PROCEEDINGS
Abstracts

6th NATIONAL SYMPOSIUM ON AGRICULTURE - 2024

Resilient agriculture –
A tool for reviving Sri Lankan economy

6th March, 2024

Faculty of Agriculture
Eastern University, Sri Lanka
Palachcholai, Kaluwankerny

NSA 2024

Proceedings of the
6th National Symposium on Agriculture
(6th NSA–2024)

"Resilient Agriculture –
A tool for reviving Sri Lankan economy"

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"Resilient Agriculture – A tool for reviving Sri Lankan economy"

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MESSAGE FROM THE VICE CHANCELLOR

Eastern University, Sri Lanka

It is my pleasure to extend warm greetings to all of you on behalf of Eastern University, Sri Lanka. I welcome you to the 6th National Symposium on Agriculture 2024 (NSA - 2024) organized by the Faculty of Agriculture, scheduled on March 6th, 2024.

The theme for this year, "Resilient Agriculture – A Tool for Reviving Sri Lankan Economy", is highly relevant in the current global context where Agriculture and Technology play a crucial role in addressing challenges. I commend the Faculty of Agriculture for embracing innovation and research to bring about positive change in our communities.

The National Symposium on Agriculture has consistently served as a platform for collaboration, sharing groundbreaking discoveries, and fostering the spirit of inquiry. Through various events like conferences and workshops, the Faculty cultivates a culture of innovation and encourages scholars to explore new horizons.

As the Vice Chancellor of this esteemed institution, I am honoured to be a part of this academic journey. I believe that the research presented at NSA-2024 will contribute significantly to the advancement of scientific knowledge and demonstrate our commitment to addressing real-world challenges through cutting-edge research.

I extend my sincere gratitude to the Dean, Coordinator, organizing committee members, faculty staff, researchers, and all participants for their dedication and hard work in making NSA-2024 a reality. Your efforts are deeply appreciated.

I encourage all participants to actively engage in the sessions, exchange ideas, and forge connections that will undoubtedly lead to new discoveries and innovative solutions. May your research endeavours bear fruit, and may this event be a catalyst for transformative scientific knowledge.

Wish you all the very best to success this event.

Prof. V. Kanagasingam
Vice Chancellor
Eastern University, Sri Lanka

MESSAGE FROM THE DEAN

Faculty of Agriculture

Eastern University, Sri Lanka

With great pleasure I pen this message to the 6th National Symposium on Agriculture 2024 - Faculty of Agriculture, EUSL on Resilient Agriculture – A Tool for reviving Sri Lankan economy. Annual Research Symposium is an annual event of the Faculty, which is organized to disseminate research and development findings, creativity and innovations in Agriculture and related areas for the benefit of students, academia, researchers, the farming community, government, and non-government officials.

This Symposium will provide many opportunities for all Agricultural stakeholders to present research findings to an appreciative audience. I sincerely believe the experience that the presenters gain, and the partnership strengthened in participating in the research session will brighten their path to the challenging future. The proceedings of this year's symposium consists of 51 research abstracts presented in five technical sessions.

I wish to express my sincere gratitude to Prof. C.M.B. Dematawewa – Former Director, PGIA for gracing the ceremony and sharing their valuable insights.

The quality of the abstracts has been maintained by reviewing thoroughly and assessed by a panel of experienced editorial board. I would like to extend my gratitude to the Coordinator of the symposium, Editor-in-Chief of the proceedings of the 6th NSA 2024 and other committee members for their tremendous effort for the success of the symposium. As the Dean of the Faculty, I also wish to convey my sincere gratitude to the Heads of the Departments, academic, administrative and non-academic staff of the Faculty of Agriculture for extending their fullest support and cooperation.

I also congratulate the presenters and would like to place a special remark to Prof. V. Kanagasingam, Vice Chancellor of the University for his moral support and inspiration to complete the event successfully. I also would like to express my sincere gratitude to the university administrators, sponsors, and contributors for the financial assistance to meet the expenses of the symposium. I wish the 6th NSA 2024 would be a great success.

Prof. (Mrs.) P. Premanandarajah
Dean/Faculty of Agriculture
Eastern University, Sri Lanka

MESSAGE FROM THE COORDINATOR

6th National Symposium on Agriculture 2024

With great pleasure and gratitude, I convey this message in honour of the 6th National Symposium on Agriculture 2024 (NSA 2024) hosted by the Faculty of Agriculture, Eastern University, Sri Lanka. The NSA 2024, scheduled for 6th March 2024, serves as a pivotal forum for a diverse array of research communities across the nation to communicate, discuss, and exchange the latest advancements in the realm of resilient agriculture. The scientific insights shared during this event will be an invaluable source to address the country's current economic challenges. With an eye-opening keynote speech and an array of paper presentations and panel discussions, NSA 2024 aims to explore innovative approaches in the agricultural sector as a tool for reviving the Sri Lankan economy.

A significant number of research abstracts received for this symposium reflects the timely need to convene a common platform for scientists and policymakers to discuss new ideas in agriculture and associated technologies. The rigorous review process of eminent scholars facilitated the selection of compatible research findings for presentation at NSA 2024, thereby ensuring the quality of content.

I extend my congratulations to all participants for their contributions to a fruitful symposium and wish the 6th National Symposium on Agriculture every success.

Dr. M.S. Mohamed Nafees
Coordinator/NSA 2024

MESSAGE FROM THE SECRETARY

6th National Symposium on Agriculture 2024

Greetings!

The Faculty of Agriculture, Eastern University, Sri Lanka is pleased to organize its 6th National Symposium on Agriculture – 2024 (6th NSA 2024). The theme of the symposium is "Resilient agriculture – A tool for reviving Sri Lankan economy". The scope of the symposium is to provide a common platform to scientists, academics and researchers from the field of Agriculture and enable them to integrate their knowledge and experience with cutting-edge technology for regional and national development.

We have organized five technical sessions and a keynote speech. The Proceedings of the symposium carries 51 research abstracts which were refereed by subject specialists in the relevant fields.

I sincerely place on record our appreciation and gratitude to the Vice Chancellor, Eastern University, Sri Lanka and the Dean, Faculty of Agriculture for their fullest support in making this event a success. I am indebted to the keynote speaker, panel of reviewers, chairpersons and evaluation panel members of the technical sessions for their valuable time and support. The research symposium could not have been possible without the cooperation of the staff and students of the Faculty of Agriculture, Eastern University, Sri Lanka. I would like to thank all for their cooperation and dedication. I extend our gratitude to our sponsors for their valuable contributions. To summarize, I am sincerely appreciative to all who have supported us and contributed to this symposium in one way or the other.

I wish you all a fruitful research symposium.

Dr. K. Prasannath
Secretary/NSA 2024

KEYNOTE ADDRESS

6th National Symposium on Agriculture 2024

It is a great honour and privilege to deliver this keynote address on the occasion of the Faculty of Agriculture, Eastern University of Sri Lanka staging its National Symposium on Agriculture (*NSA-2024*) for the sixth time consecutively. In an era which is destined to be recorded in history as one of the most challenging for Sri Lankan agriculture and economy, it is quite timely and appropriate that *NSA-2024* symposium is staged under the broad theme "*Resilient Agriculture – A tool for reviving Sri Lankan economy*", where many key aspects of resilience in the field of agriculture are conferred in parallel research sessions; such as climate smart agriculture, crop production technology, farm mechanization, food and nutrition, ICT and geospatial technology, precision agriculture, livestock and fisheries, soil and water, environment and waste management, food and environmental economics and agricultural extension. Hence it is deemed appropriate that the keynote address opens the floor with a prelude to the general concept of resilience in the context of agriculture. I strongly envisage the fruitful scientific deliberations spring out thenceforth from the unique findings of *NSA-2024* would be immensely beneficial for expanding the knowledge horizons of academics, agriculture professionals, students and general public on moving Sri Lankan agriculture towards ensuring resilience, and even for policy makers to make necessary changes towards reviving the national economy of Sri Lanka.

Three Pillars of Resilience

With the ever changing global challenges for food security and environment, *Resilient Agriculture* has become a universal theme and focus not only among developing countries but the developed world as well, though perceived in their own volitions. In general, resilience in agriculture focuses on the crucial ability of a farming system to withstand shocks and recuperate, and adapt to diverse challenges such as climate and weather changes, pest and disease outbreaks, and market fluctuations. Resilient agrifood systems are considered to rest on three core pillars namely economic, environmental and, social and community, where failure of one pillar would collapse the whole system. Farmers across the globe engage in agriculture with a passion as providers of food for the nation, while shouldering the inherent responsibility of generating sufficient income to support their families. Not only farmers and local community, often the distant consumers who demand certain products are also counted as part of the social and community pillar and can be influential in regulatory policy making and gaining government support. Complex scenarios could also arise where certain environments that constrain resilience to economic and social challenges would enhance resilience to sudden ecological changes, which would demand assessment methods of overall resilience of farming systems to be more sophisticated.

Three key aspects are often discussed when we compare resilience of farming systems which are persistence or robustness, adaptability and transformability. Although they sound somewhat similar (with contested interpretations of their boundaries), persistence deals with the ability to handle short-term challenges such as a sudden but short-term drop of crop and livestock prices, which can be handled by setting up adequate financial reserves. In contrast, adaptability refers to the ability to make larger changes to your enterprise to keep the operation profitable over the long run such as adding an irrigation component to sustain droughts or a new drainage system to cope with heavy rains and floods. Finally, transformability demands much larger changes in the enterprise such as adding a new crop or livestock component to the farming system to substitute or supplement the current

enterprise or introducing a renewable energy component. Such major transitions to new technologies and activities demand farmers to move outside their comfort zones.

Achieving Resilience in Agriculture

Global agriculture has the unwritten massive responsibility of feeding the increasing world population of 9.9 billion by 2050 with affordable and healthy diets in a resilient and sustainable manner. At present, nearly 80 percent of the poor live in rural areas of the world and many have adopted farming for their livelihood. Hence the World Bank speculates that agriculture development itself could reduce poverty of 75 percent of the world's poor, where developing countries have to take the major initiative regardless of their economic and political turmoils. Diverse suggestions and strategies have been proposed and implemented in global arena towards achieving resilient agriculture which would vary greatly depending on the type of threat and food system of the country, however, some threats and options are discussed in greater commonality. Resilience to pest and disease outbreaks is often discussed as a very common topic and implementation of diversified cropping systems and integrated pest management are often suggested as an alternative implementation strategy. Loss of soil health due to various issues such as erosion, over-use of land and inadequate replenishment with organic matter, is also often considered as a threat to sustainability and resilience. Management practices such as organic agriculture, cover cropping and minimum or zero tillage have been reported to be successful in some scenarios. Water scarcity is a greater issue in many rainfed systems but also often encountered in irrigation schemes while floods also causing substantial damage in some farming scenarios. Hence a wide array of improvements in water management strategies are proposed such as rainwater harvesting and increasing efficiency of irrigation methods. In parallel, development of drought-resistant crops and precision agriculture tools are also in the top of the list of climate-smart technologies.

Human component of resilience in agriculture is also emphasized in social science and psychology arenas. The mental and economic stresses that farmers undergo with sudden changes in demand and supply of agricultural products due to sudden changes in import and export policies, drastic weather changes that destroy their meager economic reserves, discernible vulnerability of farmers which affects the social and community component such as reluctance of youth to engage in farming are also key aspects of resilience of the industry. Strengthening of collaborations among farmers, local communities and researchers, and development of an interactive culture to share knowledge and best practices are often recommended towards building resilient agriculture. Crop insurance facilities and government involvement in providing incentives, loans, subsidies, regulation of market fluctuations, bringing in long lasting farmer protection policies, and state support during disasters also are found to alleviate the vulnerability of farmers.

Agriculture and Climate Change

Global climate change poses pressing challenges in different forms for the agriculture and allied sectors depending on the location and agrifood system of the country. Most agrifood systems are extremely vulnerable to climate change, yet at the same time they are considered as significant contributors to greenhouse gas (GHG) emissions. Agrifood sectors are estimated to contribute to about 34 percent of total GHG emissions of the world through various ways such as deforestation, soil and nutrient management, livestock production, food loss and waste generation. As a beacon of hope, concepts such as green agriculture and climate smart agriculture have evolved exponentially during recent times with the aim of moving towards resilient agriculture mitigating its impact on climate change. For example,

climate smart agriculture evolved as a holistic approach integrating three key pillars: mitigation of greenshouse gas emissions, adaptation to climate change impacts, and ensuring food security. It can leverage existing scientific knowledge, technological advancements as well as traditional wisdom to optimize resource use, enhance productivity and resilience in the face of changing climatic conditions. Diverse paths of climate smart agriculture are blooming and flourishing everyday with the efforts of scientists and local communities where most such stories are available online (open access) for scholars, adapters and policy makers.

Genomic Selection for Climate-smart Plants and Animals

Improving productivity per unit land area reduces the need for deforestation and further expansion of agricultural lands to feed the growing nations. Improving the genetic potential of plants and livestock to reach their maximum productivity by minimum use of inputs would minimize the fuel, energy and other needs helping mitigation of climate change. Traits such as heat tolerance, resistance to wind and flood damages, and pest and disease resistance in plants could be improved through intense genetic selection and optimal incorporation with indigenous varieties using novel technology and specifically designed breeding programs. Methane emission is often branded with intensive and extensive rearing of livestock regardless of the country. Mass selection of livestock for low methane emissions requires testing of many animals in exclusively prepared chambers, which has its own practical limitations. Genomic technology exists now to initially test a diverse set of animals in such chambers to measure their emissions one time precisely and relate those phenotypic data to their genomic DNA differences and to detect exact single nucleotide polymorphism (SNPs) differences that are associated with the reduction of GHG emissions in animals. Subsequently, the SNP information obtained from the DNA extracted from a drop of blood of a new born animal is sufficient to predict the future GHG emission level produced by the animal when it becomes an adult. This enables testing of animals in large scale early ahead for genetic selection without having to test them individually for GHG emissions. In addition to genomics, the molecular biology field has now evolved to proteomics and metabolomics fields helping production of genetically resilient plants and animals.

Towards Climate-Smart Agriculture in Sri Lanka

Agriculture remains a crucial sector in Sri Lanka supporting livelihoods of at least 1/3rd of the population directly or indirectly, although its direct share in the national GDP (< 10 %) does not indicate the underlying greater picture. With diverse agro-climatic zones, the island also encounters multifaceted challenges stemming from erratic weather patterns, soil degradations and vulnerability to extreme events like floods and droughts which clearly indicate the need for swift adaptation of climate smart agriculture practices. The recent cataclysmic events such as covid-19 crisis, easter attacks, collapse of tourism sector and critical changes in agricultural policies had boosted the cascading detrimental effects on all aspects of national economy of Sri Lanka, where agriculture was no exception. In spite of all deterrents in the past, Sri Lanka has slowly but steadily moved towards climate smart agriculture and resilience.

