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"Innovative Agro-Technologies for a Climate-Smart and Sustainable Future"

26th June, 2025

ISATRS 2025

University of Colombo
Institute for Agro-Technology and Rural Sciences,
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MESSAGE FROM THE VICE-CHANCELLOR

I am pleased to extend my warm wishes for the 1st International Symposium on Agro-Technology and Rural Sciences (ISATRS 2025) organized by the University of Colombo Institute for Agro-technology and Rural Sciences (UCIARS). The theme of this year's symposium, "Innovative Agro-Technologies for a Climate-Smart and Sustainable Future," is both timely and critical, reflecting global and national priorities in ensuring food security, climate resilience, and sustainable agricultural development.

This symposium marks an important milestone for UCIARS as it transitions from a successful national platform to an international arena. By bringing together researchers, innovators, entrepreneurs, farmers, and industry leaders, ISATRS provides a unique opportunity for collaborative dialogue and the sharing of knowledge, technologies, and best practices that are essential to transforming the agricultural sector.

I deeply appreciate the dedicated efforts of the Director, academic and administrative staff, and students of UCIARS in organizing this international event. Your unwavering commitment to excellence, even amidst challenges, demonstrates the strength and vision of your institute. UCIARS has continually proven itself as a center of excellence in Agro-Technology, not only by nurturing skilled graduates but also by contributing significantly to research and innovation in agriculture.

The University of Colombo takes great pride in UCIARS's achievements and in its vital role in advancing climate-smart agriculture in Sri Lanka and beyond. I commend your collective efforts in making ISATRS 2025 a reality and wish the symposium great success as it sets a new benchmark in academic and research collaboration at an international level.

Professor I.M. Karunathilaka
Vice Chancellor, University of Colombo, Sri Lanka

MESSAGE FROM THE DIRECTOR

It is with great pride and enthusiasm that I deliver this message as the Director of the University of Colombo Institute for Agro Technology and Rural Sciences (UCIARS), on the occasion of the Inaugural International Symposium on Agro Technology and Rural Sciences (ISATRS 2025). This year marks a historic transformation as we elevate our national platform to the international stage, under the highly relevant theme "Innovative Agro Technologies for a Climate Smart and Sustainable Future."

Amidst growing global concerns over climate change, food insecurity, and the stagnation of agricultural productivity, the need for innovative, climate-smart solutions has become more urgent than ever. While the yields of key crops remain limited, the pressure on land and natural resources continues to escalate. In this scenario, advancing technology and research are not just options—they are necessities.

By transitioning from a national to an international symposium, ISATRS 2025 expands its horizons, welcoming a broader network of researchers, academics, and practitioners from around the globe. This platform is now poised to foster cross-border collaboration, promote diverse perspectives, and stimulate dialogue on globally relevant agricultural innovations and sustainable rural development.

ISATRS 2025 continues to prioritize the contributions of young academics, researchers, and students by providing them with a vibrant forum to present their research, share ideas, and connect with global thought leaders. UCIARS remains steadfast in its mission to facilitate knowledge sharing, technology development and transfer, product innovation, and the nurturing of agro-entrepreneurial talent that contributes to the agricultural advancement of Sri Lanka and the wider region.

I take this opportunity to extend my sincere appreciation to the organizing committee, our distinguished keynote speakers, international and local presenters, and all participants for their valuable contributions. I wish ISATRS 2025 resounding success and look forward to the collaborative energy it will spark across borders and disciplines.

Prof. D.M.C.C. Gunathilake
Director
University of Colombo Institute for Agro-Technology and Rural Sciences
(UCIARS)

MESSAGE FROM THE COORDINATOR

It is with great pleasure and honor that I welcome you to the *1st International Symposium on Agro-Technology and Rural Sciences (ISATRS 2025)*, organized by the **University of Colombo Institute for Agro-technology and Rural Sciences**. As the inaugural international symposium of our institute, ISATRS 2025 marks a significant milestone in our journey toward academic and research excellence in the field of agriculture.

Under the timely and relevant theme **"Sustainable Development through Innovative and Resilient Agriculture,"** this symposium brings together academics, researchers, professionals, and students from various disciplines to share their knowledge, findings, and innovative practices. The symposium serves as a valuable platform for fostering collaborations and directing attention toward eco-friendly, sustainable agricultural practices that contribute to global food security and resilient rural development.

Our collective vision is to harness scientific advancements to uplift the farming community and empower all stakeholders involved in agriculture. Through this initiative, we aim to promote a cleaner, greener, and more inclusive agricultural future.

It is truly an honor to serve as the Coordinator of this landmark event. I extend my sincere gratitude to all contributors, organizing committee members, and participants for making ISATRS 2025 a reality.

Let us move forward together, inspiring innovation and cultivating resilience for a sustainable tomorrow.

Mr. B.P. Siriwardena

Symposium Coordinator / ISATRS 2025

MESSAGE FROM THE SECRETARY

It is both an honor and a privilege for me to serve as the **Secretary of the 1st International Symposium on Agro-Technology and Rural Sciences (ISATRS 2025)**, hosted by the **University of Colombo Institute for Agro-Technology and Rural Sciences (UCIARS)**. This symposium marks a historic milestone, as it not only continues our proud tradition for the **6th consecutive year**, but also elevates the platform to an **international level** for the very first time.

With the theme **"Innovative Agro-Technologies for a Climate-Smart and Sustainable Future,"** ISATRS 2025 aims to foster global collaboration by bringing together researchers, academics, practitioners, and professionals from diverse fields of agriculture. The symposium is dedicated to addressing the emerging challenges of our time while promoting innovative, sustainable, and climate-resilient agricultural solutions.

I wish to extend my heartfelt appreciation to the members of the organizing committee who have invested their time, dedication, and tireless effort to ensure the success of this significant academic event. I also warmly welcome and thank all our distinguished invitees, authors, reviewers, participants, and well-wishers who have contributed to the realization of ISATRS 2025.

We believe that your engagement in this symposium will be both **enriching and inspiring**, providing valuable insights and opportunities for collaboration. It is our hope that ISATRS 2025 will pave the way for advancing agro-technological innovation and building a sustainable future for agriculture both in Sri Lanka and beyond.

Wishing you all a productive and memorable experience at ISATRS 2025.

Dr. B.S. Bandusekara

Symposium Secretary / ISATRS 2025

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CROP SCIENCE AND EMERGING TECHNOLOGIES FOR SUSTAINABLE AGRICULTURE

OPTIMIZING CAULIFLOWER GROWTH AND YIELD IN HYDROPONIC SYSTEMS: A COMPARATIVE STUDY OF A-SHAPE AND U-SHAPE HYDROPONIC STRUCTURES

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Abstract

This study examines the impact of A-shape and U-shape hydroponic structures in greenhouse conditions, using Albert fertilizer with two rates (R1: 1.0 g/plant/day; R2: 2.0 g/plant/day), on the cauliflower (*Brassica oleracea* var. *botrytis L.*) with a 0.56 × 0.80 m distance between plants and channels. Growth and yield under the hydroponic structure were analyzed using ANOVA, followed by Tukey's HSD test at a significance level of $*P < 0.05*$.Results demonstrated that Plant height in the A-shape reached 46.16±0.266a cm (R2), surpassing the U-shape's $40.16±0.266^{b}$ cm (R2). The A-shape also showed higher canopy diameter ($51.2±0.423^{a}$ cm in R1) and fresh head weight ($1.28±0.037^{a}$ kg in R2), compared to the U-shape's $0.84±0.024^{b}$ kg (R1). The perimeter of the cauliflower head was larger in the A-shape ($36.5±0.184^{a}$ cm in R2), and total biomass yield was highest in the A-shape ($1.88±0.037^{a}$ kg/m² in R2), while the U-shape recorded the lowest yield ($1.24±0.024^{b}$ kg/m² in R1).In conclusion, greater biomass yield from cauliflower can be obtained by applying Albert fertilizer 2.0 g/plant/day (R2), in A structure, for sustainable cauliflower production in tropical climates like Sri Lanka.

Keywords: Cauliflower growth, Hydroponic cultivation, Nutrient rate

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COMPARATIVE STUDY OF DAIRY SLUDGE AND MUNICIPAL WASTE SLUDGE WITH THE NORMAL COMPOST ON OKRA (*Abelmoschus esculantus*) GROWTH AND YIELD

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Abstract

Disposal of sludge from dairy industries and municipal wastewater treatment plants poses a major environmental challenge. Although detailed characterization of dairy sludge is limited, both sludge types are considered to contain elements beneficial for crop growth. This study aimed to evaluate the feasibility of using dairy and municipal wastewater sludge as agricultural inputs for okra (*Abelmoschus esculentus*) cultivation. Sludge samples from Milco (Pvt.) Ltd., Digana, and the Kandy municipal wastewater treatment plant were analyzed for the properties, including pH, electrical conductivity, nitrogen, phosphorus, potassium, organic carbon, moisture content, and sand content. The pot trial was conducted under controlled conditions at the Horticultural Crops Research and Development Institute (HORDI) using 5 kg of pots. Compost application followed the recommended rate of 40,000 kg ha^{-1} assuming a soil bulk density of 2×10^6 kg ha^{-1}. Six treatments with four replicates were tested to compare dairy sludge, municipal waste sludge, and normal compost: T1 (0.1 kg dairy sludge + 4.9 kg soil), T2 (0.1 kg municipal sludge + 4.9 kg soil), T3 (0.05 kg dairy sludge + 0.05 kg municipal sludge + 4.9 kg soil), T4 (0.1 kg compost + 4.9 kg soil), T5 (0.05 kg dairy sludge + 0.05 kg compost + 4.9 kg soil), and T6 (0.05 kg municipal sludge + 0.05 kg compost + 4.9 kg soil). Plant quality was assessed through parameters such as plant height, number of leaves, stem circumference, flower count, leaf nitrogen, chlorophyll, phosphorus, and potassium. Harvested pod parameters like length, circumference, weight, seed count, and color were also recorded. After harvesting, root and shoot length and dry weights were measured. ANOVA and Kruskal-Wallis tests showed significant differences among treatments. T3 recorded the highest yield (8 pods), plant height (0.534 m), and stem circumference (0.02648 m), with more buds and leaves, while T4 had the lowest plant height (0.306 m) and stem circumference (0.01501 m). Overall, dairy and municipal sludges improved okra growth, supporting their use as organic fertilizers.

Keywords: Dairy sludge, Municipal waste sludge, Okra, Organic fertilizer

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EFFECT OF DIFFERENT SEED COATINGS AND STORAGE TEMPERATURE ON QUALITY OF MAIZE (*ZEA MAYS*) SEEDS

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Abstract

The quality and viability of maize seeds deteriorates during storage, leading to a decline in germination rate and poor crop establishment. Seed coating technology involves applying a thin polymer layer to the seed surface, providing protection to germinating seeds and seedlings against both abiotic and biotic stresses. The study investigated the effect of different seed coating formulations and storage temperatures on the quality and storability of maize seeds. Two film-coating polymers were used: a commercially available polymer and a mixture of carboxymethyl cellulose, distilled water, and Homai (Thiophanate-methyl 50% + Thiram 30%) WP + Thiamethoxam 70% WS. These coatings were applied to seeds of two maize varieties, MI hybrid 4 and MI hybrid 5. Six distinct seed-film coating formulations were tested against an uncoated control. A factorial completely randomised design was employed, incorporating three factors: seed coating formulation (seven levels: C0–C6), maize variety (two levels: MI Hybrid 4 and MI Hybrid 5), and storage temperature (two levels: ambient at 25°C and cold storage at 15°C), resulting in 28 treatment combinations, each replicated four times. Seed quality parameters, including germination percentage, seedling length, and seedling vigour index (SVI) were evaluated prior to storage and at one-month intervals for three months using standard protocols. In the absence of interactions (p>0.05), the germination percentage and SVI of coated seeds remained unchanged, while decline was observed in the control. No significant differences (p>0.05) were observed among coating formulations over the three-month storage period. Furthermore, no significant differences in seed and seedling quality were observed between cold and ambient storage. The seed and seedling quality of coated seeds remained stable during storage, even under ambient air. Therefore, seed coating is an effective method to enhance the storability of maize seeds while preserving their quality.

Keywords: Germination, Seed-film coating, Seed quality, Seed storage, Seedling vigour index

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INFLUENCE OF GROWING MEDIA AND PLANTING TECHNIQUES ON THE GROWTH OF YOUNG BUDDING RUBBER PLANTS UNDER NURSERY CONDITIONS

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Abstract

The physical, chemical, and biological characteristics of the growing medium significantly influence the growth and development of young rubber plants. In many rubber nurseries, the availability of fertile topsoil is limited due to the repeated establishment of large-scale nurseries in the same area over extended periods and therefore, nursery operators often resort to using subsoil as a growing medium, which is high in clay, low in organic carbon, and exhibits poor physical structure. Although their chemical fertility can be enhanced through the application of fertilizers, unfavorable soil physical properties continue to hinder optimal plant growth. Therefore, this study is based on enhancing the quality of the potting medium, along with the adoption of improved planting techniques. An experiment was conducted in a rubber nursery with 5000 plants using a Randomized Complete Block Design with two factors: five growing media (T1 – Soil mixture (control), T2 - Soil mixture: Coir pith=1:1, T3 - Soil mixture: Burnt Rice Husk=1:1, T4 - Soil mixture: Coir pith: Burnt Rice Husk=2:1:1, T5 - Soil mixture: Coir pith: Compost=2:1:1) and two planting techniques (trench planting with coir pith (WC) and trench planting without coir pith (WOC)). Growth attributes *ie*, stem diameter, plant height, leaf area, root length, chlorophyll content, and stomatal conductance were measured throughout the period. Dry matter analysis was done using standardized methods. The results revealed significant ($p \leq 0.05$) variation in plant growth attributes under different treatments and planting techniques. Coir-based media, particularly T2 (coir pith: soil) and T5 (coir pith: compost: soil), promoted larger leaf area (2890.5 cm^2) and greater stem diameter (7.8mm), enhancing shoot and leaf growth. The T3 (coir: rice husk) mixture was particularly effective in root development, producing the longest taproots and highest root weights. Trench planting with coir pith consistently yielded higher growth compared to WOC. Additionally, coir-based media demonstrated 25% - 27% water retention, making them ideal for water-scarce environments. These findings suggest that coir-based growing media and trench planting techniques are practical and efficient solutions for enhancing plant growth, making them valuable strategies for optimizing nurseries in challenging environments.

Keywords: Coir pith, Growth attributes, Growing media, Rubber, Water retention

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IDENTIFICATION OF STIGMASTEROL AS A POTENTIAL ANTIVIRAL COMPOUND TARGETING ASFV DNA POLYMERASE X: A COMPREHENSIVE *IN SILICO* ANALYSIS

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Abstract

African swine fever virus (ASFV) is a highly contagious pathogen that affects pigs, with no commercial antiviral therapies or vaccines available to date. Recent research has identified several antiviral agents that can inhibit ASFV, underscoring the urgent need for new treatments. In this study, we explored the efficacy of phytochemicals derived from *Gymnema sylvestre*, an herb commonly used in traditional and Ayurvedic medicine, in inhibiting ASFV by targeting its DNA Polymerase X (ASFVPolX), a key enzyme in the virus's base excision repair (BER) mechanism. The present study encompassed a comprehensive electronic search for natural compounds from *Gymnema sylvestre* across databases focusing on literature published before April 2024. A total of 36 natural compounds were identified, and their pharmacokinetic characteristics were evaluated using SwissADME, following Lipinski's rule of five to assess potential drug safety. From this analysis, 19 compounds emerged as promising candidates. Then virtual screenings on PyRx 0.8 to evaluate the binding affinity of these compounds in their 3D SDF forms. Compounds with binding affinities lower than -5 kcal/mol underwent further analysis through blind docking with CB-Dock2. This process emphasized the significance of various compounds, including Quercetin, Citronellyl Formate, Conduritol A, Gymnemanol, Isophytol, Longispinogenin, Lupeol, Nerolidol, N-Hexanoic Acid, Paraben, Stigmasterol, Sitakisogenin, and squalene, as potential inhibitors of ASFVPolX. Among these, stigmasterol showed the most promise, with a binding affinity of -7.6 kcal/mol and interactions with crucial amino acids His 115, Arg 127, Val 120, and Leu 123 at the active site of ASFVPolX. These findings suggest that these compounds could serve as effective antiviral agents against ASFV, warranting further *in vitro* and *in vivo* studies to validate their efficacy.

