable of combining ecological understanding with scalable and explainable data-driven methods is emphasized by the findings. To support transparent and actionable decision-making for sustainable mangrove conservation and coastal management, future research ought to concentrate on hybrid modeling techniques, standardized datasets, explainable AI, and cross-ecosystem validation.

Keywords: Artificial intelligence, Ecosystem health, Mangroves, Predictive modeling, Remote sensing

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**UNDERSTANDING THE IMPACT OF DIFFERENT IRRIGATION
METHODS ON THE PERFORMANCE OF TOMATO
(*Solanum lycopersicum* L.) UNDER CONTROLLED CONDITIONS**

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Abstract

Tomato (*Solanum lycopersicum* L.) is highly sensitive to soil moisture fluctuations, particularly in sandy soils, where rapid infiltration and low water retention limit growth, yield, and water use efficiency (WUE). Despite the availability of multiple irrigation technologies, comparative evidence under sandy soil conditions is limited, creating uncertainty in selecting the most efficient method to optimize tomato productivity. This study evaluated the effects of hose pipe, gun sprinkler, and micro sprinkler irrigation on tomato growth, reproductive performance, yield, and WUE in the sandy soils of Palacholai, Batticaloa district, Sri Lanka. A Completely Randomized Design with four treatments (T1–Hose pipe, T2–Gun sprinkler, T3–Micro sprinkler, T4–Control; without irrigation scheduling) and four replications was used. Before irrigation, soil moisture characteristics, evapotranspiration, irrigation requirements, and uniformity coefficients were measured using gravimetric sampling and field observations. Growth parameters, reproductive traits, yield, and WUE were recorded and analyzed by ANOVA at $P < 0.05$. Gun sprinkler irrigation significantly ($P < 0.05$) enhanced vegetative growth and biomass, producing the tallest plants (26.25 ± 2.02 , 42.00 ± 4.30 , 59.75 ± 2.72 , and 69.50 ± 3.12 cm at 4, 6, 8, and 10 WATP, respectively) and the highest shoot and root dry weights (320.00 ± 7.36 g and 22.00 ± 1.47 g). Micro sprinkler irrigation significantly ($P < 0.05$) improved reproductive performance, achieving the highest fruit yield ($6,583 \pm 1.26$ kg ha⁻¹), lowest flower drop (3.75 ± 0.85), and greatest WUE (8.06 ± 0.06 kg m⁻³). Hose pipe irrigation and the control showed comparatively lower performance. These results indicate that irrigation method and uniform application strongly influence tomato productivity in sandy soils. Gun sprinkler irrigation is most effective for vegetative development, while micro sprinkler irrigation optimizes reproductive success and water productivity. This study provides new comparative evidence supporting efficient irrigation selection to maximize tomato yield and WUE, contributing to sustainable vegetable production and improved resource use efficiency in light-textured soils.

Keywords: Gun sprinkler, Irrigation methods, Micro sprinkler, Sandy soil, Tomato, Water use efficiency

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URBAN HOUSEHOLD SOLID WASTE MANAGEMENT PRACTICES IN MARUTHAMUNAI, SRI LANKA

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Abstract

Solid waste management in developing urban areas faces major environmental and health challenges. This study surveyed 100 households in Maruthamunai, Sri Lanka, across six GN divisions to assess waste practices and service gaps, analyzing data on composition, segregation, collection, composting, and disposal using SPSS 27. The results show that organic materials make up the majority (80%) of household waste, with green leaves (18%), garden soil (17%), and kitchen waste (16%). Hazardous waste (71%) is more prevalent in the inorganic fraction than metals (3%) and plastics (24%). While a small percentage of households use community bins (6%) or open dumping (7%), the majority (87%) rely on municipal trucks for waste collection. 20% receive daily service, 10% have irregular collection, and 70% typically receive collection twice a week. 58%, 6%, 7% of waste is disposed of by burning, burying, or open dumping, respectively, while 76% is collected by the municipality. In spite of this, only 6% of households compost, and 39% separate their waste. Improper waste management has resulted in air (81%) and water pollution (72%), bad odours, and clogged drains (81%) that create favorable conditions for mosquito breeding. It is also associated with respiratory (4%), skin (3%), gastrointestinal (2%), and vector-borne diseases (6%). Though knowledge of sustainable practices like composting and recycling remains low (17%). Most people (37%) mentioned that government and public bodies are primarily responsible for waste management, with only 9% feeling personally accountable. Disposal sites are fragmented and poorly maintained (43%), and 70% have not participated in awareness programs. Public satisfaction with municipal services is low, with 76% highlighting infrastructure gaps and poor maintenance. The study suggests that improved municipal services, community awareness, participatory planning, and organic waste utilization can enhance recycling, reduce environmental risks, and support sustainable urban living.