Sri Lanka has already ratified the United Nations Framework Convention on Climate Change in 1993 and two national communications afterwards in 2000 and 2011. Currently, The National Environmental Policy (2003), The National Climate Change Policy (2012), The National Climate Change Adaptation Strategy (2011-2016), Action Plan for *Haritha Lanka* Program (2009), The Roadmap for Disaster Risk Management (2005), and The National Policy on Air Quality Management (though not directly involving agriculture) are

some key policy and planning instruments under the national strategies towards climate smart agriculture. Many other government policies, particularly involving agriculture, livestock and fisheries, also have associations with climate smart agriculture. Currently a long list of governmental institutions, private industries and NGOs are directly and indirectly working towards climate smart agriculture initiatives.

To a great extent, preservation of genetic diversity of indigenous crop varieties and native livestock, which have adopted to local environmental stresses over centuries, has taken place in Sri Lanka. The Department of Agriculture maintains crop germplasm collections and carries out systemic crop comparison programmes in different agro-ecological regions. Current climate-resilient rice and other crop varieties of the country have effectively helped household and national food security. Efforts on improving land productivity and soil health are evident with use of agro-ecologically adopted, short-duration crop varieties as well as with perennial cropping systems. Carbon sequestration and reduction of GHG emissions are seen with crop and animal integration systems, manure utilization and government efforts to reduce chemical inputs. However, more efforts are required at policy level and with farmer education on judicious use of combination of chemical and organic fertilizers and nutrient management. Gradual reduction of synthetic fertilizers over the years is known to have the potential to reduce its share in agricultural emissions.

Sri Lankan homegardens, being diverse in form across the country, are typical examples of crop diversification, agroforestry systems, soil conservation techniques such as mulching and thatching, rainwater harvesting and micro-irrigation, particularly with major involvement of women, leading to climate resilience ensuring poverty alleviation and food security in rural households throughout the year. Water sanitization, soil degradation and erosion are emphasized in food crops such as potato and export crops as in tea plantations. However, a tremendous potential exists to expand those best climate smart agriculture practices further to all farming systems across the island.

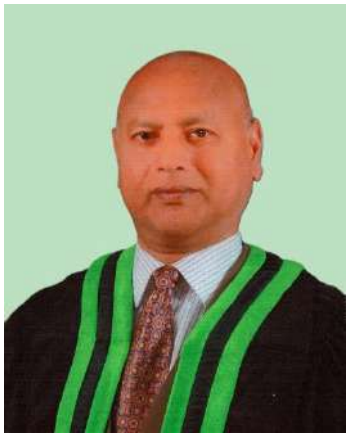
Institutional support to Sri Lankan farmer communities is immensely valuable in many crucial aspects, in the process of moving towards climate smart agriculture, such as providing seasonal climate forecasts, improving coordination among institutes and farmer communities, facilitating new and indigenous knowledge sharing platforms with latest technology, guaranteeing market share and fair trade, expanding crop insurance and disaster management efforts. Training of farmers either by the state sector (extension services) or private sector industries on modern agricultural techniques is essential for their successful adaptation. Providing farmers the access to and skills in handling climate and market information, and getting them involved in knowledge-sharing platforms foster informed decision-making and promote entrepreneurship among farmers enabling them to explore new economic opportunities such as green businesses. Such sustainable ventures include renewable energy integration, sustainable value chains and agro-eco-tourism initiatives. Venturing into innovative green businesses by the farmer community depends on the economic security and assurance of the conducive environment provided by the government authorities for safe implementation. Financial incentives by the government or private sector are also very useful in adopting sustainable farming methods and climate resilient technologies such as precision farming tools, remote sensing and climate information services. Community engagement and involvement of all stakeholder parties for knowledge and resource sharing can be ensured by fostering collaborations between government agencies, universities, research institutes, private sector industries, NGOs and farmer communities.

Ladies and Gentlemen,

Finally, it is evident that climate smart agriculture provides a tangible and time tested opportunity for Sri Lanka to embrace in harnessing the affordable and effective technology, promoting innovations and green business ventures, and engaging all stakeholder communities in ensuring a more climate resilient future with long term food security and prosperity. As mentioned previously, by glancing through the range of research studies of the NSA-2024 lined up under the broad theme of resilient agriculture, I am certain that many fruitful deliberations ignited upon the scientific outcomes would lead to many valuable conclusions and resolutions that would end up in future policy development and implementations helping Sri Lanka to chart a course towards a climate resilient future and prosperity for generations to come.

Thank you very much for the opportunity given for me by the Organizing Committee to set the stage for the upcoming presentations in numerous areas of resilient agriculture and congratulations are due for the Committee on organizing the NSA-2024 in a very professional manner. I hope the budding researchers, academics and professionals presenting their papers today would gain a memorable knowledge-sharing experience through the conference and wish the NSA-2024 a grand success.

Prof. C.M.B. Dematawewa
Former Director (2017-2024)
Postgraduate Institute of Agriculture
University of Peradeniya



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CROP PRODUCTION TECHNOLOGY

IMPACT OF *Rhizobium* INOCULATION ON THE GROWTH, YIELD AND NODULATION OF GROUNDNUT (*Arachis hypogaea* L.) VARIETIES

T. Banusha*, L. Pradheeban and K. Thanusan

Department of Agronomy, Faculty of Agriculture, University of Jaffna

Abstract

An experiment was conducted to assess the impact of rhizobium inoculation on the growth, yield and nodulation of groundnut varieties at the Faculty of Agriculture, Ariviyal Nagar, Kilinochchi from March to August 2023. Two factor factorial experiment was conducted in Randomized Complete Block Design (RCBD) with three replicates. Different percentage of inoculation such as control without inoculation (T_1), recommended rate (10 mL *Rhizobium* – 1 L of water) (T_2), and 50% percentage more than the recommended rate (15 mL *Rhizobium* – 1 L of water) (T_3) were used as treatments denoted as factor 1 and three groundnut varieties such as Tissa (V_1), ANKG2 (V_2) and ANKG3 (V_3) were used as factor 2. Total number of nodules, number of active nodules (Active nodules = Total nodules – Inactive nodules), growth and yield parameters were recorded. Shelling percentage was also calculated to find the significant difference among the treatment combinations. ANOVA was performed to determine the significance of the treatments. The means were separated using Duncan's Multiple Range Test at p=0.05. Fresh weight of pods per plant, dry weight of pods per plant, 100 pods weight and 100 seed weight were highest in T_2 (recommended rate of inoculation) than the other treatments and among the varieties, ANKG2 (V_2) variety showed the highest performance. The highest shelling percentage was observed in ANKG2 (V_2) variety under the T_2 and it was 80%. The highest yield was obtained from the recommended rate of inoculation (T_2) in each variety and among the varieties, ANKG2 gave the highest yield. It can be concluded that inoculating recommended rate of inoculum (T_2) to ANKG2 variety is ideal treatment combination to obtain the highest yield from groundnut in Kilinochchi District.

Keywords: Groundnut varieties, Nitrogen level, *Rhizobium* inoculation, Shelling percentage, Yield

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EFFECT OF GREEN SYNTHESIZED ZINC OXIDE NANOPARTICLES USING *Mimosa pigra* LEAF EXTRACT ON ROOT GROWTH OF TOMATO (*Solanum lycopersicum*) SEEDLINGS

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[3]*Department of Botany, The Open University of Sri Lanka, Nawala, Nugegoda, Sri Lanka*

Abstract

Zinc is an essential micronutrient for plant growth however, its limited bioavailability in soil limits crop productivity. Zinc oxide nanoparticles have emerged as a promising alternative to conventional zinc fertilizers due to their enhanced solubility and nutrient delivery efficiency. This study investigates the effect of ZnO NPs synthesized using a green synthesis method employing *Mimosa pigra* leaf extract as a bio-reductant, stabilizer, and capping agent on seedling root growth of the tomato (*Solanum lycopersicum*). Synthesized ZnO NPs were characterized using UV-visible spectrophotometry and scanning electron microscopy, confirming the formation of nanoparticles with an average size of 81 nm. Effects of different ZnO NPs concentrations (0, 1, 5, 10, 50, 100, 500, and 1000 ppm) on seedling root growth were evaluated under laboratory conditions. Results revealed a significant influence of ZnO NPs on root growth. Seedling root length was significantly affected by ZnO NPs application. The optimal concentration for enhancing root growth was determined to be 10 ppm. At this concentration, ZnO NPs promoted enzymatic and metabolic activities, leading to enhanced cell growth and overall seedling development. Beyond 10 ppm, increasing ZnO NPs concentrations resulted in a gradual decline in root length. This is likely attributed to the stress response induced by higher concentrations. Overall, the study demonstrates the beneficial effects of ZnO NPs synthesized using *Mimosa pigra* leaf extract on tomato seedling root growth. The optimal ZnO NPs concentration of 10 ppm holds promise for improving tomato seedling root length and growth efficacy.

Keywords: Green synthesis, Nanoparticles, Seedling root growth, Tomato, ZnO NPs

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DEVELOPMENT OF ORGANIC POTTING MIXTURE FOR CARROT (*Daucus carota*) IN PROTECTED AGRICULTURE

M.T.S. Ayisha[1], D.M.P.S. Dissayanaka[2], S. Thanusan[1] and S. Vinujan[1]*

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Abstract

Daucus carota, commonly known as carrot, is an important vegetable crop grown and consumed in numerous countries worldwide. The carrot is a root vegetable, typically orange in colour, though purple, black, red, white, and yellow cultivars exist, all of which are domesticated forms of the carrot. This study aims to develop an organic potting mixture for in protected agriculture. The research was conducted at the Sustainable Agriculture Research and Development Center, Makandura. The experiment was carried out as a completely randomized design (CRD) with seven treatments with three replicates. The treatment was designed using T1- the Control (coir dust only), T2- Coir dust: vermicompost powder (1:1), T3- Coir dust: vermicompost powder (1:2), T4- Coir dust: vermicompost powder (2:1), T5- Coir dust: vermicompost powder: Partially Burn Paddy Husk (PBPH) (1:2:1/2), T6- Coir dust: vermicompost powder: Partially Burn Paddy Husk (PBPH) (1:2:1), T7- Coir dust: vermicompost powder: Partially Burn Paddy husk (PBPH) (2:1:1). The parameters such as height of the plant, width of the plant, number of leaves, pH, EC, N, P & K of potting media were measured. The results indicated that the significant effect of media (T3) was observed in mean plant height (21.8 cm), number of leaves (5), root length (45.6 cm), fresh leaf weight (96.7 g), and total weight (135 g). According to the findings, T3 was the most suitable organic potting media for carrot in protected agriculture. In this study, the individual usage of coir dust did not show that much improved growth and yield than the other potting media on *D. carota*. The entire research proved that the combination usage of coir dust and vermicompost improved the plant growth as well as the yield Therefore we would like to suggest to small-scale farmers and growers to prepare the potting media by using coir dust and vermicompost for the *D. carota.*

Keywords: Coir dust, *Daucus carota*, Vermicompost

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EFFECT OF FISH AMINO ACID ON YIELD OF RADISH

(*Raphanus sativus* L.)

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Abstract

Fish Amino Acid (FAA) is an organic fertilizer that promotes plant growth and enhances soil fertility and microbial activity. An experiment was carried out at Palachcholai, Eastern University, Sri Lanka to study the effects of different concentrations of FAA as a foliar application on radish yield. The experiment was conducted using a completely randomized design (CRD) with six treatments and thirty replications. The treatments were; field soil with no fertilizer (T1), field soil with recommended inorganic fertilizer (T2), field soil with 10 tons/ha compost (T3), field soil and 10 tons/ha compost with 0.5% FAA (T4), 1.0 % FAA (T5) and 1.5 % FAA (T6) sprayed 1st, 3rd and 5th week after planting. Results revealed that the application of FAA had significant differences ($p<0.05$) in yield per plant. Among the tested treatments radish yield was high in T6 and low in T1. The present study concludes that among the tested treatments, 10 tons/ha compost with 1.5% FAA would be the most suitable concentration to enhance radish yield. As it is one of the eco-friendly soil enhancers, this can be used to increase the radish yield while maintaining sustainability.

Keywords: Compost, Fish amino acid, Foliar application, Growth, Yield

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ASSESSMENT OF DIFFERENT PROPAGATION METHODS AND TRELLIS SYSTEMS ON THE GROWTH AND YIELD OF WATER SPINACH (*Ipomoea aquatica)*

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Abstract

Ipomoea aquatica is a nutritious rich leafy vegetable It is a potential crop in alleviating malnutrition in vulnerable rural people. An experiment was carried out to assess the effects of propagation methods and supporting with trellis on the commercial production of *Ipomoea aquatica.* The experiment was conducted at the Integrated Farm and Training Center, Faculty of Agriculture, University of Jaffna, Kanakarayankulam, located in the dry zone of Sri Lanka. Two propagation methods were tested with three trellis systems. The propagation methods are direct seeding (P_1) and stem cuttings (P_2), and the trellis systems are control (T_1), basket-shaped (T_2) and cylindrical shape (T_3). A randomized complete block design (RCBD) with three replicates was used to carry out the experiment. ANOVA was done using the SAS 9.1 package at α=0.05 and the mean separation was done using the Duncan multiple range test. Growth parameters measured are plant height, number of leaves, and number of branches at 1, 2, and 3 weeks after transplanting. Different propagation methods have significantly ($p<0.05$) affected plant growth and yield parameters. Considering growth parameters (plant height, number of leaves, number of branches) and yield parameters (total yield, dry matter) cutting was significantly performed well among propagation methods. Under the trellis system, considering all growth parameters (plant height, number of leaves and number of branches), and yield parameters (yield 9.50 t/ha and dry matter 1.11 g) the basket-shaped trellis system performed well among other trellis systems. The interaction was non-significant. The farmers could be advised to cultivate *I. aquatica* using the cutting as the propagation method with basket-shaped trellis made from locally available materials.

Keywords: Dry zone, *Ipomoea aquatica*, Propagation method, Trellis system

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STUDY ON GROWTH AND AGRONOMIC PERFORMANCES OF DIFFERENT CHILLI HYBRIDS FOR YIELD AND YIELD ATTRIBUTING CHARACTERISTICS

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Abstract

Capsicum annuum L., commonly known as chilli, is a distinctive and popular spice worldwide, renowned for its hot and pungent flavour. The selection and adaptation of new hybrid varieties are required to meet the national demand. This study aimed to assess the growth and agronomic performance of different chilli hybrids for yield and yield attributing characteristics. The experiment was carried out in a Randomized Complete Block Design (RCBD) with fifteen treatments having two replications. Various parameters such as plant height at 100% flowering, height at the third harvesting stage, canopy width at 100% flowering, primary and secondary branches at 100% flowering, and canopy width at the third harvesting stage were measured. Additionally, weekly observations were made on the number of pods, colour before and after ripening, fresh weight of chilli, pod length, pod width, and pod thickness. Notably, treatments T10 and T12 displayed the highest mean canopy width (63.3 cm), while T3 (20), T13 (19), and T11 (18) had the highest mean number of primary and secondary branches in the order. Treatment number 7 was identified with the highest number of pods, while T11 and T7 showed the highest dry weight (46.2 g) and the highest length of pod (7.5 cm) was found in the T12. In comparison, the results indicated that there was significant difference ($p<0.05$) among the treatments. These findings indicate that different chilli hybrids have varying effects on plant growth and pod characteristics. The results from this study demonstrate the valuable insights for optimizing the selection criteria of chilli hybrids to enhance yield and quality traits.