Keywords: African Swine Fever Virus, Antiviral, ASFVPolX, *Gymnema sylvestre*, *In silico*

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EFFICACY OF NUTRIENT NANOPARTICLE INFUSED SLOW-RELEASE FERTILIZER BASED ON SODIUM ALGINATE AND POLYVINYL ALCOHOL FOR CHILLI (*Capsicum annuum*) PLANTS

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Abstract

Innovative agriculture products that up scale the quality and quantity of yield are considered a need of the time due to the growing world population. Slow-release fertilizers (SRFs) offer a more targeted and sustainable approach to plant nutrition by minimizing nutrient losses, ensuring a steady supply, and promoting efficient uptake. The aim of this research was to synthesize and characterize an advanced SRF with novel combination of polymers along with nutrients and evaluate its effect on yield, nutritional and morphological responses of Capsicum annuum (chilli) as a model crop. The SRF utilizes a biocompatible polymeric matrix of sodium alginate and polyvinyl alcohol to encapsulate concentrated NPK fertilizer, with ZnO and MgO nanoparticles, synthesized via sol-gel precipitation incorporated to enhance nutrient delivery. Powder X-ray diffraction results reveal that the average diameters of MgONPs, and ZnONPs were 17.40 nm, and 31.19 nm respectively. Fourier Transform Infrared peaks, respectively, at 3700 cm^{-1} and 400 cm^{-1} to 500 cm^{-1} confirmed the presence of MgONPs and ZnONPs. Fourier Transform Infrared analysis confirmed successful copolymerization of SRF beads via intermolecular hydrogen bonding between sodium alginate and polyvinyl alcohol. Scanning Electron Microscopy revealed the surface morphology and cross-linked structure, while water absorption capacity was evaluated and compared to that of beads made from individual raw materials. The SRF beads exhibited a cumulative nitrogen release of 67.23% over a 27-day period at pH 7.2. The effect of synthesized SRF bead was compared with traditional and commercial fertilizers on the growth, yield and nutrient uptake of *Capsicum annuum* (chilli). It has been concluded that newly formulated SRF bead has a strong positive relationship with plant growth ($r = 0.634^{**}$) and yield ($r = .879^{**}$). The fitted multiple linear regression model has shown that SRF bead ($p < 0.05$) has a significant impact on plant growth and yield. Proximate composition analysis of the chillies indicated enhanced nutrient uptake in plants treated with SRF beads, as evidenced by higher ash content (3.89%) as well as protein content (12.25%) and lower moisture content (12.89%). All of the results in this work showed that newly proposed SRF hydrogel bead had a good potential in nutrient managing and slow-release properties, which are expected to be widely used in sustainable agriculture.

Keywords: Biopolymer Matrix, Nanoparticles, Nitrogen release, Slow-Release Fertilizers

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EFFECTS OF VARIABLE SEED RATES AND POTASSIUM LEVELS ON YIELD COMPONENTS AND QUALITY PARAMETERS OF BASMATI TYPE NO. 06 RICE IN SRI LANKA

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Abstract

Basmati rice is known for its fragrance, long grains, and excellent cooking qualities. This study was conducted to identify the suitable seed rate and potassium fertilizer combination to achieve the maximum grain yield and quality of Basmati type No.06 rice variety. A field experiment was carried out at CIC seed farm, Pelwehera, Sri Lanka from May 2024 to August 2024. The study had nine treatments (T1- 45g/plot + Department of Agriculture recommended Muriate of Potash [DoA MoP], T2- 45g/plot + 1 ½ DoA MoP, T3- 45g/plot + no MoP, T4- 90g/plot + DoA MoP, T5- 90g/plot + 1 ½ DoA MoP, T6- 90g/plot + no MoP), T7- 135g/plot + DoA MoP - control, T8- 135g/plot + 1 ½ DoA MoP and T9- 135g/plot + no MoP) in a Randomized Complete Block Design (RCBD) with three plot replications with a plot area of $18m^2$. Based on the ANOVA results, selected combinations of seed rates and MoP levels did not have a significant effect ($p>0.05$) on vegetative growth and actual yield. The effect was significant ($p<0.05$) on grain quality characters. A moderate seed rate of 90g per plot (one bushel per acre) combined with 1½ of the DOA recommended MOP had the best performance in terms of grain physical quality, with a significant ($p<0.05$) maximum grain length (8.04±0.05 mm). It also showed superior milling quality, with a significant ($p<0.05$) higher head grain percentage (35.03±0.37 %) and a significant ($p<0.05$) lower broken grains percentage (33.56±0.45 %), along with excellent cooking quality, including a significant ($p<0.05$) longer grain length after cooking (12.23±0.03 mm) and an elongation ratio of 1.52±0.01. Based on these findings, the study concludes that using a 90g seed rate per plot (one bushel per acre) with 1½ of the DOA recommended MOP is the optimal combination to achieve maximum yield and quality for Basmati type no. 06 rice variety. However, the research should be replicated and tested in other agro-ecological zones in Sri Lanka during both *Yala* and *Maha* seasons to validate the findings.

Keywords: *Basmati rice, Grain quality, Grain yield, Potassium (K) fertilizer, Seed rate*

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AGRONOMIC AND ECONOMIC ASSESMENT OF TOP- DRESSING TIMINGS IN GHERKIN (*Cucumis sativus* L.) CULTIVATION

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Abstract

Application of fertilizer at the correct time is essential to maximize yield, nutrient use efficiency, and profitability, while minimizing nutrient losses. This study assessed the economic and agronomic impact of different top-dressing timings in gherkin cultivation. The experiment included four treatments based on the time of the first top-dressing;10 days (T_1), 15 days (T_2), 20 days (T_3), and 25 days (T_4) after seedling emergence, followed by subsequent applications at 10-day intervals up to 60 days. The experiment followed a randomized complete block design with eight blocks. Growth parameters (vine length, leaf area of the 14th and 21st leaves, number of flowers per vine), yield parameters (number of fruits per vine, yield per vine), and economic factors (cost benefit ratio and net benefit) were recorded. Only labor and fertilizer costs were considered, as other costs remained constant across treatments. Data were analyzed using ANOVA, and means were compared using Duncan's Multiple Range Test at 5% probability level. The results revealed that the significantly ($p<0.05$) higher vine length at 50% flowering stage (120.41 cm and 111.34 cm) and at 1st harvesting stage (160.19 cm and 153.31 cm), number of flowers per vine (59.88 and 50.25), yield per vine (905.03 g and 902.83 g), number of fruits per vine (292.88 and 292.13) for T_1 and T_2, respectively. Significantly ($p<0.05$) higher values for leaf area of 14th leaf (271.18 cm², 269.94 cm² and 257.50 cm²) were obtained by T_1, T_2 and T_3 and for 21st leaf, T_4 (204.93 cm^2) recorded the significantly ($p<0.05$) highest value. Economically, T_2 recorded the highest net benefit (LKR 1,252,375.00 per acre), and T_4 showed the highest cost-benefit ratio (CBR= 28.01). T_1 incurred the highest cost (LKR 56,850 per acre). In conclusion, applying the first top-dressing at 15 days after seedling emergence provides the best balance of yield and profitability, making it ideal for maximizing returns. For cost-efficient farming with limited resources, applying it at 25 days is recommended.

Keywords: Delay, Fertilizer, Gherkin, Performance, Profit

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INCREASING NITROGEN USE EFFICIENCY IN RICE USING NITRATE AND AMMONIA INHIBITORS

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Abstract

Nitrogen fertilizer loss in rice fields, through processes like denitrification, volatilization, and leaching, leads to reduced nitrogen use efficiency (NUE). Nitrogen inhibitors are added to nitrogen-based fertilizers to reduce losses, by slowing down the conversion of nitrogen to forms susceptible to loss. This study was conducted to evaluate the NUE of three selected nitrogen inhibitors in rice variety Bg 352. A field experiment was conducted from May 2024 to August 2024 at Rice research and Development unit, CIC seed farm, Pelwehera, Sri Lanka, in a randomized complete block design (RCBD) with seven treatments each with three replicates. The treatments comprised of varying nitrogen applications and three nitrogen inhibitors: T1 - 100% Department of Agriculture (DOA) recommended dose of urea (RDU), T2 - 75% RDU, T3 - 60% RDU, T4 - 60% RDU with Power nitrogen inhibitor 1L Mt^{-1}, T5 - 60% RDU with Limus inhibitor 1L Mt^{-1}, T6 - 60% RDU with Vibelsol inhibitor 1L Mt^{-1}, and T7 - no urea. Based on the ANOVA results, ($p > 0.01$) the application of 60% RDU did not significantly reduce grain yield (5.53 ± 0.347 t ha^{-1}) compared to 100% RDU (6.34 ± 0.224 t ha^{-1}); however, the reduction was nearly 1 t ha^{-1}. The use of nitrogen inhibitors significantly mitigated the yield reductions caused by reduced urea applications. Among the three nitrogen inhibitors tested, Vibelsol obtained the most significant results in improving nitrogen use efficiency. The results revealed that there was no significant difference ($p > 0.01$) in actual grain yield between 100% RDU (6.34 ± 0.224 t ha^{-1}) and 60% RDU (6.33 ± 0.197 t ha^{-1}) with Vibelsol inhibitor 1L Mt^{-1}. Additionally, the 60% RDU with Vibelsol inhibitor 1L Mt^{-1} treatment demonstrated the highest NUE (10.26 ± 1.031). These findings suggest that using 60% RDU with Vibelsol inhibitor 1L Mt^{-1} is an effective strategy to enhance NUE and maintain actual grain yield which can reduce the DOA recommended urea dose by 40% while ensuring optimal yield for the Bg 352 rice variety under low-country dry zone conditions in Sri Lanka. Further research is necessary to validate these results under different environmental conditions.

Keywords: Ammonia inhibitor, Nitrate inhibitor, Nitrogen inhibitor, Nitrogen use efficiency, Urea

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EVALUATING THE EFFECT OF DIFFERENT FERTILIZER FORMULATIONS ON POD FILLING IN THE GROUNDNUT VARIETY "LANKA JUMBO"

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Abstract

Lanka Jumbo is a popular medium-duration jumbo peanut (*Arachis hypogaea* L.) variety released by GLORDC, Angunakolapelessa, Sri Lanka. Pod filling is a crucial phase in groundnut development, significantly affecting yield and plant health. Calcium plays a key role in pod formation, yield improvement, and nutritional quality. This study aimed to identify an optimal fertilizer mix to enhance pod filling and increase the yield of groundnut variety Lanka Jumbo. A field experiment was conducted in Rideemaliyadda, Badulla district (IL2 Agro-ecological zone), Sri Lanka, to evaluate the effectiveness of seven fertilizer treatments. The Department of Agriculture (DOA) Sri Lanka recommendation (T1 - Urea 65 kg/ha, TSP 100 kg/ha, MOP 75 kg/ha) was compared with six alternatives: a 20% increase in TSP and MOP (T2), 250 kg/ha gypsum with enhanced nutrients (T3), gypsum with the DOA recommendation (T4), DOA recommendation + 500 kg/ha Nutri Pellets compost (T5), Commercially available complex fertilizer (125 kg/ha) + Commercially available calcium nitrate and boron mix fertilizer (62.5 kg/ha) (T6), and DOA recommendation + nitrogen foliar spray (T7). Treatments were arranged in a Randomized Complete Block Design (RCBD) with three replicates. Plant height and the number of branches per plant were recorded as plant growth data at 25 and 60 days after planting, while yield parameters included the number of pods per plant, the number of filled and unfilled pods per plant, and the dry weight of 100 seeds. No significant differences in plant growth were observed among treatments at 60 days after planting, though T7 recorded the highest plant height (58.7 cm) and number of branches (9.6). T4 showed the best yield performance, producing 134.67 g of dry pod weight per plant, with 53.3 pods per plant, a 96.2% pod filling rate, and a 100-seed weight of 210 g. In contrast, T7 had the lowest performance, with 40.7 pods per plant and a significantly lower pod filling rate (39.3%). These findings suggest that applying 250 kg of gypsum with the DOA-recommended fertilizer mixture improves pod filling and enhances the yield of groundnut var. Lanka Jumbo.

Keywords: Fertilizer management, Groundnut, Jambo Lanka, Peanut, Pod filling

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ASSESSING THE AVAILABILITY AND INVASIVENESS OF ORNAMENTAL PLANTS IN SRI LANKA USING A QUANTITATIVE RISK ASSESSMENT FRAMEWORK

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Abstract

Sri Lanka, recognized as a global biodiversity hotspot, provide habitats for an exceptional wealth of flora and fauna, characterized by remarkable endemism and diverse range of ecosystems, spanning from lush tropical rainforests to dynamic coastal wetlands. This study evaluated the availability and potential invasiveness of ornamental plants in Sri Lanka's bioclimatic zones Wet zone, Dry zone, Intermediate zone and Arid zone. Anuradhapura, Badulla, Gampaha, Kandy, Kurunegala and Puttalam districts were selected accordingly to represent each bioclimatic zone. The ornamental plant nurseries that were randomly selected from each district were visited, and the plants for sale were identified to the nearest taxonomic level with standard keys. A questionnaire survey of plant nurseries was conducted to gather further information on plants. The invasive potential of available plants in the nurseries was evaluated using a model "Quantitative Invasiveness Assessment Framework (QIAF) for Plant Species in Sri Lanka", which was created based on the Australian Weed Risk Assessment (AWRA). The model consists of species seed production, vegetative propagation, natural dispersal mechanisms, human-assisted dispersal, climate range and tolerance, adaptation to disturbance, growth rate, allelopathy, known global invasiveness and local impact evidence. Among the 255 plant species recorded, only 24 native ornamental plant species were found in nurseries belonging to 22 families. From the 231 exotic plant species recorded, 185 plants were excluded from further analysis due to the long history of those plant species either due to the absence of major invasive traits or insufficient data for evaluation to continue the analysis. Other 46 exotic ornamental plant species were analyzed and two of them (*Lantana camara* and *Miconia calvescens*) were found already listed as invasive plants in Sri Lanka. Based on the (QIAF) 11 exotic ornamental plant species belonging to 10 families were found with the highest value for the Cumulative Invasive Potential Index (*Prunus laurocerasus, Clusia fluminensis, Helianthus annuus, Allamanda cathartica, Plectranthus verticillatus sp., Ruellia tuberosa, Asparagus setaceus, Euphorbia tirucalli, Sansevieria trifasciata, Euphorbia hypericifolia,* and *Opuntia microdasys*). This study highlights the presence of potentially invasive ornamental plants in nurseries in Sri Lanka emphasizing the need for stringent monitoring and strict regulatory measures to prevent their ecological threats.

Keywords: Exotic, Invasive, Invasive Potential Index, Ornamental plant species, Quantitative Invasiveness.