Keywords: Awareness program, Environment, Organic waste, Public participation, Solid waste management

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ELECTRICAL AND ELECTRONIC WASTE DISPOSAL PRACTICES AND PUBLIC PERCEPTIONS OF ENVIRONMENTAL AND HEALTH IMPACTS IN KANDY, SRI LANKA

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Abstract

The rapid increase in electrical and electronic device usage has led to a significant rise in electrical and electronic waste (EEW) in urban areas. Improper disposal of EEW releases toxic substances that pose serious risks to environmental and human health. This study examines EEW disposal practices, public awareness, and perceived environmental and health impacts among urban households and electrical and electronic shops in the Kandy Divisional Secretariat, Sri Lanka, while identifying institutional roles and key challenges in sustainable EEW management. A mixed-method approach was adopted, combining quantitative surveys and field observations. Structured questionnaires were administered to 100 households and 89 electrical and electronic shops using purposive stratified random sampling. Data on EEW generation, disposal methods, awareness levels, and safety practices were collected and analyzed using descriptive statistical techniques. Field observations were conducted to document visible environmental impacts associated with improper EEW disposal. Results revealed that shops generated higher volumes of EEW than households; 61% of shops discarded more than 10 units monthly, while 87% of households reported no monthly disposal. Although awareness of EEW issues was high (94% among households and 92.1% among shops), participation in formal recycling systems remained low (40% and 27%, respectively). Households mainly delivered waste to recycling centers (96%), whereas shops returned items to manufacturers (44.9%) or stored them (42.7%). Common waste items included batteries, LED bulbs, and mobile accessories. Observations indicated soil discoloration, metallic-tasting water, and reduced vegetation near dumping sites. Reported health concerns included skin rashes (49 - 57.3%), respiratory problems (53%), and eye irritation (43-52.8%). Despite local initiatives such as the Guhagoda waste separation facility and “Samapath Piyasa” recycling centers, participation remains limited due to inadequate awareness, insufficient infrastructure, inconvenience, and weak regulatory enforcement. Strengthened regulations, expanded collection systems, and targeted awareness programs are recommended.

Keywords: E-waste, Electronic shops, Environmental impacts, Urban households

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**ECO-ROUTE: A MOBILE-BASED ROUTE ALERT SYSTEM TO
IMPROVE THE SOLID WASTE MANAGEMENT SERVICES IN
AMPARA URBAN COUNCIL, SRI LANKA**

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Abstract

Municipal solid waste (MSW) management is a critical component of urban environmental hygiene, public health, and sustainable development. In Ampara Urban Council area, waste collection systems are often hindered by irregular schedules, poor communication between households and waste collectors, and limited coordination, leading to improper disposal practices such as open burning and open dumping. These challenges contribute to environmental pollution, pest infestations, and resident dissatisfaction. This study aims to develop a mobile application for providing real-time route updates and feedback mechanisms between municipal authorities, waste collectors, and residents regarding solid waste collection to improve solid waste management services. A mixed-method research design incorporating pre- and post-intervention surveys were conducted with 185 households to evaluate the effectiveness of Eco-Route application. As a first step, the Eco-Route system was developed as a cross-platform hybrid mobile application using Flutter with a Firebase cloud backend. The application interface comprised sequential functional screens, including onboarding and role selection, secure authentication, daily and weekly collector route updates, and householder information screens displaying collection schedules. A dedicated live map screen enabled real time tracking of waste collection vehicles. These slides guided user interaction and ensured intuitive navigation for both collectors and households. Quantitative data were analyzed using descriptive statistics (frequencies and percentages) using SPSS to evaluate changes in schedule awareness, missed collections, disposal behavior, communication effectiveness, and environmental hygiene. Results showed that 94.6% of participants reported improved awareness of collection schedules, missed collections decreased by 87.1%, and open burning of mixed waste declined by 76.3%, reflecting enhanced service reliability and household participation. This study concludes that integrating digital communication and community engagement can substantially improve waste management outcomes and underscores the importance of adaptive, data-driven strategies for promoting cleaner, healthier, and more sustainable urban environments.