Keywords: *Capsicum annuum*, Growth parameters, Hybrids, Yield attributes

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EFFECT OF POTTING MEDIA FOR SPROUTING ON AIR LAYERING AND STEM CUTTING OF MORINGA (*Moringa oleifera* L.)

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Abstract

Moringa oleifera L., commonly known as Moringa or drumstick tree, is a versatile plant with a global presence. It is renowned for its exceptional nutritional value, and various value-added products derived from Moringa have gained popularity in the market. Due to the soaring demand, it has become imperative for the plants to expedite their growth process in order to alleviate the shortage in supply. This urgent need for accelerated growth aims to address the increasing demand and ensure a steady and sufficient provision of resources. So this study aimed to identify the most effective vegetative propagation method and the ideal propagation medium for Moringa. To ensure the reliability of the experiment, a single variety of Moringa plants was employed throughout the experiment. The research design involved two distinct propagation techniques: air layering, which followed a Randomized Complete Block Design, and stem cutting, executed in accordance with the Complete Randomized Design. There were three different media types, such as top soil, coir dust and sand media for stem cutting and for the air layering, topsoil, coir dust and cow dung. These media were sterilized by sun drying. They were used as treatments, with three replicates for stem cutting and two for air layering (low number of plants available in the area). Several parameters, including the number of successfully rooted stems, the number of shoots and roots, and the length of roots, were meticulously measured and analyzed by using SAS software. The data analysis indicated that the air layering method outperformed stem cutting in terms of the percentage of successful rooting. According to that the most suitable propagation method is air layering for the Moringa plant. Meanwhile, the coir dust medium exhibited superior performance in terms of root and shoot formation compared to top soil and sand media. According to the result, the best media for the Moringa is coir dust media.

Keywords: Air layering, Media, *Moringa oleifera*, Propagation, Stem cutting

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EFFECT OF UREA AND AMMONIUM SULPHATE ON GROWTH AND YIELD OF RICE (*Oryza sativa* L.)

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Abstract

Rice (*Oryza sativa* L.) is a staple crop worldwide. In Sri Lanka, rice farmers occupied approximately 34 percent (0.77 million ha) of the country's total cultivated area. Vital for its growth, rice requires ample mineral nutrients, particularly nitrogen, often supplied through urea fertilizers. However, disruptions caused by the *COVID-19* pandemic in global supply chains potentially affected urea availability. This shortage led to inflated prices, posing challenges for farmers in acquiring necessary inputs. Consequently, the cost of rice production may rise, impacting its market price in the foreseeable future. Ammonium sulfate gives plants the essential nutrients such as nitrogen and sulfur and has some potential agronomic and environmental advantages over conventional N fertilizer like urea. However, limited literature is available on the effect of ammonium sulfate on rice production in Sri Lanka. Therefore, this study was contemplated to compare the effectiveness of ammonium sulfate and urea as a source of nitrogen in rice and evaluate the efficiency of varying nitrogen sources on growth and yield parameters, along with nitrogen use efficiency. This study was conducted as a pot experiment filled with sandy regosol at the Eastern University of Sri Lanka from August to November 2022. The experiment was arranged in a Completely Randomized Design with five treatments (T1: control fertilizer, T2: urea (225 kg/ha), T3: ammonium sulfate (225 kg/ha), T4: ammonium sulfate (337.5 kg/ha), and T5: ammonium sulfate (450 kg/ha)) and four replications. The total number of tillers per plant was counted, chlorophyll content of the plant was gathered using a SPAD meter, Nitrogen Use Efficiency (NUE) was determined by a sulfuric acid and perchloric acid mixture along with the Kjeldahl method, at harvest the grain yield was determined. Minitab software (version 17) was used to analyze the collected data, and Turkey's test was used to make a mean comparison. According to the results, there were significant differences ($p<0.05$) among treatments on grain yield, tiller number, chlorophyll content, and nitrogen use efficiency (NUE). Further, it was noted that grain yield increased by 88.6% over the control treatment, and nitrogen use efficiency (NUE) increased by 53% compared to urea fertilizer. Based on the results obtained in this experiment,450kg/ha of ammonium sulfate could be used as an alternative to urea fertilizer application to increase the growth and yield of rice plant.

Keywords: Ammonium sulfate, Growth parameter, Nitrogen Use Efficiency (NUE), Urea

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INVESTIGATION ON THE EFFICIENCY OF ORGANICALLY DERIVED NUTRIENT SOLUTION FOR HYDROPONIC CULTIVATION OF LETTUCE

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Abstract

Hydroponic is a soilless culture which has been trended in recent years. Considering the detrimental impacts and higher cost of inorganic fertilizers, locally available materials could be used to produce an organic solution to cultivate leafy vegetables which has more demand among the public. Therefore, an experiment was conducted at the crop farm, faculty of agriculture, university of Jaffna to determine the efficiency of nutrient solutions that are derived from different organic resources for hydroponic cultivation. In this research, fifteen non-circulating hydroponic systems were designed and the experiments were laid out in a completely randomized design. The treatments were T1-Albert solution, T2-Glyricidia solution, T3-Azolla solution, T4-Water hyacinth solution, and T5- Fermented rice water solution. Each treatment with three replicates was studied. Ten-day-old lettuce seedlings from the nursery were transplanted in the hydroponic system and were allowed to grow for 45 days. Crop growth parameters such as length of stem, leaf number, leaf length, and leaf width were measured at 2-week intervals and the recorded data were analysed using SPSS software. According to the results highest stem length (7.18 cm) and leaf number (6) were observed in T4, while the lowest values were recorded in T3 as 3.83 cm and 4.33 respectively. The maximum leaf length of 11.4 cm and widest leaf width of 7.18 cm were found in T1, whereas T5 showed the lowest values of 4.02 cm and 2.67 cm respectively. Based on the study, Albert solution performed well in terms of leaf length and width. However, considering the availability, cost effectiveness and the highest number of leaves and the stem length, it is concluded that the water hyacinth solution is the suitable organic nutrient solution which can improve the growth of lettuce and reduce the cost of hydroponic lettuce cultivation.

Keywords: Albert solution, Cost effectiveness, Hydroponic cultivation, Lettuce, Organic sources

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DIFFERENT COMBINATIONS OF JEEWAMIRTHA AND COMPOST ON GROWTH AND YIELD OF COWPEA (*Vigna unguiculata* L.)

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Abstract

Cowpea (*Vigna unguiculata* L.) is a widely cultivated legume crop in Sri Lanka as it is a popular source of protein in the local diet. Owing to the various environmental impacts and high cost of cultivation caused by synthetic fertilizer, there is a need to find out alternative nutrient sources to be used in cowpea cultivation. Being a crop that has the ability to fix atmospheric nitrogen, there is a potential for the application of organic liquid fertilizer such as *Jeewamirtha* to improve the growth and yield of cowpea as it is a rich source of organic nutrients and beneficial microorganisms. In the present study, a polybag experiment was conducted at a home garden in Moratuwa, Sri Lanka, to investigate the effects of different combinations of *Jeewamirtha* and compost on growth and yield parameters of *Vigna unguiculata* L. (variety *Waruni*) during the period of July to September 2021. The experiment was arranged in a Complete Randomized Design (CRD) with 6 treatments and 10 replicates as; Control - without any fertilizer (T1), 100% *Jeewamirtha* (T2), 75% *Jeewamirtha* + 25% compost (T3), 50% *Jeewamirtha* + 50% compost (T4), 25% *Jeewamirtha* + 75% compost (T5) and, 100% compost (T6). *Jeewamirtha* was prepared and diluted 10 times with water before application and was used within 5 days of preparation. Soil application of *Jeewamirtha* and compost to the crops was started 2 weeks after planting (WAP) cowpea and was done once in every two weeks' time. The results showed that at 10 WAP, T3 produced a higher plant height (22.35%), shoot dry weight (43.03%), root dry weight (40.90%) and, tap root length (28.80%) compared to the control. At 42 days, T3 had the shortest ($p<0.05$) duration for 50% flowering, producing 75% more flowers per plant compared to the control. Remarkable ($p<0.05$) 48.0 number of root nodules were present in T3 with an increased percentage of 31.14% compared to the control. T3 continued to remain significantly high ($p<0.05$), producing 37% more pods per plant compared to the control, representing the highest yield (1.11 tons/ha) among the treatments. In conclusion, the results of this experiment revealed that the application of 75% *Jeewamirtha* with 25% compost to soil achieves a higher growth and yield in cowpea and therefore can be recommended for cowpea cultivation in an environmentally friendly manner excluding the use of synthetic fertilizers. It is also possible to produce *Jeewamirtha* on a large scale due to the cost-effectiveness and on-farm availability of its ingredients.

Keywords: Beneficial microbes, Natural fertilizer, Yield

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INVESTIGATION ON EFFECTIVENESS OF DIFFERENT ORGANIC GROWING MEDIA ON THE GROWTH AND DEVELOPMENT OF SELECTED LEAFY VEGETABLES UNDER HYDROPONIC SYSTEM

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Abstract

Hydroponic cultivation is gaining popularity due to efficient resources management and quality food production. In general, different inorganic media are being used in hydroponic cultivation. This study aimed to investigate the effectiveness of organic media for hydroponic cultivation. Leafy vegetables such as *Amaranthus cruentus* and *Lactuca sativa* were selected for this study and planted in four different growing media namely coir dust, pine cones, ground nut shell and combination of pine cone and ground nut shell. Further, Albert solution and vermi wash were used as nutrient solutions. The different treatments were designed by combining nutrient media and growing media (Treatment 1-Albert+ coir dust, T2-Albert+ pinecone, T3-Albert+ groundnut shell, T4-Albert+ 50% pinecone +50% groundnut shell, T5-Vermiwash+ coir dust, T6-Vermiwash+ pinecone, T7-Vermiwash+ groundnut shell and T8-Vermiwash+ 50% pinecone +50% groundnut shell). The experiment was laid out in a completely randomized design with eight treatments and each treatment had three replicates. The plant height, number of leaves, chlorophyll content and fresh weight were measured and the data were analyzed using Minitab. The study revealed that the plant height, number of leaves and fresh weight are higher for the combination of pine cones and Albert solution in both plants. In contrast, the combination of coir dust and vermi wash had the lowest values for all the measured parameters. On the other hand, the chlorophyll content was higher in the combination of vermi wash and pine cone while the lowest value was observed for the combination of Albert solution and coir dust. With all such analysis, it is possible to conclude that the pine cones and Albert solution combination as the best medium for hydroponics cultivation.

Keywords: Albert solution, Nutrient medium, Pinecone, Plant height, Vermiwash

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EFFECTS OF *JEEWAMIRTHA* AND MODIFIED J*EEWAMIRTHA* ON THE GROWTH AND YIELD OF GREEN GRAM (*Vigna radiata)*

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Abstract

Vigna radiata, popularly known as Mung bean belongs to family Fabaceae. The excessive and unnecessary use of inorganic fertilizer in agriculture cause harmful effects to the environment and living organisms. Due these adverse effects and high cost of chemical fertilizer there is a requirement for alternative low cost and harmless fertilizer which have the potential to provide the necessary nutrient requirement of crops. *Jeewamirtha* is one of the important organic liquid fertilizers that can be used to replace the synthetic fertilizers. A pot experiment was conducted at the crop farm of Faculty of Agriculture, Eastern University of Sri Lanka during August to November 2023, to investigate the effects of *Jeewamirtha* and modified *Jeewamirtha* on the growth and yield of *Vigna radiata.* The experiment was laid out in a Completely Randomized Design with five treatments and five replicates as; T1 (*Jeewamirtha*), T2 (Modified *Jeewamirtha* 1- *Jeewamirtha* + *Gliricidia* leaves), T3 (Modified *Jeewamirtha* 2- J*eewamirtha* + Poultry manure), T4 (Modified *Jeewamirtha* 3- *Jeewamirtha* + Wild sunflower leaves), T5 (Control - Department of Agriculture recommended fertilizer). All the agronomic practices were done according to the recommendation of Department of Agriculture, Sri Lanka, except fertilizer application which was done according the different treatments. Measurements of shoot dry weight, total yield and 100 seed weight were collected and data were statistically analyzed using Minitab 17 statistical software and mean separation was performed by Tukey's test at 5% significant level. In this experiment, no significant differences ($p>0.05$) were observed among the shoot dry weight, total yield and 100 seed weight. Accordingly, it could be concluded from this study is that the use of inorganic fertilizer, *Jeewamirtha* or modified *Jeewamirtha* have the same effect on the growth and yield of *Vigna radiata*. Therefore, the production of *Vigna radiata* by using *Jeewamirtha* or modified *Jeewamirtha* organic liquid fertilizer instead of inorganic fertilizer will be an economically and environmentally friendly way of crop production.