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RELATIVE CHLOROPHYLL CONTENT (SPAD) VALUES FOR THE CHARACTERIZATION OF *Cucumis melo* L. AND *Cucumis sativus* L. GENOTYPES IN SRI LANKA

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Abstract

Cucumis melo L. (Vern: *Kekiri*) is a significant vegetable species in Sri Lanka. The complexity and diversity within *C. melo* make it crucial to understand the specific delimitation of *Kekiri* within the Sri Lankan context compared to *C. sativus* (cucumber) cultivars for breeding and conservation purposes. Here, we report the applicability of SPAD for characterizing genotypes. Eight *C. melo* genotypes (*Green-Seeni-Giant, Green-Seeni-Small, Yellow-Seeni-Small, White-Seeni-Medium, Mal-Kekiri, Deshiya-Kekiri, Sigari-kekri, Long Yellow Vegetable,* and *Gon-Kekiri*) and 12 *C. sativus* genotypes (*Sassy, Wealthy, Fiesty, Ajex, Chandani, Treasure, Kalpiti-White, LY58, Deshiya-Pipinna, Thiyambara* and *Thiyambara White*) were grown in the field for assessment. The data collection started four weeks after planting and continued for two and a half months using Multispe Q.V2.0. The daily sets of SPAD data were subjected to Correlation and Principal Component Analyses (PCA) in Minitab 16. The daily sets of SPAD measurements were positively correlated, starting from the second day of SPAD measurements. In PCA, PC1 and PC2 explained 35.1% and 13.8% of the total variance generated by the entire array of daily SPAD data. PC biplot demonstrated that the *C. melo* and *C. sativus* genotypes got clustered separately except for *Fiesty*, *Wealthy*, *Sassy*, and *Thiyambara-White* of *C. sativus*. PC1 was mainly affected by SPAD readings of 8/28/22 (0.30), and the PC2 was affected by 7/17/22) (-0.44). When we drew a scatter plot between the SPAD data of 8/28/22 and 7/17/22, species-based clustering except for *Yellow-Seeni-Small* with *C. sativus* and *Fiesty* with *C. melo*. The present study demonstrated that high throughput SPAD measurements can be used to characterize the *Cucumis* genotypes reflecting their species delimits.

Keywords: Cucumis melo, *Cucumis sativus*, Relative Chlorophyll Content, SPAD, Germplasm Characterization

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IMPACT OF DIFFERENT CONCENTRATION OF GIBBERELLIC ACID ON THE GROWTH AND YIELD OF RICE (*Oryza sativa* L.) UNDER THE LOW COUNTRY DRY ZONE IN SRI LANKA

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Abstract

This study focuses on identifying the optimal gibberellic acid concentration to enhance rice productivity in semi-arid condition while identifying the impact of different concentration of gibberellic acid on growth and yield of rice. Growth regulators, such as gibberellic acid, play a crucial role in optimizing crop growth, improving yield and mitigating the effect of environmental stress. This experiment was conducted at the rice research station in *Ambalantota* during the "*Yala"* season in 2024, the experiment utilized the At362 rice variety. Grown under the experiment design was randomized complete block design (RCBD) with four replicates including six gibberellic acid treatments (0 ppm, 25 ppm, 50 ppm, 75 ppm,100 ppm,125 ppm). In this experiment, 15 ml of gibberellic acid solution was applied to the plant. This application was done four weeks after planting the plant. The plant was separated before application. The result indicated significant differences in plant growth parameters and yield components with the 75 ppm treatment produced the highest plant height (104.09 cm), number of tillers (7.6), and number of filled grain panicles (76.27) leading to the optimal grain yield (20.60 g). Conversely, higher concentrations (100 ppm, and 125 ppm) negatively affected these parameters, resulting in reduced performance, particularly in yield. The findings highlight gibberellic acids potential as a vital plant hormone in enhancing rice growth and yield, particularly under challenging climatic conditions.

Keywords: Dry zone, Gibberellic acid, Growth, Rice, Yield

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DIVERSITY AND PEST RANGE OF FRUIT FLIES (*Tephritidae dacine*) IN FOUR SELECTED COMMERCIAL FRUITS IN SRI LANKA

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Abstract

Fruit flies cause significant negative impacts on the global fruit industry, and their impact on fruit cultivation in Sri Lanka is critical. Since the number of studies on this important fruit pest in Sri Lanka is scarce, the present study was conducted to investigate fruit fly diversity and their pest range in four selected commercial fruits. For this study, a commercial fruit farm located in *Midigama* (5°59'6.17"N; 80°23'32.32"E) was selected. The study was conducted using weekly sampling from September to November in 2024. Two sub-sampling sites per fruit type (mango, guava, papaya, and banana) were selected, and standard Methyl Eugenol (ME) traps were placed at the center of each sub-sampling site to trap fruit flies. Captured flies were collected in each sampling round and identified at the species level using taxonomic keys. Nine species of fruit flies belonging to two genera. (*Bactrocera* and *Zeugodacus*) were recorded, including 6 *Bactrocera* species (*B. dorsalis*, *B. kandiensis*, *B. correcta*, *B. latifrons*, *Bactrocera* sp.3, and *Bactrocera* sp.4), and 3 *Zeugodacus* species (*Z. cucurbitae*, *Z. tau*, and *Z. caudatus*). *Bactrocera* fruit flies were the most abundant ($P>0.05$), and among them, both *B. dorsalis* and *B. kandiensis* were recorded as highly abundant species ($P>0.05$). All three *Zeugodacus* species showed a similar abundance ($P>0.05$) in the fruit farm. The pest range reveals that both *B. dorsalis* and *B. kandiensis* were highly abundant in mango and guava. In papaya, *B. dorsalis*, *B. kandiensis*, and *Z. cucurbitae* showed a non-significant high abundance ($P>0.05$). In bananas, *B. dorsalis* and *Z. cucurbitae* were highly abundant ($P>0.05$). Five species (*B. dorsalis*, *B. kandiensis*, *B. correcta*, *Z. cucurbitae*, and *Z. tau*) were recorded in all four fruit types. Both *Z. cucurbitae* and *Z. tau* showed their lowest abundance in guava. While *Z. caudatus* was not reported in guava. *B. latifrons* was reported only from papaya and guava. *Bactrocera* sp.4 was recorded only in guava and banana. While *Bactrocera* sp.3 was reported only in bananas. The present study's findings will be helpful in effective management practices of Dacine fruit pests in the commercial fruit industry of Sri Lanka.

Keywords: Diptera, Fruit pests, Fruit farm, Southern Sri Lanka

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OPTIMIZING POST-TRANSPLANT RECOVERY AND YIELD OF RICE (*Oryza sativa*) USING DIFFERENT COMPOSTS IN MODIFIED DAPOG NURSERIES

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Abstract

Rice (*Oryza sativa L.*) is a staple food for over half of the global population, requiring improved cultivation practices to meet increasing demand. However, transplanting often induces transplanting shock, delaying growth and reducing yield potential. This study examines the effects of compost amendments in modified dapog nurseries on mitigating transplanting shock in *Nipponbare* rice seedlings. Four compost types, kitchen waste compost, soybean residue compost, alfalfa (*Medicago sativa*) compost, and ordinary commercial compost, were compared with direct seeding and wet bed nursery methods. Seedlings were transplanted into pots 14 days after germination, and physiological parameters such as plant height, green leaf number, root count, SPAD values, hydrogen peroxide (H_2O_2) concentration, days to heading, panicle number, and filled grain percentage were measured. The experiment was conducted under controlled environmental conditions using a completely randomized design. There were five replicates, with each replicate consisting of a single plant. Analysis of variance and mean separation (DMRT) was done using SPSS 17.0 at a 0.05 probability level ($P < 0.05$). Alfalfa compost significantly enhanced early seedling growth by increasing green leaf number, plant height, and SPAD values while reducing oxidative stress, as indicated by lower H_2O_2 concentrations compared to the plants of the wet bed nursery. Also, alfalfa-treated plants exhibited earlier heading and higher filled grain percentage than other transplanted treatments, closely resembling direct-seeded plants. These benefits may be attributed to triacontanol, a plant growth-promoting compound in alfalfa, known to enhance chlorophyll content, improve stress tolerance, and stimulate growth. The findings suggest that alfalfa compost effectively alleviates transplanting shock and enhances early growth and yield in transplanted rice. Further research is needed to validate these results and compare direct triacontanol application with alfalfa compost treatment. This study underscores the importance of compost selection in dapog nurseries for optimizing rice transplanting success and promoting sustainable rice production.

Keywords: Modified dapog nursery, Organic compost, *Oryza sativa*, Transplanting shock, Triacontanol

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OPTIMIZATION OF CARBON-TO-NITROGEN RATIOS AND ASSESSING SALINITY TOLERANCE IN *Metarhizium* spp. FOR BIOFERTILIZER DEVELOPMENT IN *Vigna unguiculate* CULTIVATION

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Abstract

This study investigates the optimization of growth media for *Metarhizium spp.* as a multifunctional biocontrol agent and plant growth-promoting agent by examining the effect of carbon concentration and carbon-to-nitrogen (C:N) ratios on fungal growth and sporulation. The research addresses key knowledge gaps by evaluating how varying C:N ratios influence growth dynamics and spore yield, assessing its potential to alleviate salinity stress at 0, 4, 6, 8, and 10 dS m^{-1} salinity levels using media tailored to Sri Lankan soil conditions. Additionally, the impact on cowpea *(Vigna unguiculata)* seed germination, and seedling growth was assessed under normal conditions via seed coating. Fungal growth was evaluated through radial growth, dry biomass, and spore counts. Experimental findings revealed that optimized nutrient composition, achieved by regulating C:N ratios and balanced mineral supplementation significantly influenced fungal growth and sporulation. Herein a C:N ratio of 20:1 combined with 8 g L^{-1} carbon concentration was identified as optimal, yielding the highest spore production (327 x 10^6 spores ml^{-1}). Seed coatings with spores produced under optimized conditions (8 g L^{-1} carbon, C:N 20:1) significantly improved seed germination (100% vs. 60% with Xanthum gum, 40% with distilled water), shoot length (19 cm vs. 6 cm and 4 cm), root length (24 cm vs. 8 cm and 6 cm), and seedling vigour indices (SVI-I: 4300 vs. 880 and 400; SVI-II: 38,000 vs. 3200 and 1500), demonstrating substantial improvement over untreated controls. The findings demonstrated that C:N optimization boosts both the growth and sporulation efficiency of *Metarhizium* spp. as well as its functional efficacy as a plant growth promoter. This study supports the development of cost-effective and eco-friendly biofertilizers that enhance crop resilience and productivity, promoting long-term sustainable agricultural practices.

Keywords: Carbon concentration, Carbon to nitrogen ratio, *Metarhizium* spp., Sustainable agriculture, *Vigna unguiculata*

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QUALITY ASSESSMENT OF SRI LANKAN BANANA VARIETIES AT DIFFERENT RIPENINGSTAGES

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Abstract

Bananas (Musa spp.) are a widely consumed food crop in Sri Lanka, with their nutritional and chemical composition varying according to variety and stage of ripeness. This study aimed to evaluate the physicochemical, proximate, functional, and mineral properties of selected banana varieties—*Seeni* (ABB), *Ambul* (AAB), *Embun* (AAA), *Kolikuttu* (AAB), *Suwandel* (AAB), *Rath Kesel* (AAB), *Sudu Kochchi* (AAA), and *Nethra-palam* (AAA)—at three defined ripening stages: R1 (0–33% ripened, more green than yellow), R2 (34–66% ripened, more yellow than green), and R3 (67–100% ripened, fully yellow). Physicochemical properties assessed included pulp-to-peel ratio, pH, titratable acidity, and Brix value. Proximate composition (moisture, protein, fat, fiber, and ash) and mineral content (potassium, sodium, magnesium) were determined, along with functional properties such as total flavonoid content (TFC), total phenolic content (TPC), and antioxidant activity. Statistical analysis was conducted using ANOVA at a 0.05 significance level ($p<0.05$) to determine the effects of ripening stage and variety. The results revealed that as bananas ripened from R1 (0–33%) to R3 (67–100%), moisture content, pulp-to-peel ratio, pH, and Brix value significantly increased, while crude protein, fat, fiber, ash, titratable acidity, and magnesium content decreased. Potassium and sodium levels remained relatively stable across ripening stages. Notably, antioxidant activity, TFC, and TPC peaked at the R2 ripening stage (R2: 34–66%) in several varieties, especially *Kolikuttu* and *Embun*, before declining at full ripeness. These findings highlight the dynamic changes in nutritional, mineral, physicochemical, and functional properties during banana ripening. The identification of the R2 ripening stage as a critical window for maximizing antioxidant and bioactive compound content underscores the importance of both ripening stage and variety in optimizing the nutritional and functional benefits of bananas, offering valuable guidance for dietary recommendations, food product development, and post-harvest utilization.

Keywords: Antioxidant capacity, Physicochemical properties, Nutritional composition, Ripening stages

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PRODUCTION OF SINGLE-CELL PROTEIN FROM BANANA (*Musa* spp.) PEELS: A SUSTAINABLE APPROACH TO PROTEIN-ENRICHED BISCUITS

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Abstract

Single-cell proteins (SCP) are dried microbial biomass used as an alternative protein source. Banana is one of the mostly consumed fruits, and 30–40% of its weight consists of peels, which are typically discarded. This research investigates the potential of utilizing banana peel waste for the production of single-cell protein, thereby addressing a critical gap in sustainable protein production using banana waste. Two banana varieties, *Seeni* (ABB) and *Ambul* (AAB), were collected, dried, powdered, and subjected to proximate analysis. The *Ambul* variety, with a higher protein content (4.10 ± 0.01%) than *Seeni* variety (3.51 ± 0.03%), was selected for further study. Then the dried peel powder underwent pretreatment and peel extract was inoculated with 2 mL suspension of *Saccharomyces cerevisiae* followed by submerged fermentation at pH 5.5 and 32°C for 48 hours. SCP was harvested via differential centrifugation and evaluated for physical and physicochemical parameters. Then the SCP was incorporated into biscuits at levels of 0%, 5%, 7.5%, and 10%. Proximate analysis and shelf-life tests were conducted on the most accepted biscuit formulation. The resulting SCP exhibited a water absorption capacity of 1.80 ± 0.04 mL/g, a dry cell weight of 11.05 ± 0.09 g, a bulk density of 0.50 ± 0.02 g/cm³, a crude protein content of 24.2%, and an average protein yield of 31.2%. Sensory evaluation indicated that biscuits containing 5% SCP were the most preferred, while proximate analysis of the 5% SCP-enriched biscuits showed a significant increase ($p<0.05$) in protein content (8.30 ± 0.02%) compared to the control biscuits (4.47 ± 0.33%). The accelerated shelf life of the biscuit was 10 weeks, while 25°C was the best storage temperature. This study demonstrates that banana peels can be considered a viable fruit waste substrate for producing SCP and banana peel-derived SCP is a sustainable protein supplement.