Keywords: Eco-Route, Feedback system, Mobile applications, Solid waste management, Urban Sanitation

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IMPACT OF INDIVIDUAL AND INTEGRATED APPLICATION OF GARUDAN FERTILIZER (+HA) WITH ORGANIC AND INORGANIC FERTILIZERS ON GROWTH AND YIELD OF OKRA (*Abelmoschus esculentus*) IN SANDY REGOSOL

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Abstract

Sandy regosol is a significant challenge to agriculture due to their high porosity and low cation exchange capacity, which leads to rapid nutrient leaching and poor water retention. Though applying 100% recommended doses of NPK and organic manure is mostly practiced by the farmers, these nutrients are often underutilized by crops in sandy textures, resulting in economic loss and groundwater contamination. There is a critical need to identify soil amendments that can stabilize these nutrients. This research was conducted to investigate the role of humic substances specifically from the Garudan fertilizer. The study was conducted using a Completely Randomized Design (CRD) by using Garudan as sole and integration with cattle manure, and NPK at different ratios with 8 treatments and 3 replicates. Crop parameter at reproductive stage was evaluated and post-harvest soil organic carbon content was analyzed at harvest. The integrated application of Garudan with both cattle manure and NPK significantly enhanced plant growth, yield, and improved the soil properties in treatment number 8 (Garudan100% with urea75% and TSP100%, MOP100%) when compared to individual applications. The findings suggest that Garudan can play a vital role in promoting sustainable cultivation of okra by improving soil structure, enhancing nutrient uptake, and reducing nutrient losses in sandy soils. This study highlights the potential of integrating humic substances with traditional fertilizer practices for better productivity and long-term soil fertility management.

Keywords: Bio-stimulant, Erosion prevention, Nutrient management, Soil fertility, Sustainable agriculture

HA: Humic Acid

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THE IMPACT OF LAND USE LAND COVER CHANGES ON HYDROLOGICAL DYNAMICS IN THE KALU RIVER BASIN, SRI LANKA

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Abstract

This study aimed to evaluate the spatial and temporal dynamics of land use and land cover (LULC) changes and their hydrological impacts within the Kalu River basin, Sri Lanka, over ten years (2015–2024). Landsat 8 OLI/TIRS satellite imageries were used to perform GIS-based hydrological analysis such as watershed delineation and sub-watershed mapping, to identify the drainage characteristics and streamflow variations. The basin was divided into four major sub-watersheds namely Ellagawa, Ratnapura, Millakanda, and Putupaula, based on digital elevation and flow accumulation data derived from the SRTM DEM. The LULC analysis resulted in significant changes from 2015 to 2024, with significant forest loss of about 17% and natural vegetation loss of around 10–12% across the sub-watersheds, alongside high urbanization in Ratnapura by 26.85% and in Millakanda by 27.53%, and agricultural expansion in Putupaula by 40.48% and in Ellagawa by 27.87%. Moderate increases were shown in bare lands, ranging from about 6% to 13%, and in water bodies, which increased by less than 1%. Buffer zone analysis from 250 m to 2 km indicated severe degradation of riparian ecosystems, with forest losses exceeding 70% within 1 km of the river. Temporal analysis showed a clear shift from forest loss and agricultural expansion (2015–2019) to increased urbanization and plantation growth (2019–2024). Sub-watershed analysis showed significant spatial trends that urbanization peaked in Ratnapura and Millakanda, while agricultural expansion was more prominent in Putupaula and Ellagawa. Streamflow mapping from 2010 to 2022 showed a marked increase in discharge rates, corresponding with major LULC changes. Deforestation, plantation expansion, and urbanization collectively increased surface runoff and reduced infiltration, intensifying flood vulnerability. The study determines that rapid LULC changes are the primary drivers of hydrological alteration in the Kalu River basin.