Keywords: *Jeewamirtha*, Modified *jeewamirtha*, Wild sunflower, Liquid fertilizer, *Vigna radiata*

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OPTIMIZING TOMATO GROWTH BY PARTIALLY SUBSTITUTING CHEMICAL FERTILIZER WITH SEAWEED EXTRACT

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Abstract

Sri Lanka is endowed with a rich and abundant biodiversity of seaweeds along its coastal line, out of which certain species such as *Padina antrillarum* and *Sargassum crassifollium* have been identified through numerous research, to have the potential to partially replace synthetic fertilizer use in agriculture. In the present study, we conducted a poly bag experiment at the crop farm of Faculty of Agriculture, Eastern University, Sri Lanka to examine the effects of foliar application of seaweed extracts (SWE) made from *P. antrillarum* and *S. crassifollium* combined with the soil application of different doses of chemical fertilizers (Urea, Triple Super Phosphate, Muriate of Potash) as recommended by the Department of Agriculture (DOA) Sri Lanka, on the growth performance of the tomato (*Lycopersicon esculentum*) variety '*Rajitha'*. The experiment was arranged in a 2 × 4 Factorial Completely Randomized Design with 8 treatments and 3 replicates; 20% (v/v) *S. crassifollium* + 100% DOA recommendation (T1), 20% *P. antrillarum* + 100% DOA recommendation (T2), 20% (v/v) *S. crassifollium* + 75% DOA recommendations (T3), 20% (v/v) *P. antrillarum* + 75% DOA recommendation (T4), 20% (v/v) *S. crassifollium* + 50% DOA recommendations (T5), 20% (v/v) *P. antrillarum* + 50% DOA recommendation (T6), 20% (v/v) *S. crassifollium* + 25% DOA recommendation (T7) and 20% (v/v) *P. antrillarum* recommendation + 25% DOA recommendation (T8). The results showed that the application of 20% (v/v) *S. crassifollium* + 25% DOA recommendation (T7) showed the highest leaf area (1292.69 cm^2), root fresh weight (12.42 g) and root dry weight (2.89 g), at 10 Weeks After Transplanting (WAT) tomato seedlings. T7 also showed significantly higher values in the leaf chlorophyll content at 8 WAT (41.16), number of leaves at 10 WAT (46) and shoot dry weight at 10 WAT (15.15 g). In addition, the application of only 25% of the recommended amount of chemical fertilizer brings about a reduction in the cost of cultivation of tomato. Considering the main factors of the experiment, application of *S. crassifollium* SWE produced a higher leaf area (25.5%) and root dry weight (28.9%) compared to *P. antrillarum* SWE. Moreover, application of 25% DOA recommendation produced a higher number of leaves (20.8%), root fresh weight (85.4%) and root dry weight (85.4%) compared to 100% DOA recommendation. Therefore, it can be concluded from this study that the foliar application of 20% (v/v) *S. crassifollium* SWE combined with the soil application of 25% of DOA recommended chemical fertilizer could be used for the cultivation of tomato var. '*Rajitha*' in order to enhance the vegetative growth of the crops and to reduce the use of chemical fertilizer in agriculture.

Keywords: Growth parameters, Liquid seaweed extract, *Padina*, *Sargassum*, Tomato

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CROP PROTECTION TECHNOLOGY AND BIOTECHNOLOGY

EVALUATION OF *IN VITRO* ANTIFUNGAL ACTIVITY OF DIFFERENT PLANT EXTRACTS FOR THE INHIBITION OF *Colletotrichum gloeosporioides*, CAUSING BANANA ANTHRACNOSE

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Abstract

At present, there is a widespread requirement for environment–friendly approaches to the production of quality and healthy food to ensure food security and sustainability in agriculture. Efforts are underway for sustainable crop production with organic fungicides and botanicals from natural resources to reduce the usage of synthetic fungicides to control postharvest diseases. The present study evaluated the efficacy of different plant extracts on the inhibition of *Colletotrichum gloeosporioides*, a fungus causing banana anthracnose. The selected plant extracts, such as *Piper longum*, *Acorus calamus*, *Allium sativum* and *Citrus limon,* were investigated in this experiment along with a control. The experiments were laid out in a Completely Randomized Design. Mycelial inhibition percentage was recorded eight days after inoculation. The findings showed that *A. calamus* exhibited the highest mycelial inhibition percentage (100%) among the plant extracts tested. Further, the least concentration of methanolic *A. calamus* extract for complete inhibition of *C. gloeosporioides* was 2%. Therefore, *A. calamus* could be used as an alternative to synthetic fungicides to combat *C. gloeosporioides* infection on banana. Hence, this treatment could be an ecologically acceptable non-fungicidal approach for managing postharvest anthracnose disease of banana.

Keywords: *Acorus calamus* extract, Garlic extract, Lemon extract, Mycelial inhibition percentage, *Piper longum* extract, Postharvest disease

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PREPARATION OF ALTERNATIVE CULTURE MEDIA FROM NATURAL PLANT SOURCES FOR CULTIVATION OF *Botrytis cinerea*

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Abstract

This study was conducted to find out the best alternative, cheap solid culture media derived from plant products for the cultivation of *Botrytis cinerea* instead of the potato used in routine microbiological studies. The selected plant-based alternative nutrient media, namely cowpea media, mung bean media, maize media, and lentil media, were investigated in this experiment along with the natural Potato Dextrose Agar (PDA) media as the control. The experiment was arranged in a Completely Randomized Design with five treatments and four replicates. Treatment effects were determined by analysis of variance. The effects of different culture media on mycelial growth and conidia production were evaluated. The results revealed that the lentil media significantly ($p<0.05$) increased the rate of mycelial growth and conidia production. Further, there were no significant differences between lentil- and potato-based media in colony growth and conidia formation. Also, the cost of production of the lentil media was lesser than that of natural PDA media. The findings suggest that the lentil-based nutrient medium could serve as a better alternative medium for culturing *B. cinerea* fungus.

Keywords: Alternative culture media, *Botrytis cinerea*, Plant-based nutrient media, Protein-rich plant sources

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EXPLORING THE POSSIBILITY OF USING ANTITRANSPIRANTS TO MINIMIZE THE EFFECT OF MOISTURE STRESS ON GROWTH OF MAIZE

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Abstract

Maize is a prominent cash crop among the Sri Lankan farmers in the dry zone. However, its productivity has decreased mainly due to the effects of climate variability. Intermittent dry spells during the cropping period negatively affect its growth. Therefore, exploring alternative measures to mitigate the impact of drought is important to expand maize production in Sri Lanka. Thus, a study was undertaken to optimize the maize growth and yield using anti-transpirants under moisture stress conditions. The experiment was conducted using a factorial split-plot design assigning moisture stress in the main plots and anti-transpirants with different concentrations in the subplots. The main factor (moisture stress) consisted of four levels in different durations of maize crop growth (No moisture stress throughout the crop growth, from germination to tasseling, from tasseling to harvesting, germination to harvesting). The sub plot factor consisted of 5 levels where 2 anti-transpirants (Salycilic acid and Kaolin) were applied in 2 concentrations (100, 200 ppm of Salycilic and 5, 10% of Kaolin) and water as the control. The results showed that the interaction effects of moisture stress and anti-transpirant application were not significant in all measured parameters. Spraying the anti-transpirant had no significant effect on all measured parameters. Moisture stress had a significant effect on plant height, chlorophyll content, leaf area, dry weight, number of days to 50% tasseling, and root length. Plant height has decreased by moisture stress when imposed from germination to harvest. Root length significantly increased with increasing moisture stress. It was also observed that the moisture stress had not positively or negatively influenced root area and root diameter. However, it is suggested to test other anti-transpirants to explore possible effects on the crop under moisture stress.

Keywords: Antitranspirant, Kaolin, Moisture stress, Salicylic acid, *Zea mays*

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MOLECULAR DISCRIMINATION OF *Rhinacanthus* SPECIES USING *rbcL* MARKER

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Abstract

Rhinacanthus is an important genus belonging to the family Acanthaceae and possesses valuable medicine properties used in traditional medicine for diverse therapeutic purposes. Some species of this genus are endemic to Sri Lanka, emphasizing the urgency of accurate identification for their conservation and future utilization. Therefore, this study aimed to categorize *R. flavovirens* from *R. nasutus* at the molecular level using the *rbcL* gene in the chloroplast. The genomic DNA from *R. flavovirens* leaves was extracted using optimized CTAB protocol and quality DNA was obtained for polymeric chain reaction (PCR). The PCR was performed using a universal primer targeting the chloroplast *rbcL* region (*rbc*L-BF and *rbc*L-724R) and the PCR product was subsequently subjected to Sanger sequencing. The obtained *rbcL* sequence for the *R. flavovirens* was deposited in GenBank under accession no. OQ181218. A comparative analysis was conducted by aligning the *rbc*L sequence of *R. flavovirens* with sequences of *R. nasutus* retrieved from GenBank (accessions GQ436493.1, LC461831.1, and KF381120.1). Results revealed only two variable sites differentiating these two species for *rbcL* marker. The smallest pairwise distance (0.0095) was observed between *R. flavovirens* and *R. nasutus* accessions GQ436493.1 and LC461831.1. While phylogenetic analysis indicated a sister relationship between *R. flavovirens* and *R. nasutus* vouchers, the complete phylogeny of *Rhinacanthus* species could not be fully resolved. Overall, our results indicated that the universal *rbcL* primer we used to be not enough to categorize *R. flavovirens* from its close relative *R. nasutus.* Future studies should explore additional molecular markers to achieve a more accurate delineation of *Rhinacanthus* species. These findings will contribute to understanding of the genetic diversity within this genus, aiding in effective conservation and sustainable utilization of these medicinally significant plant species.

Keywords: Endemic, CTAB, phylogenetic relationship, *rbcL*, *Rhinacanthus flavovirens, Rhinacanthus nasutus*

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POTENTIAL USE OF PLANT EXTRACT FORMULATIONS TO MANAGE CABBAGE RING SPOT PATHOGEN UNDER *IN VITRO* CONDITION

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Abstract

The cabbage leaf spot disease causes great destruction to cabbage cultivation in the up country wet zone in Nuwara Eliya District in Sri Lanka. The disease is controlled by chemical fungicides, which cause many negative environmental and health effects. Bio controls of the pathogens by natural antifungal extracts are considered as desirable alternatives. However, in Sri Lanka, no any positive attempts have been explored yet to find the potential use of plant extracts as bio-fungicides against the cabbage leaf spot disease. Therefore, this study was carried out to identify the causative agent of cabbage leaf spot and to evaluate the potential effect of plant extract formulations to manage this pathogen under *in-vitro* conditions. Pathogen was isolated from leaf spot-infected cabbage leaves and identified by morphological and molecular procedures. Pathogenicity test was conducted to confirm the pathogen. Four concentrations of three plant extract formulations, namely clove (*Syzygium aromaticum*), nutmeg (*Myristica fragrans*) and a mixture of clove and jasmine (*Jasminum* sp.) were tested under *in vitro* conditions using food poisoning technique. The concentrations of the original formulation were identified as 10% of clove, 5% of jasmine and 5% of nutmeg. Colony diameter was measured at 3, 5 and 7 days after inoculation of the pathogen and inhibition percentage was calculated. Pathogen was identified as *Alternaria tenussima* and confirmed through pathogenicity test. Among the tested plant extract formulations, clove with jasmine at the concentration of 50 µl/10ml of PDA from the original formulation showed the potential to inhibit the pathogen growth, followed by clove formulation with the concentration 50 µl/10ml of PDA. The lowest inhibition was recorded by nutmeg formulations that failed to inhibit the pathogen under *in vitro* conditions.

Keywords: Cabbage leaf spot disease, Clove, Jasmine, Nutmeg

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IN VITRO SCREENING OF SELECTED FUNGICIDES AGAINST BLACK LEAF SPOT PATHOGEN OF OKRA

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Abstract

Okra is one of the major vegetables which gets a significant place in Sri Lankan cuisine. Okra is susceptible to various diseases. In that way, Okra black leaf spot disease is one of the major diseases of okra which is caused by the fungal species *Cercospora abelmusachi*. The severe infection of black leaf spot disease in okra harms the plant and reduces okra yield. To get rid of this issue farmers apply various fungicides that are available in the commercial market. Sri Lankan farmers follow a malpractice called cocktail application of fungicides where they apply a mixture of commercially available fungicides for disease control without knowing the harmful impacts on the environment and human health. This experiment was carried out to find the most effective fungicides against black leaf spot pathogen *in vitro*. The experiment was initiated with the isolation of okra black leaf spot pathogen from the infected leaves and was cultured on potato dextrose agar (PDA) media. Afterwards, the PDA culture media received various fungicide treatments. In this experiment, the treatments were mancozeb 80% WP (0.4 g/200ml), thiram 80% WP (0.25 g/200ml), homai (thiophanate-methyl 50% + thiram 30%) (0.2 g/200ml), and sulfur 80% (1 g/200ml), with PDA without fungicide serving as the control. Five treatments and four replicates were used in a completely randomized design for the experiment. The findings indicated that under *in vitro* conditions, both mancozeb and homai fungicides entirely halted the colony growth of the pathogen. Consequently, it was deduced from this study that the fungicides, mancozeb and homai, could exhibit efficacy in managing the okra black leaf spot fungus at the recommended rate of application.

Keywords: *Cercospora,* Fungicides, Homai, Leaf spot, Mancozeb, Okra

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IMPACT OF DIFFERENT PRE-WEEDING CONTROL METHODS ON *Centella asiatica* L. (GOTU KOLA) CULTIVATION

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Abstract

Gotu kola (*Centella asiatica* L.) is one of the notable leafy vegetables of Sri Lanka. From ancient times on, it has been widely used for its distinct flavour, therapeutic value and nutritive value, particularly iron. Therefore, it has strong market demand. The emergence of the weed is a vital impediment to *C. asiatica* cultivation, which reduces growth and yield while generating laborious and expensive weed management techniques. The current study was conducted to evaluate the performance of different pre-weeding approaches to address this problem. Five different pre-weeding methods, such as solarization, lifeline glufosinate ammonium chemical pre-emergence weedicide application, paddy husk burning, UV-treated polythene mulching, and banana stem mulching were tested along with the untreated control. The experimental units were laid out using a Randomized Complete Block Design with four replicates. The experiment evaluated weed density, weeding time per plot, and weight of weeds at 12 weeks after planting. Plots treated with polythene mulching reduced weed weight, density, and weeding time by 94.5%, 88.9% and 86.9%, respectively, compared with the control. The study concluded that using a UV-treated polythene mulching pre-weeding approach can potentially control the weeds in *C. asiatica* cultivation.

Keywords: Eco-friendly weeding, Polythene mulching, Solarization, Weed density, Weed management

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EFFICACY OF SELECTED PLANT EXTRACTS ON THE CONTROL OF LEAF CURL IN CHILLI (*Capsicum annuum* L.)

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Abstract

Chilli (*Capsicum annuum* L.) is one of the economically important spice crops and is widely cultivated in Sri Lanka. Chilli leaf curl is a major viral disease that affects chilli plants and causes significant yield losses in Sri Lanka. As chilli leaf curl is an insect-borne disease, chemical insecticides are widely used to control this disease. The negative effects of insecticides on human health and the environment prompted the search for safer and more sustainable alternatives. The use of botanicals is one of the effective eco-friendly approaches to manage this disease. In this study, the effectiveness of botanicals prepared from onion (*Allium cepa*) bulbs, neem (*Azadirachta indica*) leaves, and tobacco (*Nicotiana tabacum*) leaves against chilli leaf curl was investigated in the yala season. Treatments included three organic botanical extracts prepared from onion bulbs, neem leaves, and tobacco leaves arranged in a Randomized Complete Block Design with five replicates along with the control. Treatment solutions were prepared in a 1:5 ratios by mixing with water and applied as a foliar spray. Data on percent disease incidence, plant height, number of leaves per plant, number of branches per plant, and number of flowers per plant were recorded six weeks after application. The collected data were analyzed using two-way analysis of variance (ANOVA) to determine the significance of treatment effects. The overall results showed that all botanical extracts significantly ($p<0.05$) reduced chilli leaf curl symptoms compared to the control. Among extracts, neem leaf extract and tobacco leaf extract showed the highest reduction in disease incidence in chilli plants. Meanwhile, the botanicals compounds had no influence on the growth and yield parameters as there were no significant ($p>0.05$) differences in plant height, number of leaves per plant, number of branches per plant and number of flowers per plant. Therefore, the results suggest that neem leaf extract and tobacco leaf extract have the potential to be effective alternatives to conventional chemical pesticides for controlling chilli leaf curl.