Keywords: Banana peel waste, Single-cell protein, Submerged fermentation, Sustainable protein

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POLLINATION: NEGATIVE EFFECTS OF NOISE POLLUTION ON INSECT POLLINATORS

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Abstract

Majority of global crops rely on pollinators to maintain food security. Approximately 75% to 95% of flowering plants depend on biotic pollinators; primarily insects like bees, butterflies, and flies, rather than abiotic carriers such as wind. These insect pollinators play a vital role in plant reproduction and contribute to the initiation of broader ecosystem processes. Alarming declines in pollinator populations have been reported in various parts of the world, posing a serious ecological threat. Among the contributing factors, noise pollution, especially in urban areas has emerged as a significant and growing concern. Many insect species are highly sensitive to excessive noise, which has been shown to negatively affect their behavior, communication, immune function, and reproductive health. This study provides a detailed exploration of how noise pollution impacts on insect pollinators and consequently threatens food security. Using qualitative research methodology, the paper conducts a systematic literature review that includes national and international sources referred from 2021 to 2024. Scholarly articles, books, dissertations, and conference papers across disciplines such as agriculture, entomology, and environmental science were examined to ensure a comprehensive understanding of the issue. Various search engines and databases were employed to gather diverse viewpoints and data sets. The study identifies several detrimental effects of noise pollution on insect pollinators, including disrupted reproductive behaviors, impaired communication, physical stress, weakened immune responses, and altered pollination patterns. These disruptions highlight the urgent need for long-term ecological studies, particularly focusing on species like bumble bees. The research advocates the development of targeted pollinator conservation strategies in urban environments and emphasizes the importance of creating institutional regulations with the contribution of both public and private organizations to mitigate the impacts of noise pollution. Given their indispensable role in global food systems, protecting pollinators must be prioritized. Future research should focus on policy-driven conservation initiatives that safeguard insect pollinators and support sustainable agricultural practices.

Keywords: Food Security, Insect Behaviour, Noise Pollution, Pollination, Urban Ecology

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SELECTION OF SUITABLE ROOTSTOCK FOR CUCUMBER (*Cucumis sativus*) CULTIVATION GROWN UNDER PROTECTED HOUSE CONDITION

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Abstract

Grafting is an effective method to enhance crop growth and yield by increasing the plant tolerance to root related stress. Therefore, this study was carried out to find suitable rootstock for cucumber grafting at the Regional Agriculture Research & Development Center, *Bandarawela* from March 2024 to August 2024. The experiment was designed as a Completely Randomized Design (CRD) with four replicates using four types of cucurbits as root stock in hole insertion grafting of cucumber. Each replicate consisted of 10 plants. The five treatments tested were T1: bottle gourd + cucumber, T2: Pumpkin + cucumber, T3: Ash pumpkin + cucumber, T4: *Kakiri* + cucumber and T5: cucumber without grafting (control). Grafting success rate was evaluated 10 days after grafting. Treatments 1, 2, 3 and 4 received 77.5%, 87.5%, 17.5%, and 0% grafting success rate respectively. Therefore, data (plant height, number of leaves per plant, total wet and dry weight of plant, wet and dry weight of shoots and root per plant, maximum root length per plant) were recorded only in T1, T2, and T5 treatments. The data were analyzed using Minitab using ANOVA procedure at 0.05 significant levels. Plant height was measured from 10 days to 20 days after grafting. Results revealed that there was significant difference ($P \leq 0.05$) of plant height among treatments throughout this period. Significantly higher plant height was recorded in T1 (bottle gourd + cucumber) compared to T2 and T5 treatments. But there was no significant difference ($P \geq 0.05$) in number of leaves per plant among treatments. Significantly higher fresh and dry weight of shoots, maximum root length, fresh and dry weight of plant was also recorded in T1 treatment with compared to other treatments. The fresh and dry weight of root was significantly higher in T1 and T2 compared to T5 treatments. Therefore, it can be concluded that bottle gourd is a suitable rootstock among tested rootstocks for successful grafting of cucumber. Further studies are needed to evaluate the performance of these plants under protected house conditions.

Keywords: Bottle gourd, *Cucumis sativus*, Cucurbits, Grafting, Rootstock

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EFFECT OF AMMONIUM SULPHATE APPLICATION ON CHEMICAL AND PHYSICAL PROPERTIES IN CINNAMON GROWING SOILS

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Abstract

Cinnamon cultivation requires effective soil fertility management to maintain plant health and achieve optimal yield. In commercial plantations, continuous application of ammonium sulphate (SA) as a nitrogen source is common practice. However, the long-term effects of SA, particularly its acidifying nature, on soil properties remain underexplored. This study was conducted over a seven-year period (2016–2023) at the Cinnamon Research Station, *Thihagoda,* situated in the Low Country Wet Zone of Sri Lanka, to evaluate both short- and long-term impacts of different SA application rates on soil chemical and physical properties. Six fertilizer treatments were tested: T1 (Control) with urea alone (480 kg/ha/year); T2 to T6 with increasing SA rates (225–976 kg/ha/year) and decreasing urea rates (346–0 kg/ha/year). The experiment followed a Randomized Complete Block Design with four replicates. Soil samples were collected at two time intervals—six weeks (to assess short-term effects) and five months (for long-term effects) after fertilizer application. Sampling was performed at three lateral distances (15 cm, 30 cm, and 45 cm) and three depths (10 cm, 20 cm, and 30 cm) from the plant base. Soil parameters assessed included pH, electrical conductivity (EC), available sulfur, bulk density, moisture content, and soil color. Data were analyzed using ANOVA to determine treatment effects. The results showed that both short- and long-term applications of SA significantly ($P<0.05$) affected soil chemical properties. A marked decrease in soil pH was observed with increasing SA rates, with the lowest pH values recorded in T3 and T4 treatments (4.15±0.47 and 4.34±0.32, respectively). EC and available sulfur levels increased significantly with higher SA applications, with the highest EC value (0.022±0.98) observed in T6, where only SA was applied. Conversely, soil physical properties such as bulk density and moisture content were not significantly affected over the study period. These findings highlight the acidifying effect of prolonged SA use and underscore the need for balanced fertilizer management. The study recommends regular soil monitoring and appropriate liming practices to mitigate soil acidification and sustain long-term soil health in cinnamon plantations.

Keywords: Cinnamon, Ammonium Sulphate, Soil Fertility, Chemical parameters, Physical Parameters

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ASSESSMENT OF GROWTH AND YIELD TRAITS OF NOVEL MUSHROOM STRAINS *(Pleurotus* spp.*)* FOR COMMERCIAL CULTIVATION

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Abstract

Mushroom cultivation in Sri Lanka holds promise for improving nutrition and generating income. Despite this potential, the industry remains underdeveloped due to outdated cultivation methods, and narrow genetic bases. This study evaluated the growth and yield traits of four pure mushroom strains (American Oyster (T1), Abalone (T2), Chaina (T3), and Black Oyster (T4)) and four hybrid strains (American O. × Black O. (T5), Chaina × Abalone (T6), Chaina O. × Black O. (T7), and American O. × Chaina (T8)) to identify candidates best suited for commercial cultivation. The experiment was conducted using a Completely Randomized Design (CRD) with 20 replicates per treatment. All strains were cultivated on a 950g substrate mix (albizia sawdust-50kg, rice bran-5kg, dhal flour-500g, calcium carbonate-1kg, and magnesium sulfate-100g) with moisture adjusted to 60–65%, then sterilized and inoculated under aseptic conditions. Incubation was maintained at 25±2°C and 80–85% humidity. Data on spawn run duration (days), stalk length (cm), cap diameter (cm), yield (g), and biological efficiency (BE%) were collected weekly over eight weeks from the day of inoculation and analyzed using ANOVA and Tukey's HSD test. Results showed significant differences ($p < 0.001$) among strains in spawn run duration, yield, and BE. Hybrid strain T8 had the fastest colonization (23.87±2.09days), while T4 had the slowest (49.45±8.71days). T6 recorded the highest yield (98.5±44.08g) and BE (10.36±4.64%), indicating its strong production potential. In contrast, T1 recorded the lowest yield (34.32±12.97g) and BE (3.61%), highlighting its limited commercial value. Morphological differences among strains were not statistically significant, although T6 had the longest stalks (4.85±1.75cm) and T3 the largest caps (10.71±1.52cm). T5 and T3 recorded the shortest stalks (3.09±0.67cm) and smallest caps (9.74±1.63cm), respectively. Overall, hybrid strains particularly involving the Chaina strain outperformed pure strains in both yield and biological efficiency. This suggests that hybrid vigor plays a key role in enhancing growth and productivity traits. The superior performance of specific hybrid strains underlines their potential for large-scale cultivation in Sri Lanka. However, to support industry-wide adoption, future research should assess additional traits such as nutritional content, shelf life, disease resistance, and adaptability to diverse substrates and agro-climatic zones.

Keywords: Commercial mushroom farming, Growth performances, Mushroom strains, Yield traits.

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WASTE DERIVED FILTER MEDIA FOR SUSTAINABLE HOUSEHOLD AQUAPONICS: A REVIEW

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Abstract

Global food production faces growing challenges, increasing interest in sustainable, resource-efficient systems. Aquaponics offers a solution by converting fish-derived Ammonium waste into plant nutrients. Filtration is key to this process. Conventional filters' limitations, prompting interest in use of waste materials as alternative media to enhance system efficiency and support sustainable waste management. This review aimed to evaluate and compare the effectiveness of waste-derived filter materials such as ceramics, biochar and wood chips. A comprehensive literature search was conducted via Google Scholar and ResearchGate focusing on peer-reviewed articles from 2015-2025 using keywords like "Biofilters", "Mechanical Filters", "Wastewater treatment", "Aquaponics systems". Out of 55 screened articles,32 were deemed relevant. Analyzed based on methodology and conclusion. It focused on waste-derived filter materials, advantages and limitations, comparison with commercial filters and remaining research gaps. Ceramic materials showed excellent fine particle removal, high durability, efficient nitrate conversion and no issue with pH changes, leaching, or clogging. Activated carbon showed strong adsorption capacity for anions, cations, and pesticide residues, while maintaining optimal water quality parameters. Wood chips promote microbial growth and effectively remove nitrates, phosphates and total suspended solids in aquaculture systems. They offer a small ecological footprint, low energy requirement, installation and maintenance cost. But issues include tannin release and quick degradation. Biochar exhibits superior nitrate and phosphorus removal, surface roughness, bacterial adhesion and cost effectiveness compared to plastic media. However further research is needed on its structural support, longevity and scalability. Other materials, like paddy husk and nylon net scraps, were less effective due to clogging, leaching, and odor. Natural wastes such as coconut husks, shells, wood shells and charcoal showed comparable or superior filtration efficiency to commercial plastic filters, particularly in removing TAN and Nitrite. Horns and bamboo reduced nitrite levels but were less effective overall. Despite positive results with materials like ceramics, activated carbon and biochar in nitrate conversion, TAN removal, pH stability, durability and cost effectiveness; significant research gaps remain. These include long-term performance, degradation, maintenance, the effect of microbial interactions, toxicity, and chemical stability. Therefore, standardized studies are essential to address these gaps and enhance the practical applications of these materials.

Keywords: Aquaponic systems, Biofilters, Mechanical Filters, Sustainable waste management, Waste water treatments.

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EVALUATING THE ADOPTION OF CLIMATE SMART AGRICULTURE (CSA) PRACTICES OF PADDY FARMERS IN CASCADE IRRIGATION SYSTEMS IN SRI LANKA

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Abstract

Climate Smart Agriculture (CSA) practices address agricultural challenges by promoting climate-resilient food systems. Despite their potential, CSA adoption in Sri Lanka is slow. Recognizing the importance of developing practical strategies to enhance climate resilience, this study focused on evaluating adoption levels and identifying the factors contributing to their low adoption. Primary data were collected through a questionnaire survey from 150 randomly selected beneficiary farmers of CRIWM Project who practiced diversified cropping systems; paddy and Other Field Crops (OFC) across five districts: Anuradhapura, Vavuniya, Trincomalee, Puttalam, and Kurunegala, representing five cascades and ten village irrigation systems in Sri Lanka's Dry and Intermediate zones. The study focused on key CSA practices for paddy cultivation, including Downstream Water Management (DWM), Traditional Paddy Varieties (TPV), Parachute Seed Transplanting (PST), and Agromet Advisory Services (AAS). For OFC, CSA practices included Soil Conservation (SC), DWM, self-seed production (SSP), AAS, and Organic Manure Production (OMP). Data were analyzed descriptively, categorizing responses into high (>80%), moderate (50-80%), and low (<50%) awareness and adaptability groups. Paddy farmers show high adoption of DWM (95%) and moderate use of AAS (56%), with lower adaptability to traditional methods (24%) and PST (4%). During the OFC cultivation, SC practices exhibit high adaptability (95%), while moderate adaptability is seen for DWM (60%) and the SSP (65%). OMP (40%) and AAS (30%) show the least adaptability. Key barriers include a lack of knowledge, wild animal attacks, insufficient financial incentives, and reluctance to adopt new practices. The study revealed a positive correlation (0.921) between CSA adoption and average annual income (Rs. 422,519.00) of farmers who practiced a diversified cropping system, highlighting varying adoption levels between paddy and OFC seasons (low to moderate levels). It recommends enhancing the climate action plan with a holistic approach with practical strategies, including Agromet advisory services, practicing the seed bank concept, Downstream Water, etc., while incorporating OFC to paddy fields to improve resilience in diversified cropping systems.

Keywords: Agromet advisory system, Climate action, Climate-smart agriculture, Crop diversification

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A STUDY ON THE EFFECTS OF DIFFERENT IRRIGATION WATER HARDNESS LEVELS ON THE FIRMNESS OF GHERKIN (*Cucumis sativus* L.) DURING VINEGAR FERMENTATION

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Abstract

Irrigation water hardness, determined by calcium and magnesium levels, can influence the structural integrity of the gherkin during vinegar fermentation. Since firm pickles are highly preferred by consumers, it is essential to study how irrigation with different hardness levels affects pickle quality. This study aimed to evaluate the effect of different levels of irrigation water hardness on the firmness of gherkin during vinegar fermentation. The experiment was conducted at the University of Ruhuna. Industrial-grade $CaCl_2$ and $MgCl_2$ were used to prepare water with different levels of hardness. Eight treatments with varying electrical conductivity (dS m^{-1}), specifically 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, and 4.0, designated as T_1 to T_8, and were tested in a randomized complete block design with five blocks. Harvested grade 1 gherkins (11–14 mm diameter) were fermented and evaluated after 45 days using sensory and instrumental methods. A trained panel assessed firmness using a structured three-point scale (1 =soft, 2 =less firm, 3 =firm), while a digital force gauge was used to measure objective firmness. ANOVA was used for data analysis, and means were compared using Duncan's multiple range test at a 5% probability level. A strong correlation (R^2 =0.78) was observed between instrumental and sensory firmness scores. According to the texture analysis, T_1 (4.88 N) and T_2 (4.59 N) showed significantly ($p < 0.05$) higher firmness. Sensory evaluation indicated that treatments from T_1 to T_6 received significantly ($p < 0.05$) higher values (2.6 to 3.1). T_8 exhibited the lowest values in both instrumental firmness (4.06 N) and sensory score (2.19). These findings suggest that maintaining irrigation water hardness within the optimal range of 0.5 to 1.0 dS m^{-1} to retain gherkin firmness during vinegar fermentation.