Keywords: Change detection, Kalu River basin, Land cover dynamics, Streamflow, Sub-watersheds

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**A GEOSPATIAL APPROACH ON SPATIAL AND TEMPORAL
CHANGES OF PADDY LANDS IN RUGAM AND UNNICHCHAI
COMMAND AREAS, BATTICALOA**

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Abstract

The study aimed to assess the spatial and temporal changes of paddy lands and assess the impact of rainfall and Land surface temperature (LST) on change detection of cultivated and uncultivated paddy lands by using change detection analysis for the *Yala* and *Maha* seasons in Unnichchai and Rugam Command area, Batticaloa, from 2016 to 2024. The study used cloud-free Sentinel 2A MSI images for unsupervised classification and change detection analysis of paddy lands and other land uses. The area (ha) was quantified to assess the percentage share, percentage change, and the rate of change of the LULC over 09 years. Landsat 8 OLI/TIRS data were used to develop LST maps and monthly rainfall data for the period from 2016 to 2024 were collected from command areas stations to perform trend analysis using Man-Kendall test in RStudio. Uncultivated paddy lands showed an overall increase of 8.7% whereas cultivated paddy lands showed a minor overall decline of 0.5% between 2016 and 2024 in *Yala* season. The rate of change obtained for uncultivated and cultivated paddy lands showed an overall positive (41.46) and negative (3.72) ha/year, respectively in *Yala* season. Uncultivated paddy land increased by 3.8%, and cultivated paddy land decreased by 7.2% with the rate of change of +19.47 and -48.95 ha/year in *Maha* season. LST changes correspond with a reduction in the total area of cultivated paddy lands by 5.38%, uncultivated paddy lands increased by 32.73%. The rainfall during the *Maha* season led to a decrease in cultivated paddy lands by 7.2%. Overall, the study reveals significant conversion between cultivated and uncultivated paddy lands, with conversions of 32.73% (*Yala*) and 35% (*Maha*) from cultivated to uncultivated, and 5.38% (*Yala*) and 24.20% (*Maha*) in the reverse direction, due to the influence of climatic factors and LULC changes in the command area.

Keywords: Change detection, Land surface temperature, Land use land cover, *Maha*, Rainfall, *Yala*

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DEVELOPMENT OF SMART RAINWATER HARVESTING SYSTEM WITH REAL-TIME WATER QUALITY MONITORING AND AUTOMATION

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Abstract

Water is a vital resource for all forms of life, yet its availability is increasingly threatened by excessive consumption and irregular rainfall. In Sri Lanka, household water use has risen significantly due to gardening, vehicle washing, and domestic cleaning, leading to higher utility costs and local water shortages. Atmospheric pollutants, including sulphur dioxide and nitrogen dioxide released from burning fossil fuels, contribute to acid rain, negatively impacting harvested rainwater quality. Conventional rainwater harvesting systems generally focus only on collection and storage, without evaluating water quality or providing automated control. As a result, contaminated roof runoff, sediment deposition, and improper manual operation often make the collected water unsuitable for irrigation. This study aims to develop a smart automated rainwater harvesting system that integrates water quality monitoring with sensor-based storage control to ensure safe and reliable irrigation water. The system was implemented using an ESP32 microcontroller connected to pH, turbidity, and TDS sensors in a two-tank configuration: a primary assessment tank with a conical base and a secondary storage tank. Sensor data were visualized through the Blynk IoT platform, while programmed control logic operated solenoid valves to either store acceptable water or divert contaminated water to drainage. The system automatically rejected water when pH fell below 5.5 or exceeded 7.5, or when turbidity levels were high. Results showed that the secondary storage tank achieved significantly improved water quality compared to direct roof top water and drainage discharge. The developed system demonstrated effective automation, enhanced water quality, and improved harvesting efficiency. It offers a sustainable and low-maintenance solution suitable for urban and rural environments, promoting water conservation while reducing the risk of using low-quality water for irrigation. The findings highlight the potential of IoT based smart harvesting systems to address key challenges in water management and support agricultural resilience.

Keywords: Automatic water control, Clean water storage, IoT system, Smart rainwater harvesting, Two-tank configuration, Water quality monitoring

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