Keywords: Botanicals, Chilli leaf curl, Disease incidence, Neem leaves, Tobacco leaves

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IMPACT OF BIOTIC FACTORS ON MAIZE CULTIVATION: A CASE STUDY IN HOROWPOTHANA DS DIVISION, SRI LANKA

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Abstract

Maize (*Zea mays* L.) is the most important cereal crop globally. Most maize is expected to come from Sri Lanka's districts of Anuradhapura, Moneragala, and Ampara. Horowpothana is the second-largest Divisional Secretariat (DS) in the Anuradhapura District and is composed of 38 Grama Niladhari Divisions (GN). Thus, the purpose of this survey was to determine the influence of biotic factors on maize cultivation and assess the management strategies employed by farmers to overcome biotic challenges such as pests, diseases and weeds in the Horowpothana DS division. Simple random sampling method was used for the study. The sample size was decided as 60 farmers. Farmers were selected in proportion to the number of maize farmers available in 12 GN divisions. The data for this research were collected from primary data and secondary data sources. The primary data were collected from maize farmers in selected GN divisions using structured questionnaires through personal interviews. Then statistical analysis was done using the Minitab statistical software. The results revealed that among that 100% of farmers experienced problems with brown spot disease and 15% of the farmers faced downy mildew attack in maize cultivation. Fall armyworms and maize weevil bug attacks impacted every farmer (100%) whereas aphid attacks had the least impact (8.33%). Birds provided the greatest threat to farmers' fields (100%) whereas deer posed the least threat (28.33%). Through field observation, 100% of farmers were able to identify the impact of biotic factors on maize cultivation. 15% of farmers employed mechanical means to control diseases and pests, compared to 85% who relied on chemical approaches. In order to reduce the biotic factor damages such as pests, diseases and weeds in maize cultivation in Horowpothana DS division, awareness programs are needed for farmers about biotic factor influence and management practices in Horowpothana DS division. Additionally, while creating extension plans to increase maize production even more, the relevant authorities should take all of these factors into consideration.

Keywords: Biotic factor, Cereals, Maize, Pest and diseases

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ANIMAL PRODUCTION AND FOOD PROCESSING TECHNOLOGY

A MINI-REVIEW: INCORPORATING ENCAPSULATED POLYPHENOLS IN MEAT PRODUCTS

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Abstract

With the increase in global meat consumption over the past few decades, the meat industry has evolved into an era of seeking innovative methods to improve the health-promoting attributes of meat while eliminating the synthetic ingredients that can cause negative health impacts to consumers. Plant polyphenols have been highly used in the development of functional foods recently due to their antioxidant and antimicrobial properties. Controlling the activities of oxidized compounds in meat, and preservation of meat by inhibition of microbial activities and oxidation reactions to reduce the use of synthetic additives are the main focused aspects regarding the development of meat products by incorporating plant polyphenols. Encapsulation is an effective technology that can deliver polyphenols into foods with improved stability and bioavailability while masking unfavorable flavors and odors. The objective of this review is to summarize the importance of using encapsulated polyphenols in meat products and recent advancements in the production of various meat products incorporating encapsulated polyphenols. Spray-dried or freeze-dried microencapsulation, nano-liposomes, nano-gels, coacervation, and emulsions are the most studied methods in encapsulating polyphenols. In summary, by now, encapsulated polyphenols of Mulberry, Bay leaf, Rosemary, Garlic, Thyme oil, and Tea leaf have been successfully used in different meat products to achieve the above goals, and various other plant polyphenols are also extensively studied in this perspective.

Keywords: Antimicrobials, Antioxidants, Encapsulated polyphenols, Meat preservation

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GROWTH AND NUTRIENT ASSIMILATION IN SUGARGRAZE, RED-NAPIER AND CO5 IN TROPICAL CLIMATE

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Abstract

Sorghum and Napier hybrid cultivars exhibit better adaptation to tropical climates, offering a sustainable solution to fodder shortages during dry periods. This study investigated the growth and nutrient assimilation of Sugargraze (*Sorghum bicolor*), Red-Napier (*Pennisetum purpureum* cross), and CO5 (*P. purpureum x Pennisetum americanum*) grown at Diyagama Farm located in the mid country wet zone of Sri Lanka. Fodder cultivars were randomly assigned to plots (25m²) according to Randomized Complete Block Design. Sugargraze seeds and Napier stem cuttings were planted with a recommended spacing of 15 x 45 cm and 1 x 1 m within and between rows, respectively. After 12 days, Sugargraze and Napier cultivars received a recommended mixture of Urea-TSP-MOP at the rate of 125-125-100 kg/ha and 100-200-150 kg/ha, respectively. Shoot or plant density, clump or plant height, and leaf density were weekly recorded. Forages were harvested at nine weeks, and their dry mater (DM), organic matter (OM) and ash contents were determined. Subsequently, fresh matter (FM) and DM yields were estimated. At two weeks, Red-Napier and CO5 initiated shooting and reached the peak ($p<0.05$) shoot density at six (4.11 shoots/m^2) and seven (5.90 shoots/m^2) weeks, respectively. They achieved the peak ($p<0.05$) leaf density at eight weeks (48.15 and 76.80 leaves/m^2, respectively). At harvest, Sugargraze recorded the highest ($p<0.05$) plant height, plant density, and leaf density (113.74 cm, 33.00 plants/m^2, and 251.25 leaves/m^2, respectively), followed by CO5 and Red-Napier. Proximate composition of fodder was different ($p<0.05$) among the cultivars. Sugargraze exhibited higher ($p<0.05$) DM and OM contents (15.44% and 90.32%, respectively) than Red-Napier (12.08% and 83.48%, respectively) and CO5 (10.55% and 82.46%, respectively). Moreover, Sugargraze recorded greater ($p<0.05$) FM and DM yields (22.08 and 3.43 MT/ha, respectively) than Red-Napier (10.92 and 1.32 MT/ha, respectively) and CO5 (15.10 and 1.60 MT/ha, respectively). Sugargraze demonstrated superior nutrient assimilation, outperforming Red-Napier and CO5 at Diyagama in the in mid country wet zone of Sri Lanka.

Keywords: Dry matter content, Leaf density, Organic matter content, Plant density, Yield

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ENHANCING GRILLED SPENT-HEN MEAT QUALITY THROUGH THE PINEAPPLE AND PAPAYA FRUIT EXTRACT IMMERSION

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Abstract

In recent year, the demand for chicken meat is rising quickly. Spent hen meat could be used to meet consumer demand. However, spent hen meat is low in physicochemical and organoleptic properties. Therefore, the laboratory experiment was conducted to document the effect of pineapple and papaya fruit extract immersion on the organoleptic and physicochemical quality of grilled spent hen meat. The study was laid out with two experiments. The treatments in experiment 1 were: control (E_1T_1), 10% (E_1T_2), 20% (E_1T_3), and 30% (E_1T_4) of pineapple fruit extract immersion. The treatments in experiment 2 were: control (E_2T_1), 10% (E_2T_2), 20% (E_2T_3), and 30% (E_2T_4) of papaya fruit extract immersion. The spent hen meat was immersed for four hours at 4±1 ^{0}C and grilled. A complete randomized design was used as an experimental design with three replicates. Physicochemical parameters, including pH, marinade uptake, cooking yield, cooking loss, and sensory parameters including smell, colour, appearance, taste, flavour, texture, and overall acceptability were analysed for grilled spent hen meat. The data were analysed using ANOVA with SPSS software version 25.00 and Duncan's Multiple Range Test with a significant level of 5%. The results of experiment 1 revealed that pH after cooking (6.64±0.07) and cooking loss (60.06±1.52%) were significantly ($p<0.05$) higher for E_1T_1. pH before cooking (6.40±0.02), marinade uptake (2.33±0.19%), and cooking yield (59.48±1.20%) were significantly ($p<0.05$) higher for E_1T_2. Experiment 2 revealed that there was no significant ($p>0.05$) difference between the treatments of pH before and after cooking. E_2T_4 showed a significantly ($p<0.05$) higher value for marinade loss (0.88±0.13%). E_2T_2 showed significantly ($p<0.05$) higher value for cooking yield (53.67±3.26%). Cooking loss (60.48±3.80%) was significantly ($p<0.05$) higher for E_2T_1. Physicochemical analysis of experiment 1 and 2 revealed that E_1T_2 and E_2T_2 had positive impact on spent hen meat. Therefore, the comparison between E_1T_2 and E_2T_2 revealed that E_1T_2 had significantly ($p<0.05$) higher cooking yield and marinade uptake. Results of the sensory analysis showed that E_1T_2 received higher acceptance for sensory parameters including smell, flavour, taste, texture, and overall acceptability. Finally, it was concluded that papaya and pineapple fruit extract immersion influence the quality of spent hen meat. However, 10% pineapple fruit extract immersion has a greater positive effect on the sensory and physicochemical quality of grilled spent hen meat than other treatments.

Keywords: Cooking yield, Immersion, Papaya, Pineapple, Spent hen

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EFFECT ON PHYSICOCHEMICAL AND SENSORY ATTRIBUTES OF STIRRED YOGHURT ADDED WITH JAMUN (*Syzygium cumini*) FRUIT PULP

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Abstract

This study aims to evaluate the effect of adding different levels of Jamun (*Syzygium cumini*) fruit pulp into the stirred yoghurt as a source of antioxidants. The most suitable concentration of Jamun pulp was determined to be added to produce stirred yoghurt. Three different concentrations (5%, 10%, and 15%) of Jamun fruit pulp (w/w%) was added. The physicochemical properties such as pH, titratable acidity, syneresis, total solids, protein, fat, colour (L, a*, b*) and sensory properties of the yoghurt developed were evaluated. The treatments were assigned according to completely randomized design (CRD). The experimental data were analysed by one way ANOVA in Minitab 17.1.0 software. Tukey's method was used to determine a significant difference between treatments at a level of significance ($p<0.05$). The findings of this study revealed that the physicochemical parameters such as pH, lightness (L), yellowness (b*), protein and fat content were significantly reduced ($p<0.05$) while acidity and redness (a*) values were increased significantly ($p<0.05$) with the increasing level of Jamun pulp incorporation. The average fat content, protein content, total solids, titratable acidity, syneresis and pH of the prepared samples were determined as 3.15 to 3.56%, 4.10 to 4.52%, 18.25 to 18.50%, 0.88 to 1.30%, 2.95 to 4.70%, and 4.31 to 4.56 respectively. The results showed that yoghurt with 15% Jamun pulp added had the lowest pH value (4.31), protein content (4.10%), fat content (3.15%), lightness (76.05) and yellowness (-2.9). On the other hand, 15% Jamun pulp added yoghurt showed a higher value for titratable acidity (1.30%) and redness (5.45). However, total solid and syneresis were not significantly ($p>0.05$) impacted by the inclusion of Jamun fruit pulp. Sensory attributes revealed that 10% Jamun pulp added yoghurt was the most preferred by the panellists according to its overall acceptability. According to this study, yoghurt with 10% and 15% Jamun pulp added had the desirable physicochemical composition. However, for the large-scale production yoghurt containing 10% Jamun pulp could be suggested due to its higher overall acceptability by consumers.

Keywords: Jamun fruit, Physicochemical attributes, Sensory attributes, Stirred yoghurt

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FORMULATION AND PRODUCTION OF COOKIES USING COMPOSITE FLOUR OF WHEAT, PUMPKIN AND *OLU* SEEDS, AND QUALITY EVALUATION

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Abstract

This study investigated the quality parameters of cookies made from the composite flour of wheat *(Triticum aestivum)*, pumpkin *(Cucurbita maxima)*, and *olu (Nymphaea pubescens* Wild) seeds in different ratios were used for the formulation and preparation of cookies. Treatments were the control, (wheat flour only T1), and composite flour (wheat: pumpkin: *olu* seeds flour) at 70:5:25 (T2), 70:10:20 (T3), 70:15:15 (T4), 70:20:10 (T5), and 70:25:5 (T6). The developed cookies were tested for proximate composition, physical, microbiological analysis, shelf life and sensory evaluation. Seven-point Hedonic scale using 30 semi-trained panellists. The best sensory attributes were possessed with cookies treatment 3 (T3). Incorporation of pumpkin flour and *olu* seeds flour has increased crude fat, crude fiber, protein and ash by 32.18%, 5.78%, 11.51% and 5.82% respectively compared to control. Free fatty acid and carbohydrate contents were high in the control treatment (0.50% and 58.64%). Sodium, Calcium, potassium, phosphorus, and iron content were 73.51, 80.55, 63.95, 53.15, and 0.83 mg/100g, respectively in the mineral profile. Shelf-life studies were observed over two months under refrigerator (4 ^{0}C) and at room temperature (25-30 ^{0}C). In the physical parameters, there was a significant increase in mean diameter, thickness, and volume, and a slight decrease in mean spread ratio. No microbial contamination was observed in any treatment. Cookies developed using treatment 3 (T3) possessed substantial nutritional constituents, sensory appeal and shelf life other than the control and other treatments. Therefore, composite flour of wheat, pumpkin and *olu* seed at 70:10:20 ratio could potentially be used for the formulation of cookies with additional health benefits.

Keywords: Cookies, Hedonic scale, Pumpkin flour, *Olu* seeds flour

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DEVELOPMENT OF NUTRITIOUS BAR ENRICHED WITH RICE FLAKES AND MORINGA LEAF POWDER

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Abstract

The present study intended to design a healthy bar enhanced with rice flakes and moringa leaf powder. Formulations were created using the ratio based on a preliminary trial of moringa leaf powder and rice flakes T1 (0:35), T2 (6:29), T3 (10:25), T4 (14:21), and T5 (18:17), respectively. Other than the major ingredients, the Nutri Bar was produced using date paste (38%) and honey (8%) as a binding agent and natural sweeteners, chopped pumpkin seeds (3%), peanuts (10%), raisins (3%), and powdered jaggery (2%). To enhance the flavour vanilla essence (1%) was used. These ingredients provide excellent sources of carbohydrates, protein, fat, fiber, energy, and minerals. Nutri Bar was kept at room temperature of 25±5 °C and RH 95%. The Completely Randomized Design was employed and means separation was done with Tukey Pairwise Comparisons in Minitab 19 software. Physical qualities, sensory attributes, and nutritional composition such as moisture, ash, protein, fat, calories, fiber, and iron content were investigated for Nutri Bar. Physical investigation of the Nutri Bar results revealed that length and width were observed with no significant variation ($p>0.05$). However, there was a substantial variation in the height and weight of the Nutri Bars between treatments due to the adding different concentrations of moringa leaf powder and rice flakes. Nutritious bars were tested organoleptically using a sensory test. Results of sensory evaluation suggested that T4 and T5 had a greater preference for overall acceptability and were selected for further study. Nutritional composition data demonstrated a significant difference ($p<0.05$) between treatments for moisture content, ash, protein, fat, calories, fiber, and iron content of the Nutri Bar. Finally, it could be stated that moringa leaf powder can be utilized for nutrient bar manufacturing and this product is good for all age groups and malnourished persons.