Keywords: Demand, Gherkin, Integrity, Pickle, Vinegar

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INVESTIGATING THE IMPACT OF SMART SPRINKLER IRRIGATION SYSTEM OVER MANUAL SPRINKLER SYSTEM ON MAIZE CROP PERFORMANCE WITH CROP MODEL SCENARIO ANALYSIS FOR PRECISION WATER MANAGEMENT

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Abstract

Efficient water use in precision agriculture is essential for maximizing crop yield and minimizing resource wastage. This study explored two approaches to irrigation optimization: a novel IoT-based smart sprinkler irrigation system and scenario analysis using the Agricultural Production Systems Simulator (APSIM). The IoT system was calibrated to automate irrigation between field capacity and management allowable depletion (MAD) levels for maize and was evaluated against a conventional manual sprinkler system. A field experiment was conducted from December 2023 to April 2024 (Maha season) at the Field Crops Research and Development Institute, Mahailuppallama, Sri Lanka, using a randomized complete block design with two treatments. Calibration of the IoT system established system values of 86 and 75 as thresholds for field capacity and MAD, respectively. Results indicated that the manual system consumed more water than the smart system; however, the difference in water productivity was not statistically significant ($p > 0.05$). Due to higher rainfall during the season, the lower water usage by the smart sprinkler system was not clearly emphasized. Nevertheless, the system shows strong potential to reduce water use and improve water productivity. No significant differences ($p > 0.05$) were observed in key growth parameters at the tasseling stage or harvest metrics, including plant height, SPAD values, stem diameter, leaf area index, number of leaves, dry weight, cob length, cob diameter or grain yield. Further IoT system developments should focus on reducing electrical noise and signal distortion in soil moisture sensors by using advanced data filtering algorithms and enhancing electron transfer efficiency between probes. Additionally, APSIM v7.10 simulations evaluated three irrigation strategies: varying intervals, timing, and combined frequency with amount adjustments. Optimal approaches included 7.68 mm every two days, 80 mm at sowing, jointing, and tasseling stages, and 90 mm distributed across five evenly spaced intervals during the growing period. Combining field experiments and digital modeling shows how smart irrigation and simulations can improve water efficiency in maize and enable data-driven agricultural water management

Keywords: APSIM Simulations, IoT, Precision Agriculture, Smart irrigation, Soil moisture sensors

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DEVELOPMENT AND EVALUATION OF RADIAL WEEDER TO CONTROL WEEDS EFFECTIVELY IN TEA FIELDS IN SRI LANKA

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Abstract

Weeding is an important and challenging management practice in tea cultivation. Hand weeding and chemical weeding had limitations due to the current economic crisis. Chemical weeding causes environmental pollution and develops herbicide-resistant weed species. According to the field survey conducted in this study, majority of small-scale tea plantations had grass as a prominent weed type and 89.09% of small-scale tea state holders utilize hand weeding. However, hand weeding consumes considerable labour and time; ultimately, it increases the production cost of tea leaves. This study aimed to develop Radial Weeder (RW) as an alternative manually operated weed control solution to control weeds effectively in the small-scale tea fields. RW utilized two interchangeable blades, which were able to perform slash weeding and scraper weeding. A newly developed weeder was evaluated on the mature tea field in Nawalapitiya using chemical weeding, hand weeding, and both interchangeable blades of RW as treatments. The results showed RW had 88.13% and 85.33% weeding efficiency in scraper blade attachment and slash blade attachment. Slash weeding blade attachment achieved 0.012 ha/h field capacity, and scraper blade attachment had 0.011 ha/h field capacity. As a result, RW achieved the lowest weeding cost among other treatments. Plant damage in both attachments of the weeder showed no significant difference compared to other treatments at the 0.05% probability level. Furthermore, scraper blade attachment and slash blade attachment had 74.18 g/m^2 and 9.01 g/m^2 surface soil disturbance. However, slash blade attachment showed lower surface soil disturbance than hand weeding and indicated no significant difference compared to chemical weeding. Considering the results of this study, RW can be recommended to small-scale tea state holders as an alternative manual weed control mechanism.

Keywords: Interchangeable blades, Radial Weeder (RW), Tea, Weeding

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SINGLE-STAGE CHILI MILLING FOR IMPROVED ENERGY EFFICIENCY THROUGH BRITTLENESS ENHANCEMENT

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Abstract

This study evaluated the potential of single-stage chili milling (SSCM) as a significantly more energy-efficient alternative than the conventional multistage milling method. The research specifically investigated the impact of reducing the chili moisture content to enhance milling efficiency by increasing material brittleness. Initial chili moisture content, ranging from 12% to 13% w.b. during storage, was effectively reduced to 3.5-4% w.b. by allowing the chili to reach equilibrium moisture content in a controlled environment of 20% relative humidity and 37°C, created using heat pump air dehumidifiers. SSCM trials were performed using a pulverizer, and the energy consumption was rigorously analyzed using classical grinding laws, including Bond, Rittinger, and Kick's laws. The results demonstrated a remarkable reduction in energy consumption for SSCM (266 kJ kg^{-1}) compared to the conventional multistage chili milling process (1116 kJ kg^{-1}). This substantial decrease is further highlighted by the significantly lower specific energy (88.65 kJ kg^{-1} for SSCM compared to 611 kJ kg^{-1}) and Bond Work Index (BWI) (8.82 kWh t^{-1} for SSCM compared to 255 kWh t^{-1}) observed with the single-stage method. The calculated constants for Kick's, Rittinger's, and Bond's laws consistently indicated the superior energy performance of SSCM. This study unequivocally demonstrates that controlled dehumidification as a pre-treatment significantly enhances the energy efficiency of chili milling, and the adoption of SSCM offers a compelling strategy for substantial energy savings in chili processing.

Keywords: Chili milling, Dehumidification, Energy efficiency, Grinding laws, Moisture content, Single-stage milling

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ASSESSING THE VARIABILITY OF RAINFALL AND TEMPERATURE IN MAJOR PADDY CULTIVATING DISTRICTS OF SRI LANKA

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Abstract

Agriculture in Sri Lanka, particularly rice cultivation, is highly vulnerable to the impacts of climate change. Given that rice is the nation's staple food, understanding the variations in climatic parameters during the Yala and Maha seasons is crucial for ensuring food security through appropriate adaptation and mitigation measures. This study focuses on four central paddy-producing districts in Sri Lanka—Ampara, Anuradhapura, Polonnaruwa, and Kurunegala and analyzes climatic data from 1992 to 2021. Specifically, data on rainfall, maximum temperature, and minimum temperature were sourced from the Malwatta, Mahailluppalama, Aralaganwila, and Bathalagoda weather stations. Monthly and annual averages of daily temperature and precipitation were computed, and descriptive statistics were employed to calculate the mean, standard deviation, and coefficient of variation for these parameters. Additionally, cumulative rainfall was calculated, and deviations from the 30-year average rainfall (1992–2021) were analyzed. For trend analysis, the Mann-Kendall non-parametric statistical method was applied to annual and seasonal rainfall and temperature data. The Sen's slope test was also conducted to identify the magnitude of detected trends. The results revealed several important trends in climatic patterns: in Anuradhapura and Polonnaruwa, rainfall during the Yala season exhibited increasing trends ($p<0.05$). Notably, the Anuradhapura district showed the most significant positive variation in rainfall during the Yala season, with the highest values compared to other districts. When considering the maximum temperature, no significant variation was observed ($p>0.05$) across all districts. However, in both Anuradhapura and Ampara, minimum temperatures were rising in both the Yala and Maha seasons ($p<0.05$). The observed increases in rainfall in certain districts, particularly in the Yala season, may positively influence paddy productivity, while rising temperatures could challenge crop yields. These findings emphasize the need for adaptive agricultural strategies to mitigate the adverse effects of climate change and ensure the sustainability of rice production in Sri Lanka. Further research should explore the underlying mechanisms of these climatic variations and their direct impacts on agricultural productivity.

Keywords: Climate variation, Rice Cultivation, Trend Analysis, Yala and Maha seasons

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ADVANCING FOOD SECURITY, NUTRITION AND POST-HARVEST TECHNOLOGIES

DEVELOPMENT OF INSTANT BIRIYANI FULL MEAL PACK AS MEAL FOR READY TO EAT (MRE)

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Abstract

Instant food products are convenient, ready-made items specifically designed to cater to the fast-paced lifestyles of today. These products, including instant noodles, spaghetti, soups, ready-to-eat cereals, and pre-cooked rice, provide time-efficient meal solutions for those seeking quick options. Hence, considering this, a series of experiments was conducted to develop an instant biryani full meal using basmati long-grain rice, infused with flavor. The study aimed to evaluate the effects of different dehydration methods, water: rice ratio and packaging material on organoleptic and physicochemical properties. In the first experiment, the rice was conventionally cooked and then subjected to different dehydration treatments (sun drying, oven drying, and roasting) to produce instant rice. The spices were dehydrated using similar methods. In the second experiment, three different water-to-rice ratios (1:1, 1:1.25, 1:1.5) were tested with the instant biryani mix to identify the best rehydration method. Experiment three aimed to determine the best packaging material for the instant biryani mix with an emphasis on shelf life with five treatments (T1: HDPE with vacuum and freezing, T2: HDPE with vacuum, T3: LAP, T4: HDPE, and T5: LDPE). Based on the results, 1:1.5 water-to-rice ratio was selected as the optimal rehydration method, providing the closest resemblance to authentic biryani and achieving high consumer satisfaction. The results indicated a significant difference between tested packaging methods ($P<0.05$), and T4 (HDPE packaging) emerged as the most effective. Based on the experiments, considering cost, the sun-drying method combined with HDPE packaging was found to perform better than other methods. Nutritional analysis of the meal revealed that the selected process yielded a product containing 72% carbohydrates, 15.2% protein, 5.21% fat, 2.64% salt, 4.26% ash, and provided 398.89 Kcal per 100g serving.

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Keywords: Biriyani, Dehydration, Instant, Rehydration

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FORMULATION AND STANDARDIZATION OF NATURAL LIQUID SOAP USING PALMYRAH (*Borassus flabellifer*) FRUIT PULP AND BUTTERFLY PEA FLOWER (*Clitoria ternatea*)

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Abstract

This study aims to develop and standardize a natural liquid soap using locally available Butterfly Pea Flower (Clitoria ternatea) extract (BPF) and Palmyrah fruit pulp (Borassus flabellifer) (PFP), addressing growing consumer demand for sustainable, eco-friendly, and health-conscious personal care products. Six formulations with different BPF: PFP ratios (T1:1:2, T2:1:1, T3:2:1, T4:3:0, T5:0:3, and T6:0:0) were used in the study. To identify the best formulation, sensory and physico-chemical (pH, Density, Lather volume, Total free alkali) tests were performed. Features like texture, color, foaming ability, washing ability, skin feel after washing, and general acceptance were evaluated through sensory evaluation. T2 consistently got the highest ratings across all sensory metrics, indicating its higher consumer appeal across the formulations. This combination involved a 1:1 ratio of BPF to PFP. Physiochemical testing confirmed the liquid soap's stability and effectiveness. Crucial metrics like pH (10.23), foaming stability (380 cm foam height), viscosity (75.42 at 60 RPM), and washing power (0.28% total free alkali) verified that the solution complied with industry requirements while remaining skin friendly. To further guarantee adherence to quality and safety standards, the formulation of liquid soaps was evaluated according to Sri Lanka Standards (SLS). The T2 was the most suitable for standardization and commercialization due to its optimal sensory and physio-chemical properties. Additionally, the soap maintained its chemical and physical qualities, exhibiting a satisfactory shelf life of one year.

This study highlights the feasibility of using traditional ingredients, such as Butterfly Pea Flower and Palmyrah fruit pulp, in contemporary formulations to support local resource promotion and sustainable product development. This approach makes meeting customer demand for natural products possible while promoting economic and environmental sustainability.

Keywords: Butterfly Pea Flower**,** Natural Liquid Soap, Palmyrah Fruit Pulp

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DEVELOPMENT OF SPICY MASALA BISCUIT ENRICHED WITH CAVENDISH BANANA BLOSSOM (*Musa acuminata*) FLOUR BY MITIGATING THE BITTERNESS

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Abstract

Cavendish banana blossom is a rich source of dietary fiber and other bioactive materials such as vitamins, minerals, and antioxidants. Nevertheless, due to the bitterness, its nutritional potential is not satisfactorily exploited in the food industry. In large scale banana cultivations, banana blossoms are stripped by farmers, and wasted without commercial scale utilization. The objective of the present study was to reduce the bitterness and include its worthiness as a food material. Based on preliminary studies, the Optimum practice to remove the bitterness was dipping 3mm size diced banana blossom in 0.3% citric acid for 15 hours at 50°C, which considerably reduced bitterness without affecting nutritional integrity. Citric acid treated (CAT) Cavendish banana blossom dice were ground to make flour and investigated as a functional food component in producing spicy masala flavored biscuits; four preparations of biscuits were made using 0%, 10%, 30%, and 50% CAT Cavendish banana blossom flour (CBBF). Nutritional analysis revealed when increasing amount of CAT CBBF, that biscuit's increased the level of fiber from 18.15 – 61.1, level of ash from 5.9 – 6.35.And also decreased the level of protein 31.15 – 18.8, level of fat from 15.5 – 12.2, level of total carbohydrates from 89.6 – 63.2, and level of moisture from 5.65 – 2.65 revealed its potential for a satisfactory shelf life. Though CAT CBBF enrichment added fiber to the diet, sensory properties were negatively influenced. According to the sensory analysis with 40 panelists, 10% and 30% levels of substitution were selected as optimum, therefore it can be recommended for commercialization. Packaging trial revealed that laminated aluminum pouch-maintained biscuits for a shelf life of two months, while polypropylene (PP) and polyethylene terephthalate (PET) packets provided shorter shelf lives. This study brings into focus the possibility of utilizing tons of wasted banana blossoms in the circular economy by producing nutritious foods. In addition to proposing a waste minimization approach to Cavendish banana blossom, this study offers a novel approach towards healthier, higher-fiber Spicy Masala biscuits.

Keywords: Cavendish Banana Blossom, *Musa acuminata*, Mitigating Bitterness, Spicy masala biscuit

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DEVELOPMENT OF VALUE-ADDED TROPICAL ALMOND KERNELS AND EVALUATION OF SHELF-LIFE AND QUALITY PARAMETERS

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Abstract

Tropical almond (*Terminalia catappa* L.) kernels are an underutilized resource rich in many nutrients, with many health benefits. This research aimed to add value and marketability to these nuts by developing value-added products and evaluating their shelf-life and quality parameters under various packaging and storage conditions. The sugar-coated and savory tropical almond snacks were produced by spreading sugar (30%, 40%, and 50%, w/w) and spice paste (5%, 7.5%, and 10%, w/w) on kernels using different treatments. The best products were selected by sensory evaluation using a semi-trained panel with 30 panelists and a five-point hedonic scale. Data was analyzed using the Kruskal-Wallis non-parametric test at a 0.05 level of significance. The proximate composition, physico-chemical, and functional properties of developed snacks were analyzed using standard methods. The developed products were stored in two packaging materials: paper ziplock pouch and ziplock pouch with inner alufoil under controlled inner moisture conditions with or without silica gel in ambient temperature conditions for 12 weeks. Results indicated that the 40% sugar concentration and 7.5% spice mix produced the most acceptable products to consumers. Savory almonds had the highest percentages of protein (39.60 ± 1.87%), fat (78.00 ± 4.21%), and fiber content (7.15 ± 0.65%) and lowest water activity (0.23 ± 0.002). Sugar-coated nuts had the lowest peroxide value (5.70 ± 0.64 meq/kg), and an antioxidant activity of 30.04 ± 3.46 mM Trolox/g and 5.60 ± 0.016 mg GAE/g of total polyphenol content. Savory tropical almonds exhibited comparatively higher flavonoid content (4.13 ± 1.06 mg QE/g). Shelf-life data showed that the ziplock pouch with inner alufoil with silica gel was the best packaging type for storing both products with better quality for 12-week time period under room temperature (30 ± 2 ºC).

Keywords: Nutritional composition, Packaging, Shelf-life, Sugar and savory snacks, Tropical almonds

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DEVELOPMENT OF A FICTIONAL BEVERAGE FROM COFFEE PERICARP AND ROASTED COFFEE BLENDS OF *Coffea arabica*

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Abstract

During the de-pulping the coffee pulp is produced as a byproduct. Though the Coffee pulp is rich in bioactive compounds with good antioxidant properties, the coffee pulp is usually disposed of as waste without considering the health benefits. Therefore, efforts have been made to prepare a ready to serve extract (tea) from *Coffea arabica* to evaluate the antioxidant activity, flavonoid content and pH. The beverage was prepared at three fermentation times: 12 hours, 18 hours and 24 hours, by combining pulp and seed powder in 04 proportions as: 05g + 0g, 04.5g + 0.5 g, 04.0 g + 01 g and 03.5 g + 01.5 g respectively. These 12 treatments were replicated 4 times in a Completely Randomized Design (CRD) and were analysed in two factor factorial. Each treatment combination was dissolved in 200 ml water and boiled on a hot plate. The prepared beverages were used to evaluate antioxidant activity, flavonoid content and pH. The results revealed that the antioxidant activity increased to 18 hours fermentation time and then decreased to 24 hours fermentation. But the pH decreased initially and increased to 24 hrs fermentation. The decrease in antioxidant activity may be caused by a decrease in pH since the solution recorded a more acidic atmosphere. Acidic pH values can cause the phenolic compounds to become more stable; the protons can bind to DPPH thereby decreasing the antioxidant activity of beverage. The decrease in pH value after fermentation may be due to the organic acids produced. In long fermentation the formed acetic acid would be used to stimulate the growth of yeast which could metabolize and produce alcohol and increase the pH.

Keywords: Antioxidant, Coffea arabica, Coffee waste, pH, Pericarp,

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ENCAPSULATED PROBIOTIC LACTOBACILLUS RHAMNOSUS LOADED BEETROOT LEATHER: A STUDY ON SENSORY ATTRIBUTES, STORAGE STABILITY, BIOACTIVITY AND DIGESTIVE FATE

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Abstract

Plant-based probiotic products have recently been developed for vegetarians, people with lactose intolerance, and dairy allergies. The availability of anti-microbial and antioxidant properties in herbal-based products reduces the viability of probiotics. Microencapsulation can be used to improve probiotic survival in herbal products. This research focuses on the formulation of beetroot leather infused with free and encapsulated *Lactobacillus rhamnosus* GG (LGG) and the characterization and sensory evaluation of the product. LGG was encapsulated with 50% maltodextrin, 50% sucrose, and 33% maltodextrin+17% sucrose, respectively. Encapsulated probiotics demonstrated the highest encapsulation efficiency were selected for leather formulation and subsequent sensory and storage stability, as well as antioxidant and in-vitro survival analysis. Matrix with 33% maltodextrin+17% sucrose demonstrated a significantly high encapsulation efficiency of 69%, establishing it as the ideal option for leather development. Three leather formulations were developed with: unencapsulated probiotics, encapsulated probiotics, and a control formulation devoid of probiotics. Remarkably, beetroot leather with encapsulated probiotics showed superior consumer acceptability among formulations. All three formulations exhibited significant reductions in pH and lactic acid bacterial (LAB) counts. In contrast, titratable acidity (% citric acid) increased significantly over time. The estimated shelf life, determined by the available *Lactobacillus rhamnosus* count, was found to be 66.5 days for the sample with unencapsulated probiotics, whereas 104.9 days for the sample with encapsulated probiotics. Antioxidant testing indicated that the total phenolic content and DPPH inhibition percentage of the formulation with encapsulated probiotics are significantly lower than those of the other formulations. However, no significant difference was observed in the FRAP values among the three formulations. In vitro analysis indicated that the cell viability of the formulation with encapsulated probiotics is significantly higher following gastric digestion compared to the formulation with unencapsulated probiotics, and this level of viability tends to remain consistent throughout the intestinal digestion process. This study highlights the possibility of effectively developing a beetroot leather loaded with encapsulated *Lactobacillus rhamnosus*.

Keywords: *Lactobacillus rhamnosus* GG, maltodextrin, microencapsulation, sucrose, vegetable leather.

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QUALITY AND SENSORY EVALUATION OF DIFFERENT AROMATIC RICE VARIETIES FOR RICE MILKSHAKE PRODUCTION

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Abstract

This study focuses on the production of gluten-free, non-dairy milkshake using three aromatic white rice varieties AT 306, AT 309, and BG 300. In this study, carried out at Rice Research Station, Ambalanthota, the products were evaluated based on sensory attributes, nutritional content, and shelf life. The milkshake was made using 85.2g rice powder, 203.4g sugar, 0.5g salt, and 2ml vanilla in one liter of water. Sensory analysis identified AT 306 as the most acceptable variety from appearance, aroma, and overall acceptability points of view. This suggests that the unique characteristics of this rice variety contributed to an enhanced sensory profile compared to the other varieties, AT 309 and BG 300, both of which were moderately accepted The experiment was conducted using a Randomized Complete Block design. The protein content in the formulated milkshake was negligible, and thus, fortification can be necessary to improve its nutritional status. AT 306 showed antioxidant activity of 2.361%, amylose content of 0.49%, and minimal iron (0.000387%) and ash (0.000289%). Shelf-life studies revealed that the milkshake was stable for a period of up to 12 days at refrigerated (10°C) conditions but only 2 days at ambient conditions. The findings show that AT 306 is the most suitable variety for rice milkshake production and holds promising sensory and shelf-life characteristics when stored refrigerated.

Keywords: Nutrition, rice, milkshakes, rice milkshakes, sensory evaluation.

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QUANTIFICATION OF CAFFEINE AND 5-CAFFEOYLQUINIC ACID (5CQA) IN SEVEN EUROPEAN COMMERCIAL ROASTED COFFEES (*Coffea arabica*) USING HPLC-PDA

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Abstract

Coffee is the second most consumed beverage in the world. Coffee infusions exert beneficial biological effects in the human body, generating significant health benefits attributed to caffeine and other phenolic compounds. This study was conducted to quantify caffeine and 5-Caffeoylquinic Acid (5CQA) concentrations in seven different types of commercially available roasted coffee with varying intensities: 1. Ristretto Espresso, 2. Viola Espresso, 3. Classico Espresso, 4. Espresso Intense, 5. Forte Lungo, 6. Milano Dolce Gusto, and 7. Decaffeinated Espresso, which are popular in Europe and globally. To extract caffeine and 5CQA, three methods were utilized: (1) heat refluxing with 40 mL of 60% methanol followed by a 20-fold dilution, (2) hot water extraction (30 or 50 mL) using a coffee machine followed by a dilution to 1000 mL, and (3) hot water extraction (300 mL) using a coffee machine followed by a dilution to 1000 mL. Caffeine and 5CQA were quantified using an HPLC-PDA system with an InertSustain Phenyl column, employing an isocratic procedure with 7% acetonitrile and 0.1% phosphoric acid as the mobile phase at wavelengths of 275 nm and 325 nm for caffeine and 5CQA, respectively. Methanolic extraction yielded higher concentrations of caffeine and 5CQA than the water extraction methods due to the increased solubility of the tested compounds in methanol. Based on method 3, which produced higher yields of caffeine and 5CQA, the highest concentration of 5CQA was found in the Forte Lungo espresso type (26.6 ± 0.6 mg/capsule), followed by the decaffeinated espresso (25.9 ± 0.5 mg/capsule). The highest caffeine concentration was found in Milano Dolce Gusto (109.3 ± 0.6 mg/capsule). The caffeine-to-5CQA ratios recorded in the tested coffee types were 4.69, 3.37, 2.29, 4.08, 2.09, 4.08, and 0.13. Based on these findings, we recommend that the most health-beneficial coffee sample tested in this study is the decaffeinated espresso.

Keywords: 5-CQA, Caffeine, Extraction, HPLC, Roasted coffee

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INNOVATIONS IN SUSTAINABLE LIVESTOCK, AQUACULTURE AND ANIMAL HEALTH

MAGNITUDE OF HEAT STRESS ON POULTRY AND SWINE: A COMPARATIVE STUDY OF TEMPERATURE HUMIDITY INDEX ACROSS CLIMATIC ZONES OVER THE PAST FIVE YEARS

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Abstract

Heat stress is an environmental impact that negatively affects livestock welfare, performance, and productivity. This study aimed to assess the magnitude of heat stress affecting poultry and swine by analyzing the Temperature Humidity Index (THI) across three climatic zones in Sri Lanka over the past five years. The data on daily minimum and maximum temperatures and relative humidity were obtained from the weather records of the Department of Agriculture and the Department of Meteorology, Sri Lanka, from January 2019 to December 2023. The daily THI was calculated for broilers (THI broiler), layers (THI layer), and swine (THI swine) using category-specific thermal models for the selected 12 locations to represent the wet zone (WZ), intermediate zone (IZ) and dry zone (DZ). Those values were used to analyze the monthly and annual variations within and across the climate zones and to calculate the number of days exceeding the no-stress level (THI no-stress) for each animal category. The data were analysed by one-way analysis of variance. According to the results, the significantly highest THI broiler was reported in DZ (31.08±2.04), followed by IZ (30.07±2.11) and WZ (29.62±1.41), and those values were higher than the THI no-stress (27.8) for broilers. Although a similar trend was observed for the THI layer among the climatic zones, only the DZ (29.12±1.70) and WZ (27.98±1.33) had higher values compared to the TH no-stress (27.8) of the layers. A significantly higher THI swine was reported in DZ (29.85±1.56) than in WZ (28.93±1.29) and IZ (29.00±1.90). Furthermore, regardless of the zone, the number of days per year with THI values exceeding the no-stress threshold was 313 ± 7 for broilers, 168 ± 13 for layers, and 267 ± 13 for swine, indicating a risk of chronic heat stress in the absence of appropriate management measures. In conclusion, this study demonstrates that poultry and swine in all three climatic zones of Sri Lanka are frequently exposed to heat stress, with THI values exceeding category-specific no-stress thresholds for a significant number of days each year. These findings highlight the need for zonal and category-specific heat stress management strategies to enhance livestock productivity and welfare.

Keywords: Category-specific thermal models, Dry zone, Intermediate zone, THI (no-stress), Wet zone

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OPTIMAL FEEDING REGIMES FOR GENETICALLY IMPROVED FARMED TILAPIA (GIFT): EFFECTS OF FEED VARIATION ON GROWTH PERFORMANCE, SURVIVAL, AND WATER QUALITY DYNAMICS

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Abstract

Rapid expansion of tilapia aquaculture demands feeding strategies that maximize productivity while minimizing environmental impacts. This study evaluated the effects of three feed rations (3%, 8%, and 12% of body weight per day) on growth performance, survival of Genetically Improved Farmed Tilapia (GIFT) fingerlings and water quality under tropical condition in the northern region. 750 fingerlings (initial mean weight: 30.62 ± 0.23 g) were distributed across 12 cement tanks (45 m3 each; stocking density: 250 fish/tank) in a completely randomized design with quadruplicate tanks per treatment. Fish fed with a commercially formulated diet (30% crude protein) three times daily for 56 days. Growth parameters (weight gain, specific growth rate), feed utilization efficiency (feed conversion ratio), survival rates, and key water quality variables (Dissolved Oxygen, Total Ammonia Nitrogen (TAN), pH and Total Dissolved Solids (TDS)) were monitored weekly using Minitab 17. Results demonstrated significant differences in growth performance among treatments ($p < 0.05$). The 8% ration produced optimal growth, with fish reaching a final mean weight of 338.07 ± 12.4 g and length of 28.01 ± 0.8 cm, significantly outperforming the 3% ration (146.60 ± 8.2 g; 16.38 ± 0.5 cm) and marginally surpassing the 12% ration (332.27 ± 10.6 g; 27.85 ± 0.7 cm). While the 3% ration showed superior FCR (1.25 ± 0.02), its low growth rates rendered it economically impractical. 8% ration achieved an optimal balance between growth and feed efficiency (FCR: 1.43 ± 0.03). Survival rates remained high across treatments (92–96%), with no significant differences ($p > 0.05$). Water quality analysis revealed that higher feeding rations (12%) significantly increased TAN (0.416 ± 0.16 mg/L) and TDS (423.5 ± 126.6 ppm) compared to lower rations ($p < 0.01$); however, these values, along with DO levels (4.07–5.86 mg/L) and temperature (28–29°C), remained within acceptable thresholds for tilapia culture. These findings identify 8% body weight as the optimal daily ration for GIFT tilapia fingerlings, delivering maximal growth without compromising survival or water quality. This study provides critical insights for the sustainable intensification of GIFT tilapia culture in tropical regions, particularly in settings like Sri Lanka where access to high-cost feed and advanced waste management is limited. Future

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research should explore these relationships in larger production systems and assess their economic feasibility.

Keywords: Aquaculture; Feed conversion ratio; GIFT Tilapia; Nutrient management; Fingerling.

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BOVINE LUMPY SKIN DISEASE AND ITS IMPACT ON CATTLE PRODUCTIVITY: CHALLENGES FOR SUSTAINABLE LIVESTOCK FARMING- A REVIEW

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Abstract

Livestock plays a pivotal role in the agricultural and farm economy, offering a multitude of direct and indirect benefits. Amongst all livestock, cattle stand out as a significant component of this sector. Bovine Lumpy Skin Disease (LSD) is an economically significant viral infection affecting cattle worldwide, leading to substantial losses in cattle productivity. The disease is caused by the Lumpy Skin Disease Virus (LSDV), a member of the Capripoxvirus genus. This review offers innovative perspectives on LSD in to economical and sustainable livestock farming frameworks, highlighting significant deficiencies in existing management techniques. This review aims to assess both the short- and long-term impacts of LSD on cattle productivity and to identify the economic burden it places on smallholder and commercial systems. A systematic literature review was conducted using Google Scholar with specific keywords such as "Lumpy Skin Disease", "Cattle Productivity", "Economic Losses", "Sustainable Livestock Farming". A total of 59 peer-reviewed articles were screened of which data from 48 effective articles were identified as relevant. Inclusion criteria based on research and government reports between the years 2000 to 2024 published in English, paying particular attention to the methodology and confronting LSD-related impacts on cattle productivity, economic losses, or sustainability in farming systems. Selected studies addressed epidemiology and economics; production losses related to LSD sustainable cattle farming by covering diverse regions in the world. Veterinarians and livestock farmers ought to be attentive in recognizing these clinical signs, as early detection is significant for infection identification and containment. Among the foremost challenging clinical side effects to address in LSD are emaciation (severe weight loss), agalactia (lack of milk production in lactating females) and epiphora (excessive tearing). As the infection advances, additional symptoms become apparent, including erythema (redness), pruritus (itching) and nodular lesions on the skin. Notably, these lesions can be irritating, particularly when they occur in regions such as the oronasal mucosae, pubic and perineal areas; driving to prolonged milk production losses. Further, LSD-induced regenerative inefficiencies including abortions, breeding infertility and delayed oestrus; encourage undermining cattle maintainability. The cumulative effect of these factors results in long-term financial losses and diminished livestock resilience, especially in areas where smallholder farmers intensely depend on cattle for income and food security. The economic impacts that stem from LSD include reducing market access, higher veterinary care costs, prolonged recovery periods and trade restrictions for LSD-affected regions. In order to ensure sustainable farming of cattle, it is important to

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implement integrated disease control strategies, enhance preventive measures and foster disease resilience through novel and economical approaches such as mobile-based disease surveillance systems, genetic selection for disease-resilient breeds, farmer education and risk communication etc.