Keywords: Moringa leaf powder, Nutritious bar, Nutritional value, Rice flakes, Sensory evaluation

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DEVELOPMENT OF A BEVERAGE USING DATE (*Phoenix dactylifera* L.) SEED POWDER AS A CAFFEINE-FREE ALTERNATIVE FOR COFFEE

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ABSTRACT

This research explores the development and quality assessment of a beverage using date seed powder as a caffeine-free alternative to traditional coffee. The production process involves the extraction of date seed powder and its incorporation into beverage formulation. Various physicochemical and sensory analysis were conducted to evaluate the quality attributes of the beverage. There were four treatments, such as T1 (Control) - 10 g coffee powder/100 ml milk, T2 – 5 g date seed powder/100 ml milk, T3 – 10 g date seed powder/100 ml milk, and T4 – 15 g date seed powder/100 ml milk. The beverage was prepared using date seed powder, coffee powder (control), milk, sugar, cardamom, cloves, gelatine and vanilla. The sensory properties (aroma, taste, colour, texture and overall acceptability) were evaluated using 20 semi-trained panellists under 7-point hedonic scale. The data were analysed using Kruskal Wallis test. Based on the result found, T3 was the most acceptable treatment. (Average value of response for taste: 7, colour: 5, texture: 6, aroma: 7, overall acceptability: 7). Proximate analysis was performed as ash, protein, fat, titratable acidity, pH, total soluble solids and mineral content (Na, K, Ca). It revealed that mean value for titratable acidity (1.52 -1.31) decreased while ash (1.4% -1.9%), fat (4.42%- 7.05%), protein (10.42% -12.52%), pH (5.42 -5.85) total soluble solids (10.22 -13.95) and mineral contents were increased with the concentration of date seed powder. All tests were analysed by ANOVA (α=0.05) and mean separation was done with Tukey's studentized test. The study aims to address the increasing demand for non-caffeinated beverages by utilizing date seeds, an underutilized by-product, rich in nutritional components. It showed that date seed powder has more nutrients than coffee and it can be used as a coffee alternative for those who are seeking a caffeine-free option with added health benefits.

Keywords: Alternative, Beverage, By-product, Caffeine, Date seed

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STUDIES ON PHYSICO-CHEMICAL PROPERTIES AND SENSORY ATTRIBUTES OF PANEER PREPARED FROM BUFFALO MILK BLENDED WITH COCONUT MILK

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Abstract

Paneer is produced through the coagulation of milk using heat and acid. Coconut milk has several nutritional benefits and is a superior source of a number of crucial components (vitamins). The objective of this study is to develop a paneer using coconut milk and buffalo milk composite. There were four treatments used in this study, such as paneer made from 100% buffalo milk (T1 - Control) and different ratio of buffalo milk and coconut milk at 75:25 (T2), 50:50 (T3) and 25:75 (T4). Proximate analyses such as moisture content, protein content, total solid content, ash content, fat and titratable acidity were carried out for freshly made paneer samples. Sensory evaluation was done for freshly prepared paneer samples using a hedonic test of 7-point scale, using 20 semi-trained panellists. The best and most preferred sensory attributes (colour, taste, texture, flavour, mouth feel and overall acceptability) were observed in treatment three (T3). Paneer prepared from 50:50 ratio of buffalo milk and coconut milk composite was found that 42.54% moisture content, 1.42% ash content, 17.53% protein, 0.38% titratable acidity and 6.06% fat in their nutritional qualities. The combination of buffalo milk with coconut milk at 50:50 ratio is nutritionally advantageous in paneer preparation.

Keywords: Buffalo milk, Coconut milk, Nutrition, Paneer, Sensory

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STUDY ON THE QUALITY PARAMETERS AND SHELF STABILITY OF NON-DAIRY SWEETENED AND CONDENSED MILK DEVELOPED FROM CHICKPEA (*Cicer arietinum*) MILK AND SESAME (*Sesamum indicum*) MILK

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Abstract

The study aimed to create a viable alternative to dairy-based condensed milk using chickpea milk and sesame milk. Chickpeas are a wise food option because of their health-promoting elements, consumption of chickpeas decreased the risk of cancer and chronic disorders. Sesame seed also contains significant amounts of lignans and exhibit strong antitumor, anti-mitotic and antivirus activities. The absence of lactose in those chickpea and sesame milk is a significant benefit, as it will prevent the absorption of lactose, which is frequently present in dairy products. Various formulations were tested, including different ratios of combinations of chickpea milk and sesame milk (T1: 100% cow milk, T2: 75% chickpea milk + 25% sesame milk, T3: 50% chickpea milk + 50% sesame milk, and T4: 25% chickpea milk + 75% sesame milk). Physicochemical analyses were conducted initially and during the six-week storage period to assess the percent moisture, ash, fat, protein, and total solids according to AOAC (2002) methods. Organoleptic characteristics such as taste, texture, color, aroma, flavor, and overall acceptability were also evaluated. The results indicated that T1 had the highest protein, fat, total solid, and ash content with the lowest moisture content. Conversely, T3 exhibited high content of total solids, protein, and ash, yet lower unsaturated fat content and moisture among other nondairy treatments. Over the storage period, moisture increased while protein, fat, total solids, and ash decreased across all formulations. Sensory evaluations showed significant differences among treatments, with T3 being the preferred formulation of nondairy sweetened condensed milk, scoring highest in organoleptic characteristics. After six weeks, T1 and T3 were deemed safest due to lower microbial counts, suitable for consumption within one month. The study concluded that T3 is an optimal plant-based alternative for dairy based sweetened and condensed milk, suitable for lactose intolerance, milk allergies, and vegan individuals.

Keywords: Chickpea, Lactose intolerance, Nondairy sweetened condensed milk, Plant based alternative, Sesame

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TISSUE-SPECIFIC CADMIUM LEVELS IN YELLOWFIN TUNA CAUGHT FROM SOUTHERN AND WESTERN WATERS OFF SRI LANKA

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Abstract

Increasing contaminants such as heavy metals in seafood represent a concern for food safety. Therefore, measurement of Cd levels in edible tissues may help adopt a selective consumption that diminishes health risks. This study aims to compare the cadmium (Cd) levels in dark and white muscles, and liver tissues of juvenile yellowfin tuna and evaluate the health risks associated with seafood consumption. Seventy-two fish (Standard length: 50 -67cm; Body weight: 0.8 kg - 2.5 kg) caught from the southern and western pelagic coasts in Sri Lanka during the period between April 2021 to May 2022 were analyzed for Cd levels using Inductivity Coupled Plasma Mass Spectrophotometer (ICP-MS). Mean cadmium levels (mean ± SD; mg kg^{-1} dry weight) of tissues varied in the following order: liver (13.62 ± 6.20) > dark muscle (0.52 ± 0.23) > white muscle (0.42 ± 0.16). Significant differences (Wilcoxon rank sum test, $p<0.05$) were found for cadmium levels between dark muscle and liver tissue, as well as white muscle and liver tissues. A significant positive correlation was found between Cd levels in liver tissues and fish weight (Pearson correlation, $r = 0.573$, $p<0.05$). The measured Cd levels in edible fish tissues (white and dark muscles) were well below from the maximum permissible level (0.2 mg/kg wet weight) established by FAO/WHO. All the Cd levels recorded for liver tissues in this study exceeded the limit set by FAO/WHO and the European Commission. The results depicted that humans should avoid the consumption of yellowfin tuna liver. A human with a body weight of 60 kg can consume up to 4.667 kg of white muscles per week without exceeding the Provisional Tolerable Weekly Intake (PTWI) defined by FAO/WHO. The findings underscore the importance of monitoring tissue-specific Cd levels for safe human consumption of yellowfin tuna.

Keywords: Contaminants, Health risks, Maximum permissible level, Provisional tolerable weekly intake, Tissue-specific

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SOIL NUTRITION, WATER AND WASTE MANAGEMENT AND DIGITAL AGRICULTURE

EFFECTS OF DIFFERENT PROPORTIONS OF OYSTER SHELL POWDER ON PHOSPHORUS RETENTION IN A SANDY REGOSOL

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Abstract

Nutrient leaching is a phenomenon, where essential elements that important for the plant growth are lost from the soil with percolating water through the soil profile. Sandy regosols are characterized by inadequate water and nutrient retention, which poses significant challenges in crop cultivation. To address the shortcomings of low-fertility soils, the application of oyster shell powder (OSP) as a soil amendment is a viable solution to enhanced soil quality. This natural product offers several benefits to soil health, including enhanced pH balance and increased nutrient levels. This study was conducted to determine the effects of different proportions of OSP on phosphorus retention in a sandy regosol. An indoor leaching column experiment was carried out at the Soil Science Laboratory, Eastern University, Sri Lanka. The experiment consisted of five treatments, such as the control without OSP (T_1) and 0.6% (T_2), 0.7% (T_3), 0.8% (T_4), and 0.9% (T_5) of OSP amendment by weight. Urea, Triple Super Phosphate and Muriate of Potash were used as recommended chemical fertilizers. All the treatments were replicated four times in a Completely Randomized Design. The leachate was measured for phosphorus (P) from four leaching cycles within two months period. At the end of the study, available P content in soils was measured. Statistical analysis and mean separation were done by Turkey test at a 5% significance level. The leachate analysis indicated the absence of phosphorus in the OSP treated treatments due to the formation of compounds such as $Ca3(PO_3)_2$ and $Ca_{4.885}(PO_4)_3(OH)_{0.654}$. And also, the available P content was significantly high in soils where OSP was added in higher proportions due to the solubility of the insoluble phosphate compounds by the action of microorganisms. Results revealed that T_5 demonstrated the highest P retention capacity, highlighting the potential of oyster shell powder as a soil amendment.

Keywords: Oyster shell powder, P retention, Sandy soil

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FORMULATION OF A LIQUID ORGANIC FERTILIZER FROM *Chlorella* sp. GROWN IN DAIRY EFFLUENT

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Abstract

The necessity for natural or biological fertilizers instead of synthetic fertilizers arises from the growing demand for food and awareness of environmental pollution due to inorganic fertilizers. In order to increase crop productivity and create healthy plants, microalgae have emerged as a potential source of bio stimulants and biofertilizers in agriculture. *Chlorella* sp. has been identified as a potential bio-fertilizer. This study investigated the formulation of a liquid organic fertilizer (LOF) by using *Chlorella* sp. grown in dairy industry wastewater according to the Sri Lanka Standards Institution (SLSI) standards for LOF. The *Chlorella* sp. was cultivated in dairy waste water in a raceway reactor for 14 days continuously with constant light intensity and constant mixing to optimize the algal growth. The nutrient content of dry biomass of *Chlorella* sp. grown in dairy industry effluent was 5% nitrogen, 2.33% phosphorous and 2.68% potassium. The nutrient content of formulated *Chlorella* liquid organic fertilizer was 1% nitrogen (N), 0.58% phosphorous (P) and 0.67% potassium (K). pH and EC were 7.4 and 9.8 ds/m respectively. The trace metal content in the formulated LOF was 0.0047 ppm chromium (Cr) and 0.0023 ppm arsenic (As). Cadmium (Cd) and lead (Pb) were not detected. According to SLSI standards, the LOF should contain 6.0 – 8.5 pH, 20.0 ds/m EC (maximum), 1% total nitrogen, 0.5% total phosphorous, 0.5% total potassium in minimum, and 0.5 ppm chromium. Also, heavy metal concentration of LOF should be 0.5 ppm arsenic, 0.5 ppm cadmium and 1.0 ppm lead in maximum concentration. The formulated LOF using *Chlorella* sp. grown in dairy wastewater fulfilled the chemical requirements and trace metal requirements of SLSI recommendations. This study highlights the feasibility of formulating a liquid organic fertilizer using *Chlorella* sp. cultivated in dairy wastewater, aligning with the requirements outlined by SLSI standards.

Keywords: Biofertilizer, *Chlorella* sp., Dairy industry, Liquid organic fertilizer, Sri Lanka Standards Institution, Wastewater

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ASSESSMENT OF WELL WATER QUALITY IN UHANA DS DIVISION OF AMPARA DISTRICT, SRI LANKA

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Abstract

Ground water is the most significant source of water in the world for use in domestic, industrial, and agricultural purpose. The physical and chemical properties of the well water at Uhana D.S Division, Ampara District, were examined in the current study to ascertain its quality and suitability for irrigation. Water samples from 46 randomly chosen wells in the Gonagala and Galapitigala region were taken in the months of June and July of 2022. Water quality parameters such as pH, EC, and temperature were measured in the field during sample collection. Other water quality parameters were examined at the water quality lab of the Faculty of Agriculture, Eastern University. Suitability of irrigation water was also assessed utilizing derived parameters. Finally, each sample's water quality index was also calculated. The findings showed that 45.7% of the samples in this study had pH values within the range recommended by the FAO. According to EC, the 78% water samples were classified as low salinity class. Suitability of water for irrigation based on the RSC values indicated that the water samples collected in 60.9% locations can be used safely. The results of the current investigation showed that there is no sodium risk to crops by irrigating from the 63% well water sample used for irrigation at the study locations. 21.7% of water sample appreciable hazard but can be used with management for irrigation and 15.2% sample unsatisfactory for most of the crop. Considering the WQI, 50% of well water was found to be excellent water quality, while 17.4% and 10% were identified as poor and very poor.