Keywords: Cattle Productivity, Disease Mitigation, Economic Impact, Lumpy Skin Disease, Sustainable Livestock Farming

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SEASONAL VARIATIONS IN LIMNOLOGY OF RESERVOIRS IN SRI LANKA AND THEIR IMPACT ON CARP YIELD IN CULTURE-BASED FISHERIES

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Abstract

The limnological characteristics of reservoirs fluctuate significantly with seasonal changes. This study aimed to identify the key limnological factors temporally affecting carp yield in culture-based fisheries across five reservoirs in Sri Lanka: Hambegamuwa, Kiribban Wewa, Muthukandiya, Urusita Wewa, and Gestupana. Water quality and morphometric parameters of the reservoirs were measured every two months from February 2023 to April 2024. Carp yield was obtained as secondary data from fishers' logbooks. The collected data were analyzed using correlation analysis, Principal Component Analysis (PCA), Random Forest (RF), Gradient Boosting (GB), and Generalized Additive Model (GAM). According to the results, chlorophyll-a showed a strong positive correlation with total nitrogen ($r = 0.73$, $p < 0.001$). Total phosphorus showed a moderate negative correlation with Secchi depth ($r = -0.61$, $p < 0.001$), indicating that turbid waters tend to have higher phosphorus concentrations. The PCA revealed that the first two components explained 79.4% of the total variation, which was primarily influenced by conductivity, chlorophyll-a, and oxidation-reduction potential. Higher carp yields were observed in water with elevated conductivity and chlorophyll-content, highlighting their importance for reservoir productivity. RF and GB identified the catchment area, chlorophyll-a, total alkalinity, and Secchi depth as the most influential parameters for yield ($R2 = 0.70$, $p < 0.001$). Total alkalinity was found to be particularly significant in GAM, accounting for 64.5% of the variation in yield. Furthermore, the inclusion of catchment area and chlorophyll-a further enhanced the explanatory power, accounting for 94.8% of the variance in the model. These findings highlight the significant influence of seasonal changes in water quality, nutrient availability, primary productivity indicators, and watershed characteristics on fluctuations in carp yield. These insights provide a foundation for developing adaptive management strategies to enhance the sustainability of culture-based fisheries.

Keywords: Inland fisheries, Reservoir fisheries, Reservoir limnology, Statistical modeling, Water quality

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REPLACEMENT OF *Artemia sp.* BY *Moina sp.* AS A COST-EFFECTIVE ALTERNATIVE IN LARVAL REARING OF KOI CARP (*Cyprinus carpio rubrofoscus*)

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Abstract

The high cost of *Artemia* sp. as a larval feed in aquaculture has driven the search for affordable and sustainable alternatives. Therefore, this study aimed to evaluate the growth and economic viability of *Moina* sp. as a partial replacement for *Artemia* sp. in koi carp (*Cyprinus carpio rubrofoscus*) larval rearing. The experiment was conducted over 14 day-period and three-day-old post-hatch larvae (3DPH) with an initial mean weight of 0.030 ± 0.003g were subjected to four treatments: the control (CA) received *Artemia* sp. for the entire 14 days, while the experimental groups were weaned onto *Moina* sp. at different intervals: Treatment 1(3DM) after 3days, Treatment 2 (6DM) after 6 days, and Treatment 3 (9DM) after 9 days. Each treatment had three replicates, with 30 larvae per tank arranged in a completely randomized design. Tanks (60×25×20 cm) were filled with dechlorinated water (18 cm depth), and larvae were fed three times daily with 1 mL of feed per feeding. Water quality parameters were monitored twice. Survival rate and growth performance were analyzed using one-way ANOVA followed by Tukey's multiple range test ($\alpha = 0.05$) in SPSS. No significant difference was found in water quality parameters among the treatments. The survival rate was 100% across all treatments. Growth performance was assessed through percentage length gain (%), percentage weight gain (%), Specific Growth Rate (%SGR), and Average Daily Gain (%ADG). The 6DM showed the best growth performance across all metrics, with a significant increase in %SGR and %ADG ($p<0.05$) compared to the other treatments. However, the control group exhibited the lowest growth performance despite being fed *Artemia* sp. exclusively throughout the experiment. Furthermore, the cost-benefit analysis revealed that the control group incurred the highest cost, while the 3DM treatment had the lowest operational costs, suggesting that earlier weaning from *Artemia* sp. to *Moina* sp. is economically advantageous. Although the 6DM treatment exhibited superior growth performance, the findings suggest that the 3DM treatment has greater potential for commercial application compared to the existing practices of feeding koi carp larvae with *Artemia* sp. for 14 days.

Keywords: Cost-benefit analysis, Growth performance, Survival rate, Sustainable feeding strategy, Weaning

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RICE FARMER'S PERCEPTION AND KNOWLEDGE ON RICE-FISH INTEGRATION IN SOME SELECTED AREAS OF KURUNEGALA DISTRICT

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Abstract

Rice-Fish integration is a sustainable agriculture practice that involves the simultaneous cultivation of rice and fish in the same field. However, the success of rice -fish integration depends on the knowledge and perception of farmers towards this practice. This study aimed to explore the perception and knowledge of rice farmers on rice-fish integration in selected areas of the Kurunegala district. A total of 200 potential rice farmers were selected using a third-stage sampling procedure. Data collection was facilitated through a pre-tested questionnaire, and subsequent analysis was conducted using descriptive statistics. The results revealed that the majority of rice farmers were older than 60 years, with the largest group being those aged 50 or older, and the majority (84%) of the respondents were male. Only 60% of farmers are willing to practice rice-fish farming, while 14% did not accept. Although there was a low knowledge of rice-fish integration among farmers. On average, respondents had a positive perception of integrated rice-fish farming, with a (mean score of 3.73). The study identified the presence of fish in the rice field boost rice field fertility and lower fertilizer needs (mean score 4.01), waste and by-product from one subsystem are used as input on the other subsystem (mean score 3.17) and weeding should not be done with the use of herbicides (mean score 3.84) as major reasons to knowledge farmers for rice-fish farming. Furthermore, the respondents age and paddy production level were found to positively impact their preferences for practicing rice-fish farming. The study concluded that the rice farmers had moderate knowledge and positive perception of integrated rice and fish farming. There is a need to provide necessary support, such as irrigation facilities, adequate training and resources to help them adopting and sustain this sustainable agriculture practice in Kurunegala district. Additionally, rice-fish farming initiatives should be targeted towards potential rice farmers experiencing low production and young farmers.

Keywords: Integrated rice-fish farming (IRFF), Kurunegala district, Perception and knowledge, Training and targeted initiatives

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KNOWLEDGE, PERCEPTION AND CONSTRAINTS OF THE FOOD FISH FARMERS AND TRADERS ON RICE - FISH INTEGRATION IN KURUNEGALA DISTRICT

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Abstract

Rice-Fish Integration (RFI) is a sustainable farming system that can improve food security and farmer income. Despite its benefits, adoption in Sri Lanka remains low due to limited awareness, resources, and market access. This study explored the knowledge, perceptions, and challenges faced by farmers and traders to identify opportunities for promoting RFI in Kurunegala district. This study surveyed 52 registered food fish farmers and 81 traders in Kurunegala district using pre-tested questionnaires. Data were collected through a physical meeting and analyzed using descriptive statistics and Likert-scale analysis in SPSS. Participants were selected from official registries to represent key farming and trading divisions in the district. A survey of food fish farmers in Kurunegala revealed that the majority (34.6%) were aged 36–45 years, with 75% male and 88.5% married. Most (73.1%) had completed secondary education, and 57.7% had 1–5 years of fish farming experience. Farming was primarily a supplemental income (78.8%), with 50% operating medium-scale farms (0.5–2 acres). Tilapia was cultivated by 100% of farmers, marketed mainly through wholesale (57.7%). Knowledge of integrated rice-fish farming (IRFF) was moderate for 94.2% of farmers, with key awareness of species suitability (M.S.=3.76) and benefits like fertility enhancement (M.S.=3.34). Farmers held 100% positive perceptions towards IRFF, particularly recognizing water efficiency (M.S.=3.46) and waste recycling (M.S.=3.44). However, 55.8% were unwilling to adopt IRFF, citing critical constraints such as insufficient infrastructure (M.S.=4.0), lack of awareness (M.S.=3.92), and labor shortages (M.S.=3.78). Potentials identified included increased income (M.S.=3.90) and environmental benefits (M.S.=3.34). Among 81 fish traders, 77.8% had never heard of IRFF, and 82.7% were unfamiliar with rice-field fish products. While 51.9% were somewhat willing to include IRFF products in their business, concerns over supply, marketing, and awareness remain. These findings highlight the need for improved infrastructure, targeted education, and market development to enhance the adoption and sustainability of integrated rice-fish farming in Kurunegala

Keywords: Constraints, Integrated Farming, Knowledge, Perceptions, Rice-Fish Integration

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DIVERSE PASTURES OF COMPLEMENTARY SPECIES (DPCS) TO BUFFER DRY SUMMER CONDITIONS – A REVIEW

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Abstract

Climate change, through altered rainfall and temperature patterns, affects global pastoral agricultural systems by exacerbating environmental stresses such as extreme temperatures and rainfall deficit or surplus, thereby constraining agricultural productivity and farm profitability. Pastures are increasingly exposed to extreme climate - events, highlighting the needs for adaptive strategies in pastoral systems to cope with evolving environmental challenges. In Temperate Humid climates, traditional pastures combining white clover (*Trifolium repens*, Tr) and perennial ryegrass (*Lolium perenne*, Lp), both shallow-rooted species, are losing persistence under these varying climatic conditions. This paper reviews the Diverse Pastures of Complementary Species (DPCS), which are climate-smart pastures that aid to cope and deal with growing water restriction periods in pastoral systems. According to the recent studies, DPCS comprising these traditional shallow-rooted species, with the deep-rooted species pasture brome (*Bromus valdivianus*, Bv) and cocksfoot (*Dactylis glomerata*, Dg), expressing enhanced resource utilization, growth asynchrony and overyielding. Particularly in dry periods, DPCS exhibit significant production properties as the combination of hydraulic lift and pasture growth through the soil water restriction period. By managing species functional diversity, DPCS optimize soil water utilization, stabilize forage production, and increase pasture tolerance to climate change effects. However, DPCS implementation relies on - species selection and management practices. The selection of complementary species with functional traits that enhance resource utilization is crucial for addressing specific environmental constraints and management conditions. This facilitates asynchronous growth and overyielding, where different species reach their peak growth at different times a key ecological mechanism that promotes more stable pasture production throughout the year and reduces seasonal yield fluctuations. The selection of complementary species

with enhanced resource utilization functional traits to cope with specific environmental constraints and agricultural managements is important for the expression of the asynchronous growth and overyielding, where different species experience their peak growth at different times, a key ecological mechanism that contributes to a more stable pasture production across the year, reducing seasonal yield fluctuations. In addition, future studies should attempt to bridge the gap between theoretical understanding and practical application, especially concerning altered climatic conditions and economic sustainability.

Keywords: Asynchronous growth, Climate change adaptation, Diverse Pastures Complementary Species (DPCS), Drought tolerance, Over-yielding

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THE ADAPTATION LEVEL OF LARGE-SCALE BROILER FARMERS IN THE POST PANDEMIC PERIOD WITH ECONOMIC CRISIS IN PUTTALAM DISTRICT SRI LANKA

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Abstract

In Sri Lanka, broiler meat is the most preferred source of animal protein due to its affordability, high protein content, and essential nutrients. To meet the growing local demand for broiler chicken, statistics evidenced that production of broiler chicken has been increasing steadily over the years. However, the COVID-19 pandemic and the ongoing economic crisis have severely impacted broiler farming, resulting in increased production costs, reduced farm operations, and limited availability of poultry products. This study investigates the adaptive capacity of large-scale broiler farmers in Puttalam District, Sri Lanka, in response to the ongoing economic crisis. A field survey was conducted using a multistage sampling technique to select 48 respondents from 16 divisional secretariats. Data were collected through structured face-to-face interviews with a pre-tested questionnaire and analyzed using both quantitative and qualitative methods via the Statistical Package for Social Sciences (SPSS). The results revealed significant challenges, including increased feed costs, fuel shortages, limited access to veterinary services, and disruptions in electricity supply, all of which negatively impacted poultry production. Male farmers (85.4%) had significantly higher adaptation levels than females ($p<0.05$), while younger farmers demonstrated greater adaptive capacity than older farmers ($p<0.05$). Although education level did not significantly affect adaptation ($p>0.05$), farming experience demonstrated a negative correlation ($p<0.05$) with adaptation. Private farm ownership and strong knowledge in poultry production were significantly associated with better adaptation strategies ($p<0.05$). The findings underscore the necessity for targeted policy interventions, including price stabilization mechanisms, livestock insurance schemes, and strengthened extension services to enhance the resilience of the poultry sector.

Key words: Adaptive strategies, Broiler, COVID-19, Economic Crisis

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INFLUENCE OF FERTILIZER TYPE AND PLANT SPACING ON MORPHOLOGICAL CHARACTERISTICS AND FORAGE YIELD OF *BRACHIARIA* HYBRID MULATO II IN DRY ZONE SRI LANKA

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Abstract

This experiment was conducted to evaluate influence of fertilizer type and plant spacing on morphological characteristics and forage yield of *Brachiaria* hybrid mulato ii in Hambantota district, Sri Lanka under irrigated conditions. The experimental design used was a 3×2 factorial layout in a randomized complete block design with three replications which had a total of 24 plots, each measuring 2×2 m^2.The experiment had a total of 6 treatments with a factorial combination of two levels of intra - row spacing/plant spacing between plants were 15 cm and 30 cm and fertilizer types were U625 (Control) , commercial mixture (MS) and CM2.In all treatments, inter – row spacing was 50cm.The spacing between the block and plots was 2 m and 1m. Morphological parameters such as plant height (PH), number of tillers per plant (NTPP), leaf to stem ratio (LSR). . All the data were subjected to GLM ANOVA (Analysis of Variance) following the procedures of SAS (Statistical Analysis System). The result showed that most of the morphological parameters were significantly ($P<0.05$) affected by fertilizer and plant spacing. The tallest plants were observed under CM1 and CM2 (77.6 cm and 77.3 cm, respectively), compared to U625 (70.3 cm). Close spacing produced significantly greater plant height (77.7 cm) than wide spacing (72.5 cm). In contrast, wide spacing resulted in higher NTPP (25.1) compared to close spacing (21.1). Among fertilizer treatments, CM1 produced the highest tiller number (21.1), followed by CM2 (20.6) and U625 (16.0). LSR was significantly affected by both spacing and fertilizer, with the highest values recorded under CM1 (1.14) and at wider spacing (1.11).DMY was significantly influenced ($P<0.01$) by both fertilizer and plant spacing, with CM2 yielding the highest biomass (11.7 t/ha), while U625 recorded the lowest (9.6 t/ha). No significant differences were observed between CM1 and CM2 in terms of PH, LSR, NTPP, and DMY. These findings suggest that the use of low-cost commercial fertilizers (CM1 and CM2), particularly in combination with close spacing, can effectively enhance the yield potential of Mulato II grass, while wider spacing may favor individual plant development. This supports the viability of Mulato II as a productive forage option in dry zone of Sri Lanka.

Key words: *Brachiaria* hybrid, Plant height, Tillering, Forage yield, Fertilizer response

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ASSESSING GRAZING EFFECTS ON LOWLAND GRASSLAND ECOSYSTEM IN EASTERN NEPAL

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Abstract

Animal rearing is the major occupation of local people near the Koshi Tappu Wildlife Reserve (KTWR) in eastern Nepal; therefore, livestock grazing is major problem in the area. Grassland is the dominant land cover of the reserve. The areas with different grazing intensities were compared, observing lower grazing intensity in the core zone (2133 ± 391.84 Animal Units per hectare (AU ha^{-1})) to the buffer zone (3967 ± 560.88 (AU ha^{-1}), the core zone of the reserve was categorized as low grazed and the buffer as high grazed area for analysis. Herb species diversity at low grazed area of KTWR was found higher (1.23 ± 0.10) than at high grazed area (0.64 ± 0.12). Herb species richness at low grazed area was also significantly higher (6.61 ± 0.65) than at high grazed area (3.89 ± 0.75). Similarly, shrub species richness at low grazed area was found higher (1.31 ± 0.25) than that of high grazed area (0.53 ± 0.18). However, invasive plant species richness was observed higher (1.53 ± 0.27) in the low grazed zone compared to low grazed (0.56 ± 0.19). Regarding soil quality, no significant differences were found in soil pH, available phosphorus, or available potassium between high and low grazed areas. However, soil electrical conductivity (EC), bulk density (BD) and total nitrogen (TN) content were found significantly higher in the high grazed areas. In high grazed area, EC was observed 269.59 ± 65.53 µS cm^{-1}, BD was observed 0.23 ± 0.04 g cm^{-3} and TN was observed 0.65 ± 0.15 %. In low grazed area, EC was 89.45 ± 9.11 µS cm^{-1}, BD was 0.12 ± 0.02 g cm^{-3} and TN was 0.49 ± 0.11 %. Following, the study concluded that grazing pressure in KTWR has caused significant alterations in plant communities and some soil characteristics like EC, BD and TN. Based on these results, the study recommends controlled grazing at grasslands of buffer zone of KTWR to enhance vegetation diversity and nutrient availability. Also, the core areas also need interventions for controlling the abundance and distribution of invasive plant species.

Keywords: Grazing, Plant diversity, Plant richness, Soil characteristics

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AGRIBUSINESS, POLICY AND RURAL TRANSFORMATION

IMPACT OF KNOWLEDGE TRANSFER ON INNOVATION ACCEPTANCE AND ENTERPRISE PERFORMANCE THROUGH SUSTAINABLE ENTREPRENEURIAL BEHAVIOUR: A CASE STUDY RATHNAPURA DISTRICT, SRI LANKA.

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Abstract

This study examines the impact of knowledge transfer on innovation acceptance (KTIA) and enterprise performance (EP), with a specific emphasis on the mediating role of Sustainable Entrepreneurial Behaviour (SEB). A mixed-methods approach was employed in this study, combining both quantitative and qualitative research techniques. Using a quantitative approach, the study assesses these relationships through Structural Equation Modelling, based on data collected from a questionnaire survey conducted between March and August 2024, with a pilot study conducted prior to the data collection process. Additionally, qualitative insights were derived from two focus group discussions, each involving ten farmers, analysed using thematic analysis within the same period. The study sample consists of 392 farmers from the Ratnapura district, selected through a non-proportionate random sampling method from those who participated in agricultural extension programmes and trainings organised by the Provincial Department of Agriculture, Sabaragamuwa Province. This study strongly validates the conceptual framework used in the research and the tested hypotheses. As per the findings; KTIA has a positive impact on both SEB and EP, with SEB serving as a crucial mediator in strengthening the link between KTIA and EP. Regarding practical implications, enhancing EP through effective KTIA can be achieved via training programmes, workshops, and collaborations with agricultural research institutions that promote knowledge transferring and best agricultural practices. Furthermore, this study contributes to theoretical knowledge by illustrating how innovation, knowledge, and sustainability interact to drive entrepreneurial success among farmers. This study offers a novel understanding of how KTIA impacts EP, emphasizing the mediating role of SEB. The findings provide valuable insights for policymakers, practitioners, and scholars, showcasing actionable strategies to enhance EP through sustainability-driven innovation and knowledge transfer.

Keywords: Entrepreneurial behaviour, enterprise performance, innovation acceptance, knowledge transfer

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CONSUMER SURVEY ON NEWLY DEVELOPED SINGLE-USE ECO-FRIENDLY, BIODEGRADABLE AND EDIBLE SPOONS MADE FROM RED SEAWEED *Gracilaria edulis*

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Abstract

Growing global concern over plastic pollution, efforts being made to develop edible, eco-friendly, biodegradable, and nutritious alternatives to single use plastic cutlery to reduce plastic waste and environmental contamination. This study developed an edible yogurt spoon from the red seaweed *Gracilaria edulis*, which is rich in nutrients and agar, offering a sustainable and eco-friendly alternative to conventional single-use plastic cutlery. Seaweed were collected from Jaffna, and modified standard procedures were followed to produce biodegradable, edible spoons suitable for consuming yogurt and desserts. The resulting product was durable, less soluble in liquids, and either consumable or disposable after use. A consumer survey was conducted to assess sensory properties such as taste, odour, appearance, as well as the usability and edibility of the spoon. Among the respondents, 100% reported satisfaction with taste, odour, appearance, and usability. However, only 28% were satisfied with the spoon's edibility, with the remainder suggesting a reduction in hardness and enhancements to flavour to increase its appeal. Suggestions were also made to incorporate functional food properties. The chi-square test was applied and the results indicated a statistically significant preference for sensory attributes ($p < 0.05$), but a significant gap was shown in satisfaction related to consumption. Compared with edible cutlery technologies such as wheat bran, rice flour, and sorghum-based spoons, seaweed *G. edulis* spoons offer superior environmental benefits due to their marine origin and minimal land use footprint. Additionally, their high agar content allows for natural gel formation, reducing the need for synthetic binders. This research highlights the potential of seaweed bioplastics for edible cutlery, though further testing with stronger statistics and larger groups is needed to validate and refine the findings. Additional feedback suggested enhancing the spoon's flavour and considering its development as a functional food. Overall, the findings demonstrate that bioplastics derived from *G. edulis* hold significant promise as a sustainable solution for single-use plastic cutlery, with the potential to reduce environmental harm while promoting consumer well-being.

Keywords: Bioplastics, Consumer Survey, Edible spoon, *Gracilaria edulis*

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FORMULATION OF HERBAL DRY SHAMPOO POWDER USING PALMYRAH (*Borrassus flabellifer*) TENDER LEAVES

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Abstract

Natural hair care products are becoming more and more popular as people become more conscious of the negative consequences of artificial, synthetic hair care products. This research study concentrated to develop a herbal dry shampoo powder using the tender leaves of Palmyrah (***Borassus flabellifer***) to treat dandruff, Palmyrah tender leaves are generally consider as a medicine for bacterial and fungus. Palmyrah tender leaves, along with Shikakai, Soapberry, Fenugreek, and Hibiscus petals, were dried and powdered. These powders were then mixed in a **1:1:1:1:1** ratio. The mixture was further dried to 9.5% moisture content and tested for anti-fungal effects. The treatments used were T1 (control), T2, T3, T4, T5, and T6. The results showed that Treatment 2 (Palmyrah male inflorescence: 20g, Red hibiscus petals: 20g, ***Acacia concinna***: 20g, Soapberry: 20g, Fenugreek: 20g) exhibited higher dandruff inhibition than Treatment 3 (Palmyrah tender leaves: 20g, Red hibiscus petals: 20g, ***Acacia concinna***: 20g, Soapberry: 20g, Fenugreek: 20g). However, T2 had higher yeast and mold levels, making it unsuitable. There was no significant difference in inhibition between T2 and T3 ($p > 0.05$), but the high yeast and mold in T2 led to its rejection. Treatment 3, containing Palmyrah tender leaves, was selected as the best formulation for its antifungal properties and microbiological stability. It is the most effective treatment for controlling microbial growth in hair and can be used as a natural anti-dandruff shampoo powder.

Keywords: Antimicrobial properties, Herbal dry shampoo, Palmyrah tender leaves, Sensory analysis, Shelf life

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HEURISTICS AND ADAPTATION: WHAT SHAPES FARMERS' CLIMATE RISK RESPONSES?

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Abstract

Smallholder farmers in India are increasingly vulnerable to climate risks such as floods and droughts, yet their adaptive behaviours are often driven by cognitive heuristics rather than structured decision-making frameworks. This study investigates the role of heuristics specifically imitation, shock experience, and threshold-based reasoning in shaping the climate risk responses of smallholder farmers in two contrasting agro-ecological regions: Alappuzha (flood-prone) in Kerala and Gondia (drought-prone) in Maharashtra. An ex post facto research design was employed, with data collected through semi-structured interviews from 150 randomly selected farmers (75 per district). A mixed-methods approach was used to analyze behavioural patterns, including the application of K-means clustering to group respondents based on the intensity of heuristic reliance. The Elbow Method was used to determine the optimal number of clusters, resulting in three distinct categories: high, moderate, and low heuristic dependence. Findings reveal significant regional variation. Farmers in Alappuzha demonstrated higher risk perception and proactive adaptation, including adoption of integrated farming, early flood-tolerant varieties, and reliance on social networks for mitigation. Conversely, farmers in Gondia displayed lower risk sensitivity and predominantly reactive strategies, often constrained by institutional limitations and water scarcity. These behavioural patterns were further evaluated using Eakin et al.'s (2014) capacity framework, classifying farmers into four adaptation typologies: Sustainable adaptation, Safety-first population, Safe development paradox, and Poverty Trap. Alappuzha's farmers predominantly occupied the Sustainable adaptation and Safety-first quadrants, whereas a majority in Gondia were categorized under the Safe development paradox and Poverty trap, reflecting limited adaptive capacity. The study underscores the necessity of incorporating behavioural science into climate resilience policy. Designing interventions that are sensitive to heuristic-driven behaviours, enhancing peer learning mechanisms, and strengthening institutional trust can significantly improve smallholder adaptive responses.

Keywords: Agroecological vulnerability, Behavioural resilience; Climate risk adaptation; Heuristic decision-making; Smallholder farmers

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VALUE CHAIN ANALYSIS OF PEPPER MARKET: SMALLHOLDERS PEPPER INTERCROPPING WITH TEA IN NELUWA DS DIVISION, GALLE DISTRICT, SRI LANKA

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Abstract

Understanding the value chain of pepper intercropped with tea is crucial for enhancing agricultural sustainability and market efficiency in developing countries. This study investigates the structure of the pepper value chain, profit distribution among stakeholders, and the influence of key value characteristics and control points on market demand in Neluwa DS Division, Sri Lanka. A mixed-methods approach was adopted, involving 22 household surveys, four focus group discussions, and six key informant interviews. Descriptive statistical techniques were used to analyze the data. Results indicate that while smallholder farmers are central to production, large-scale collectors and traders exert significant control over price formation and value addition. Farmers captured approximately 70% of the total value chain profit, largely due to cost savings from intercropping with tea. Key challenges include inadequate post-harvest handling, labor shortages, and market volatility. Local consumers prioritized pungency and price over other quality traits. To enhance the competitiveness of Sri Lankan pepper, an integrated value chain development strategy is recommended—focusing on improved post-harvest technologies, stronger farmer-market linkages, and quality assurance systems for both domestic and export markets.

Keywords: Critical control points, Market margin, Profit distribution, Value chain, Value characteristics.

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DETERMINANTS OF FOREIGN DIRECT INVESTMENT IN SRI LANKA

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Abstract

This study examines the macroeconomic determinants of Foreign Direct Investment (FDI) inflows in Sri Lanka over the period from 1970 to 2022. Key variables analyzed include FDI net inflows (as a percentage of GDP), exchange rates, GDP growth, inflation and trade openness. Using Autoregressive Distributed Lag (ARDL) model, the research captures both short-run and long-run relationships between these variables and FDI behavior. The results reveal that both GDP growth and trade openness are significant drivers of FDI, exerting positive effects in both the immediate and long-term contexts. Stronger economic expansion and liberalized trade environments are shown to enhance Sri Lanka's investment appeal. Notably, while currency depreciation initially deters FDI, it exerts a positive influence over time, underscoring the complex role of exchange rate dynamics in investment decisions. Additionally lagged GDP- particularly with a two-period lag- proves influential, highlighting the importance of sustained economic performance in shaping investor confidence. In contrast, inflation and FDI in US dollar terms were found to have no significant impact on FDI inflows, suggesting that foreign investors weigh broader macroeconomic stability over inflationary pressures. The study concludes that policies fostering economic growth, ensuring exchange rate stability, and enhancing trade openness are crucial for attracting sustained foreign investment and driving long-term development in Sri Lanka.

Keywords: Auto Regressive Distributed Lag Model, Economic Growth, Foreign Direct Investment, Macroeconomic Determinants

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EXPLORING THE POTENTIAL OF SOCIAL MEDIA PLATFORMS FOR AGRICULTURAL EXTENSION: EVIDENCE FROM GALLE DISTRICT, SRI LANKA

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Abstract

Agricultural extension services in Sri Lanka face critical challenges due to a limited number of Agriculture Instructors serving a large farming population. Traditional advisory methods such as field visits, group discussions, and demonstrations often fail to provide timely and wide-reaching support. This study explores the potential of digital communication platforms WhatsApp, YouTube, and Facebook as complementary tools for agricultural extension. The research was conducted in the Galle district, stratified into three zones: Eastern, Western, and Central. A two-stage stratified random cluster sampling method was used. First, five geographical areas were randomly selected from each zone, yielding 15 clusters. All Agriculture Instructors (n=31) within these areas were surveyed using a pre-tested Google Form questionnaire. The study measured seven latent constructs ease of use, usefulness, relative advantage, compatibility, complexity, job relevance, and observability based on the Technology Acceptance Model and Theory of Planned Behavior. Each construct included 3–5 items measured on a 5-point Likert scale. Findings revealed platform-specific strengths. YouTube scored highest for ease of use (3.84), while WhatsApp ranked highest in perceived usefulness (3.81) and compatibility (3.55). Facebook led in job relevance (3.37), potentially due to its networking features. For relative advantage, YouTube (3.51) slightly outperformed WhatsApp (3.49) and Facebook (3.46). Observability scores were similar for WhatsApp and YouTube (3.46), with Facebook slightly lower (3.38). All platforms received low complexity scores, indicating user-friendliness. Statistical analysis using the Friedman test showed no significant differences in platform rankings ($p = 0.347$). Wilcoxon signed-rank tests also confirmed no significant pairwise differences. These results suggest that while all platforms offer distinct advantages, none is overwhelmingly superior. The findings offer valuable insights for policymakers and extension professionals aiming to leverage digital tools in agricultural knowledge dissemination.

Keywords: Advisory services, digital platforms, communicating platforms.

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PROMOTING MILLET CONSUMPTION THROUGH COMMUNITY-BASED AWARENESS IN NORTHERN SRI LANKA: A CASE STUDY OF THE NALLUR DIVISIONAL SECRETARIAT DIVISION, JAFFNA DISTRICT

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Abstract

Millets have been vital to Sri Lanka's rural agriculture. However, their cultivation and consumption have declined. This study was conducted in four Grama Niladhari divisions of the Nallur Divisional Secretariat, Jaffna District. One hundred households were selected by systematical sampling method and forty school children were involved in millet cookery sessions along with one of their parents. Data on socio-demographics, millet knowledge, consumption frequency and barriers to millet usage were collected through interviews. Awareness exhibitions, millet seed displays, nutritional education and recipe booklets were used to promote millet usage. When provided with finger millet (*Eleusine coracana*), little millet (*Panicum sumatrense*), foxtail millet (*Setaria italica*), pearl millet (*Pennisetum glaucum*) and kodo millet (*Paspalum scrobiculatum*), over 90% of participants were able to identify finger millet across all divisions. However, identification of the other millet types remained below 30%. Use of finger millets in home cooking was reported by 61% of the participants, although typically only twice monthly or less. Consumption of other millets were reported below 12%. This was due to market scarcity, higher costs and insufficient local milling facilities. Farmers also cited poor market access and low demand as key challenges. During cookery sessions, participants prepared innovative dishes like rainbow *pittu*, drumstick-leaf rotti, and millet-based porridges. A follow-up survey revealed that household millet consumption increased from 12% to 42% after the intervention. Engagement of school children and family members facilitated knowledge transfer and cultural preservation. To support farmers, authorities should establish dedicated market infrastructure. The study highlights the potential of participatory programs to restore traditional food practices, support sustainable agriculture and improve community nutrition.

Keywords: Community engagement, Millets, Participatory research, Sustainable nutrition, Traditional foods

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