Keywords: Hazard, Heavy metals, Irrigation, Water quality, Water Quality Index

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EFFECT OF DRIP IRRIGATION ON THE GROWTH AND YIELD OF YARD-LONG BEAN (*Vigna unguiculata*) UNDER DIFFERENT MULCHING MATERIALS

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Abstract

This study investigates the effects of various mulching materials under drip irrigation on the growth and yield performance of yard-long beans (*Vigna unguiculata*) cultivated under a drip irrigation system, employing a Completely Randomized Design with four treatments and six replicates (T1: control without mulch, T2: straw mulch, T3: black polythene mulch, T4: paddy husk mulch) to assess the impact on the plant height, leaf count, fresh and dry weights of shoots and roots, flower count, pod number, and yield parameters of yard-long bean as the measured outcomes. Analysis was conducted using ANOVA at a 5% significance level with Minitab 17 software, with Tukey's test applied for mean separation. Results indicated that mulches significantly enhanced the growth and yield of yard-long beans ($P<0.05$) with black polythene and straw mulch. Plants with black polythene mulch showed the highest growth than other treatments in terms of plant height (47.8 cm), leaves (18), branches (8.7), shoot fresh weight (60.6 g), shoot dry weight (17.8 g), root fresh weight (5.48 g), root dry weight (2.38 g), number of flowers (6.5), and total yield (31.94 g). The performance of plants without mulch (T1) and with straw mulch (T2) was comparable and not significantly different, while plants with paddy husk mulch (T4) showed the lowest growth characteristics. The study demonstrated that black polythene mulch (T3) significantly improved water use efficiency (WUE) to 18.14 kg/ha-mm and soil moisture content to 15.5%, outperforming control (T1), straw mulch (T2), and paddy husk mulch (T4). This increase in WUE and moisture content underlines the effectiveness of black polythene mulch in optimizing water utilization and retention. The study found that drip irrigation and mulching notably increase yard-long bean yield. Black polythene and straw mulches were the top performers, with black polythene mulch yielding the highest crop output, outperforming no mulch and paddy husk treatments. These findings suggest that black polythene could be the most effective mulch material under drip irrigation for optimizing the yield of yard-long beans in the studied area.

Keywords: Mulching, Soil moisture, Water use efficiency, Yard-long bean

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USE OF WATER HYACINTH (*Eichhornia crassipes*) AS A POTENTIAL SOURCE FOR PRODUCING QUALITY COMPOST

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Abstract

The invasive water hyacinth (*Eichhornia crassipes*) poses a significant challenge to Sri Lanka's water bodies, leading to severe blockages in irrigation and fishing activities. Hence, this study explored composting as a solution to overcome this constraint. By blending water hyacinths with locally available resources such as cow dung, goat manure, *Gliricidia sepium* leaves, poultry manure, banana peel, and dry leaves, high-quality compost with a balanced C:N ratio was produced. A Completely Randomized Design (CRD) with three replicates was implemented across six treatments to form the compost piles. The treatments included T1: Dry leaves 8% + Goat manure 15% + Gliricidia 5% + Cow dung 20% + Water hyacinth 50% + Banana residue 2%, T2: Dry leaves 8% + Goat manure 15% + Gliricidia 5% + Water hyacinth 50% + Poultry manure 20% + Banana residue 2%, T3: Dry leaves 8% + Goat manure 15% + Gliricidia 5% + Cow dung 10% + Water hyacinth 50% + Poultry manure 10% + Banana residue 2%, T4: Dry leaves 8% + Goat manure 15% + Gliricidia 5% + Cow dung 15% + Water hyacinth 50% + Poultry manure 5% + Banana residue 2%, T5: Dry leaves 8% + Goat manure 15% + Gliricidia 5% + Cow dung 5% + Water hyacinth 50% + Poultry manure 15% + Banana residue 2%, T6: Dry leaves 8% + Goat manure 15% + Gliricidia 5% + Water hyacinth 50% + Banana residue 2%. Over a two-month composting period, analysis of physicochemical properties revealed variations in sand content (1.96% to 5.72%), moisture (60.67% to 64.67%), and electrical conductivity (0.23 mScm-1 to 0.51 mScm-1). Encouragingly, all compost types shared a consistent blackish-brown appearance and were odourless. Chemical properties pH (6.5-8.5), C (< 20%), total N (> 1%), C: N ratio (10-25), total P (> 0.5%), and total K (> 1%) spanned ranges, however, obtained the quality standards (SLS 1246:2003), showcasing the potential to produce top-notch compost locally. Data analysis utilised Minitab 17, applying ANOVA to evaluate treatment variances at $p = 0.05$. Post-ANOVA, Tukey's test discerned significant mean differences. The study identifies T3 as the superior composting treatment, achieving high-quality compost with significantly higher nutrient levels ($p<0.05$). It showcases composting as a viable strategy to convert the challenge of water hyacinth invasion into an agricultural benefit, simultaneously mitigating its environmental impact and producing valuable compost. This approach not only addresses the issue of invasive species but also advances sustainable agricultural practices by facilitating the creation of nutrient-rich compost, enhancing agricultural productivity. Suggestions for future studies include detailed analyses of heavy metal components and the long-term impacts of using such compost in agricultural settings, ensuring safe and productive use of water hyacinth compost.

Keywords: Local resources, Physicochemical properties, Quality compost, Water hyacinth

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DEVELOPMENT OF IMAGE PROCESSING ALGORITHM TO DETECT CROP MATURITY OF SCOTCH BONNET PEPPER (*Capsicum chinense*)

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Abstract

Sri Lanka is a luxuriant tropical land with the potential for the cultivation and hence agriculture is considered as one of the best prospect sectors of the country. To maximize the yield from the crops, a proper classification of harvest which aids in determining the storage conditions and the export quality is essential. Deep learning technologies facilitate crop recognition by enabling a computer to automatically detect a crop and determine its ripeness level. This study introduces a real-time image processing algorithm utilizing Convolutional Neural Networks (CNNs) to identify the maturity stages of scotch bonnet peppers. The algorithm is designed to classify the scotch bonnet peppers into three maturity stages as unripe, moderately ripe, and ripe, by training the CNN aid of dataset of labelled images of scotch bonnet peppers at different maturity stages. Training the CNN through backpropagation minimizes categorical cross-entropy loss, resulting in a testing accuracy of 89.04% and training accuracy of 91.6%. These results underscore the algorithm's real-time effectiveness in discerning the maturity stage of scotch bonnet peppers. For scotch bonnet peppers, the algorithm holds significant potential to substantially reduce postharvest losses and cut production costs tied to exporting top-quality produce. Precisely discerning the maturity stages of scotch bonnet peppers ensures the delivery of high-quality products to consumers, concurrently optimizing storage conditions and export quality. The real-time image processing algorithm, developed using CNNs and Python, proves to be an efficient approach for detecting the maturity stage of scotch bonnet peppers and the approach can be extended to diverse crops, establishing its versatility in the agricultural sector.

Keywords: Convolutional neural network, Crop maturity detection, Deep learning, Image processing, Scotch bonnet

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SELECTION OF A SUITABLE FERTILIZER MIXTURE FOR HIGH-DENSITY CABBAGE (*Brassica oleracea* L.) CULTIVATION IN NUWARA ELIYA, SRI LANKA

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Abstract

Cabbage (*Brassica oleracea* L.*)* is a globally significant vegetable crop, particularly in temperate regions like Sri Lanka. The main objective of this study is to identify the most suitable fertilizer mixture for high-density cabbage cultivation in Sri Lanka's Nuwara Eliya area. The experiment consisted of five treatments namely; T_2 (Urea + Up country root special mixture (N:P:K:Mg=2:3:4:1), T_3 (urea + vegetable top dressing mixture (N:K=3:2) + Calcium nitrate granules), T_4 (Urea + vegetable top dressing mixture (N:K=3:2) + Blue granules (N:P:K:Mg=6:6:8:1+trace elements)) and T_5 (Urea + Calcium nitrate granules + Blue granules), and the fertilizer recommendations (N:P:K:=6:5:3) from Department of Agriculture was considered as control (T_1). 'Krishna' F1 Hybrid cabbage variety used for the experiment Randomized complete block design (RCBD) was used as the experimental design with 5 replicates. Plant head weight, height, diameter and compactness of the cabbage heads were measured as yield parameters after harvesting. Data were analyzed by ANOVA and mean separation was done by using Duncan multiple range test (DMRT). According to the results, there was a significant cabbage head weight received in T_3 (1.84±0.105 kg) compared to other treatments. Moreover, the higher values for head diameter (18.92±0.419 cm) and head height (16.33±0.306 cm) were observed in T_3. According to soil analysis, T_3 exhibited the highest reduction in pH by 0.62±0.082. Thus, this study concluded that the urea + vegetable top dressing mixture (N:K=3:2) + Calcium nitrate granules would be a more effective fertilizer mixture for high-density cabbage cultivation in Nuwara Eliya area among the used fertilizer mixtures.

Keywords: Cabbage, Fertilizer mixtures, Productivity, Yield

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A STUDY ON DESIGNING AN AUTOMATED IoT SYSTEM TO AID HYDROPONIC AGRICULTURE FOR DOMESTIC PURPOSE

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Abstract

The population of the global is predicted to grow daily and reach 9.3 bilion people by the year 2050. Thus, in order to ensure a sufficient supply of food, agricultural productivity needs to be raised. In addition, the cost of food in Sri Lanka rise in July 2022 at a record-breaking pace of 90.90% compared to the same month the previous year. Traditional farming, hindered by insufficient fertilizers and pesticides, fails to address the heightened demand, further diminishing productivity. The aim of the research is to the design of an automated IoT system for the deepwater culture method of hydroponics for domestic Water Spinach plant purpose. The results obtained were compared with the results obtained from the traditional cultivation method. The MQTT platform is used when cultivation uses the IoT method which is designed for IoT. In addition, Kincony esp32 A8 is used as the hardware and sensors and controllers are connected. The data received from those devices is configured with the Tasmota firmware and sent to the EMQX MQTT broker. Through the integration of Node-Red and the app via broker, this project enables users to acquire real-time cultivation data and exercise control over cultivation process accordingly. After connecting the hydroponics system, the parameters of pH, TDS and temperature were obtained in the form of graphs and the parameters of lights, fan and pump to be controlled were set to work manually. Results showed that reading the accuracy of the sensors temperature, TDS and humidity is, 98.21% for temperature, 95.51% for TDS and 96.45% for humidity. The proposed system aims to provide an efficient, cost-effective, and easy-to-use solution for domestic hydroponic agriculture. The system's automation reduces the need for constant manual monitoring, and the remote access feature allows users to monitor and control the system from anywhere.

Keywords: Conventional cultivation, Cost-effective, Hydroponic system, IoT, MQTT

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USE OF RAINWATER HARVESTING TANK FOR WATER SUSTAINABILITY: A CASE STUDY IN POTTUVIL AND THIRUKKOVIL DS DIVISIONS OF AMPARA DISTRICT, SRI LANKA

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Abstract

Water sustainability is a global imperative, given the rising demand for freshwater, which constitutes merely 1% of the earth's water and is essential for human use. Sri Lanka's dry zones contend with severe droughts, floods, and saline water intrusion in coastal areas. The aftermath of the 2004 tsunami triggered a water crisis in the Ampara district, prompting collaborative efforts between the government and NGOs to establish a domestic rainwater harvesting system. Although the project was successfully finished, there has been a problem with sustainability in some areas due to a lack of monitoring of the harvesting tanks' use. Therefore, this study was aimed to assess the status of the implemented rainwater harvesting system at the Pottuvil and Thirukkovil DS Divisions in Ampara, employing simple random sampling in Inspector Eatham, Kundumadu, Thandiyadi, and Sangamangramam villages. The data was collected using questionnaires, interviews, and literature studies. The collected data was analyzed using descriptive statistics. Results revealed that only 30% of the 150 respondents utilized rainwater tanks, with a mere 3% using harvested water for drinking and 27% for various domestic purposes. Reduced dependence on rainwater collection was associated with the introduction of a water supply scheme in those areas. In areas with restricted centralized supplies, rainwater collection serves as an alternative, particularly in larger households. A minimal percentage (2%) of respondents had higher education, emphasizing the role of education in effectively implementing rainwater-harvesting systems. Challenges such as tank damage, financial constraints among low-income farmers and inadequate maintenance skills also contributed to the reduced usage of rainwater harvesting tank. The study suggests funding for tank repairs in addition to community awareness campaigns that emphasize the advantages of rainwater harvesting and encourage more involvement. This holistic approach aims to address the multifaceted challenges hindering sustainable water practices in the region.

Keywords: Dry zone, Rain water harvesting, Water crisis, Water supply scheme

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NUTRIENT CONTENT ANALYSIS OF ORGANIC LIQUID FERTILIZER PRODUCED BY USING *Salvinia molesta* AND *Azolla pinnata* UNDER THREE DIFFERENT DIGESTION METHODS

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Abstract

Excessive use of chemical fertilizers in agriculture causes several environmental and health problems. Furthermore, organic fertilizers have become an alternative due to the high cost of chemical fertilizers. Therefore, the current study aimed to analyse the nutrient content of organic liquid fertilizer prepared from rapidly growing two plant species such as *Salvinia molesta* and *Azolla pinnata* under three different digestion methods namely, anaerobic digestion, aerobic digestion using aerator and *Trichoderma* digestion. Organic liquid fertilizers produced from both plant species were tested for nutrients like N, P, K, Ca, Mg, and Zn. Data analysis was done by using Statistical Analysis System (SAS version 9.2) software. The results revealed that anaerobic digestion has the ability to extract more amount of nitrogen while *Trichoderma* digestion led to extraction of the highest phosphorus and potassium content. In contrast, the lowest value for nitrogen content was recorded with *Trichoderma* digestion whereas the lowest phosphorus and potassium content was observed under anaerobic digestion. For the extraction of other nutrients like Ca, Mg, and Zn, the compared three methods led to different degree of nutrient extraction. As the comparison of the nutrient extraction efficiency under above mentioned three digestions showed no statistical differences, it can be concluded that special nutrition filtering is not done by any extraction method. Anyhow, *A. pinnata* has shown significantly higher nutrient content compared to *S. molesta*. Therefore, it is possible to produce liquid fertilizer using *A. pinnata* to reduce the cost spent on inorganic fertilizers while conserving the environment.

Keywords: Anaerobic digestion, Chemical fertilizer, Liquid fertilizer, Nutrient content, *Trichoderma* digestion

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PERFORMANCE EVALUATION OF A FABRICATED FLUIDIZED BED DRYER IN COMPARISON WITH A CONVECTION SOLAR DRYER

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Abstract

Solar drying is a commonly used drying method. However, it has limitations such as dependency on weather conditions and uneven drying thus causing postharvest losses. Therefore, the objectives of this study were to design a lab-scale fluidized bed dryer and to compare the efficiency of the fluidized bed dryer with that of a natural convection solar dryer. A lab-scale Fluidized Bed Dryer (FBD) was fabricated and experimentally compared with a natural convection solar dryer. Both dryers were evaluated for their performance using 1.0, 0.5, and 0.25 kg of paddy. The performance of the dryers was evaluated in terms of drying time, drying rate and thermal efficiency. The FBD showed rapid moisture removal to achieve the safe moisture content of 14% with significantly ($p<0.05$) less time of 528, 276 and 156 minutes respectively across 1.0, 0.5 and 0.25 kg of drying masses of paddy. Significantly ($p<0.05$) higher drying rate of 0.595 kg/m^2h was observed with the drying mass of 0.25 kg in the FBD. The highest total thermal energy requirement of 94.24 kJ and 19.65 kJ were required by the solar dryer and FBD respectively with 0.25 kg drying mass of paddy. This corresponds to the fact that the FBD demonstrated significantly ($p<0.05$) higher thermal efficiency of 49.8% when the drying mass was 0.25 kg, while the solar dryer showed significantly ($p<0.05$) lower thermal efficiency of 23.7% with the same drying mass. Thus, the efficiency of the fluidized bed dryer was more when drying less mass of paddy was less. Further, the findings affirm that FBD outperformed the FBD over the natural convection solar dryer in terms of drying time, drying rates and thermal efficiencies. Moreover, FBD showed better performance with a drying mass of 0.25 kg suggesting the optimum quantity of drying mass to be used in the current design.

Keywords: Convection solar dryer, Fluidization, Fluidized bed dryer, Paddy drying, Solar drying

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EXPLORING MONSOONAL RAINFALL PATTERNS IN TRINCOMALEE DISTRICT, SRI LANKA USING ISOHYET METHOD

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Abstract

Climate change emerges as a severe threat, particularly affecting South Asia's agriculture, including Sri Lanka. Variations in rainfall pose a tangible risk, impacting crop yield and water management in a significant manner. The absence of a detailed analysis of rainfall patterns and trends is a critical issue in forecasting water management in Sri Lanka. The study tends to attend to the rainfall dynamics in the context of Trincomalee District, employing the interpolation technique Isohyet method. The examination of Isohyet patterns revealed a remarkable fact which is that the initial extensive wetted areas during the Northeast Monsoon (NEM), First-inter monsoon (FIM), and Southwest Monsoon (SWM) in the first decade gradually diminished and contracted over time as NEM, FIM and SWM rainfall especially in western side of Trincomalee received 625, 178.75 and 400 mm/decade respectively at first decade then this pattern had been gradually diminishing till the 4th decade where it was 550, 112 and 200 mm/ decade respectively. Through a thorough analysis, it became clear that the coverage of wet isohyet patterns had been decreasing from 1983 to 2022, simultaneously, the coverage of dry or minimal isohyet patterns had been increasing from 1983 to 2022 over the past 40 years. Divisional Secretariat Divisions (DSDs) closer to the coastal region consistently experienced the least rainfall isohyets than the interior regions. Further, it was noted that Verugal and Muttur showed the lowest rainfall isohyets compared to other DSDs, in NEM, FIM, SWM and Second-inter monsoon (SIM) with values of 476.75, 67.88, 216.5 and 359.38 mm/year respectively.

Keywords: Interpolation, Isohyet, Monsoon, Rainfall

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FOOD AND ENVIRONMENTAL ECONOMICS AND AGRICULTURAL EXTENSION

EXPLORING DIETARY SHIFTS AND NUTRITIONAL PATTERNS ECONOMIC TURMOIL: A COMPREHENSIVE ANALYSIS OF FOOD CONSUMPTION IN SRI LANKA

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Abstract

The COVID pandemic and subsequent economic crisis have increased food prices extensively in Sri Lanka and hence has been noted as a country with one of the highest food inflations in the world. This has dire effects on the food intake and therefore, the required nutrient intake in the Sri Lankan households. This research investigates the magnitude of this effect in cross sections of the Sri Lankan populace disaggregating into rural, urban and estates and by income categories. The study was focused on to determine the responsiveness of household demand for twelve major food commodities consumed by typical Sri Lankan households and analyzing the effects of changes in price using the quadratic approximation of the Almost Ideal Demand System (AIDS) estimated using the state-of-the-art QUAIDS model. The data used are from the household income and expenditure survey conducted in 2019/2020. Results revealed that food consumption patterns in Sri Lanka are influenced by income, price, socio-economic status, and geographic factors. Research found that, except few, the majority of the most consumed food items are price and expenditure inelastic. Through running simulations, the study shows that households experienced a reduction in nutrient intake in carbohydrates, fats, and proteins and the most vulnerable and affected are low income, estate sector households. The study emphasizes the significance of formulating food policies tailored to the specific food demand patterns of separate groups, and stresses the noticeable impact of projected global food price increases on the food and nutrition security of Sri Lankan households, highlighting the necessity of targeted measures to ensure sufficient nutrition for everyone.

Keywords: Economic crisis, Elasticities, Food demand, Nutrient intake

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BANANA FARMING – A PROFITABLE ENTERPRISE IN VALIKAMAM EAST DS DIVISION, JAFFNA

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Abstract

Banana, an ancient fruit, has evolved into one of the world's most widely cultivated, traded, and consumed fruits. Its popularity is particularly noteworthy in Sri Lanka, where it is the most widely grown and consumed fruit. Jaffna emerged as a key district for banana farming, prompting an investigation into the economic dynamics of banana production in the Valikamam East Divisional Secretary (DS) division. Neervely and Urumpirai AI ranges were selected for this investigation because of their extensive cultivation and high density of banana producers. The primary goal was to study the profitability of banana farming in the Valikamam East DS division. It also examines the socioeconomic traits and cultivation challenges of banana production in the study area. The simple random sampling method was used to select 100 banana farmers for the primary data collection. In addition, secondary data were used from various sources. Data were analyzed using SPSS software with descriptive statistics and frequencies. The findings revealed all farmers utilized their own land, with an average farmer age of 55.8 years and an average family size of 4.5 members. Notably, 88% of banana farmers were men, and approximately half engaged in banana farming as their primary occupation. Despite major challenges like climate hazards and high labour costs, the annual average cost of production, return, and net profit stood at Rs 281,390, Rs 671,066, and Rs 389,676 per acre, respectively. It indicated the profitability of banana production in the study area with a Benefit-Cost ratio of 2.38. Overall, this research provides valuable insights for banana farmers, policymakers, and researchers, paving the way for enhanced cultivation practices and informed decision-making.

Keywords: Banana, Cost of production, Net profit, Profitability, Production

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ANALYSIS OF FACTORS INFLUENCING COCONUT GROWERS' ATTITUDES TOWARDS THE STATUS OF EXISTING COCONUT INDUSTRY - A STUDY IN COCONUT TRIANGLE SRI LANKA

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Abstract

Coconut is a major plantation product in Sri Lanka. Every district grows coconut, and the coconut triangle spanning the districts of *Kurunegala*, *Puttalam*, and *Gampaha* accounting for about 55% of the total area planted to the crop. Most of the farmers in this area, pluck the coconut, gather it, and sell it. But the Manufacturers and the exporters earn more profit from the coconut industry. The study was conducted to determine the factors influencing coconut growers' attitudes towards the status of the current coconut industry within the coconut triangle *where Kurunegala, Puttalam,* and *Gampaha* districts were covered based on the extent of cultivation. Data were collected from the respondents using a structured pre-tested questionnaire. The stratified random sampling method was used to select 100 coconut growers for primary data collection. In addition, secondary data were used from various sources. Data were analysed by using SPSS software with descriptive statistics and chi-squared test. Five-point Likert scaling was used to determine the coconut growers' attitudes towards the status of the existing coconut industry. The findings revealed that 90% were male. Among them, 52% had a secondary level of education. Around 86% of them had their own coconut land in the coconut triangle, and the average extent of coconut land was 39 acres. Almost 70% of the growers produced between 15,000 and 100,000 coconut nuts annually. The results further revealed that 53% of the farmers have high-level attitudes towards the status of the coconut industry. The coconut growers' attitudes towards the current status of the coconut industry are significantly associated with their gender ($p<0.05$) and the type of land ownership ($p<0.05$). The coconut growers should be given more awareness regarding opportunities available in the coconut industry. The relevant authorities should consider the above factors when designing extension programs for coconut growers and should assist them in developing the farms to the next level.

Keywords: Attitude, Coconut growers, Coconut triangle, Extent of land, Plantation

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EXPLORING UNDERGRADUATE ENTREPRENEURS' PERSPECTIVES ON PERCEIVED USEFULNESS AND PERCEIVED EASE OF USE IN BLENDED LEARNING ENVIRONMENTS

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Abstract

The use of technology in education has resulted in diverse learning modalities, with blended learning gaining popularity in academic settings. Perceived usefulness refers to people's perceptions of how valuable a specific technology is, such as blended learning and its applications. On the other hand, perceived ease of use refers to people's perceptions of how simple and easy it is to utilize a given technology. This research aims to look into how undergraduate entrepreneurs perceive blended learning environments in terms of their perceived usefulness and perceived ease of use. This study conducted at the University of Colombo Institute for Agro Technology and Rural Sciences in Sri Lanka. Using a survey study approach, the data collection process encompassed the complete population of undergraduate entrepreneurs pursuing agriculture degree in the institute. The questionnaire assessed respondents' impressions of both perceived usefulness and perceived ease of use in blended learning in a Likert scale measurement ranging from strongly agreed to strongly disagreed. The findings demonstrated that undergraduate entrepreneurs strongly agreed on the perceived usefulness of blended learning, with a specific emphasis on characteristics such as professional performance, efficacy, self-productivity, and overall usefulness. The study also emphasized the importance of perceived ease of use, as participants highly supported criteria such as simplicity with understandability, independence from psychological difficulties, ease of use, and adaptability of the learning system in the context of blended learning. Recognizing these elements is extremely useful when designing and implementing a blended learning system targeted to the specific needs of undergraduate entrepreneurs in Sri Lankan contexts.

Keywords: Blended Learning, Perceived Ease of Use, Perceived Usefulness, Technology in Education, Undergraduate Entrepreneurs

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THE RELATIONSHIP BETWEEN SALIENT BELIEFS AND GENERAL ATTITUDES OF CONSUMERS TOWARDS FARM FISH CONSUMPTION – A STUDY BASED ON NEGOMBO DS DIVISION, NEGOMBO, SRI LANKA

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Abstract

Fish is a primary source of animal protein among the Sri Lankan citizens. Sources of fish protein can be wild-caught or farmed. The FAO (Food and Agriculture Organization) define the term aquaculture as the farming of aquatic organisms including fish, mollusc, crustaceans and aquatic plants. There are limited studies that explore consumption behaviour on fish consumption but neither explores specifically in Negombo DS division on Farm Fish consumption. Therefore, a study was conducted to examine the farm fish consumption behaviour in the Negombo Divisional Secretariat Division of Sri Lanka. This study used the Theory of Planned Behaviour as the base for the conceptual framework. It examined the relationship between salient beliefs and general attitudes of consumers towards farm fish consumption in particular. The convenient sampling method was used to select the respondents, and the total sample size was 115. Data collection was done in the form of a questionnaire survey. The interviews were conducted by visiting the supermarkets and local fish markets in Negombo DS Division. The questionnaire uses the 7-point Likert scale and semantic differential scales adopted from the previous literature. The SPSS and MS Excel were used to analyse the constructs. This study employs the methods of descriptive statistics and multiple linear regression to analyse the collected data. The measures used to evaluate the constructs are adopted from past studies. The study concludes that salient beliefs of consumers, including sensory, health, convenience, and price beliefs, significantly affect consumers' general attitudes towards farm fish consumption. Among them, price consciousness had a negative effect on general attitude. It is recommended that the relevant authorities focus on communicating the positive aspects of sensory attributes, health benefits, convenience beliefs, and competitive pricing to influence consumer attitudes positively. Further, it is advisable to explore pricing strategies to make farmed fish products more competitive. This may involve identifying cost-effective production methods, promoting cost transparency, improving value addition or even offering promotional pricing to attract consumers.

Keywords: Aquaculture, Farm fish consumption, Theory of planned behaviour

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FAST-FOOD CONSUMPTION PATTERNS AMONG FACULTY OF AGRICULTURE UNDERGRADUATES OF THE EASTERN UNIVERSITY, SRI LANKA

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Abstract

Fast food is among the most consumed and well-liked food in Sri Lanka. Globalization and modernization have shaped Sri Lanka's fast food business, and we can observe that consumers are shifting from eating at home to choosing convenient options, particularly among young people and those with hectic schedules. When meeting their energy and dietary needs, university students who spend most of their time away from home typically look at criteria like availability, convenience, and eating style. This could result in an imbalance in their nutritional status and raise their risk of non-communicable diseases linked to diet. To see whether becoming an undergraduate has preferred fast food consumption patterns and to understand the factors influencing their consumption of fast food, a study was conducted among undergraduates of the Faculty of Agriculture, Eastern University, Sri Lanka (EUSL). Primary data were collected using a structured questionnaire distributed among randomly selected 100 students from five batches in the Faculty of Agriculture, EUSL. Pretested structured questionnaires were used to collect data, which were analysed using the SPSS package. Descriptive statistics, frequencies, and chi-square analysis were done. The factors influencing fast food consumption patterns like price, place, taste, variety of menu, and enjoyment differed among undergraduates. The research findings showed that most undergraduates preferred to consume short-eat items like samosas, rolls, and sandwiches. They considered mostly taste factors while choosing fast food items, but when they frequently consumed fast food per week, they mostly considered the variety of the menu. Further, the variety of menu, limited time for cooking, tasting, and eating with friends or family influenced the fast food consumption frequency per week. Promoting the benefits of healthy eating and the risks associated with excessive fast food consumption is essential. Moreover, a supportive environment for undergraduates must be created, empowering them to make healthier food choices and reducing their dependence on fast food options.

Keywords: Fast food, Food consumption, Health impacts, Undergraduates

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APPLICATION OF BLOCKCHAIN TECHNOLOGY AMONG AGRIBUSINESSES IN SRI LANKA

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Abstract

The agricultural sector plays a crucial role in Sri Lanka's economy, significantly contributing to the nation's overall economic output. Several scholarly investigations have highlighted challenges in the agricultural sector, particularly in the domain of trade. Considering these challenges, blockchain technology, an advanced database mechanism that facilitates transparent information sharing within a business network, emerges as a promising tool for effectively administering value chain activities. Therefore, this study aims to explore the potential applicability of blockchain technology in addressing prevalent challenges within the Sri Lankan agricultural sector. Qualitative interviews were conducted with purposively selected twenty-four agri-exporters, and a thematic analysis was carried out. The outcomes of the expert interviews revealed several key insights and key themes were identified. The most significant issues raised by agribusinesses include problems related to intermediaries, transparency, traceability, payments, and misuse and manipulation of records. The majority of agribusinesses highlighted blockchain technology as a potential solution and identified its benefits: reducing the involvement of intermediaries, ensuring traceability, auditability, and secure payment methods, increasing transparency, and confirming the quality of the final products. Conversely, challenges associated with the adoption of blockchain technology in the agri sector were identified, encompassing issues such as a lack of knowledge in the field, legal and regulatory considerations, costs related to establishing and maintaining blockchains, unawareness of the technology by front-end value chain actors (i.e., farmers), and coordination required for adoption. The research underscores the issues faced by agribusinesses, the benefits of adopting blockchain technology, and the challenges of adopting this technology. In conclusion, the study posits that the integration of blockchain technology has the potential to alleviate a substantial array of challenges within the agriculture sector in Sri Lanka.

Keywords: Agribusinesses, Blockchain Technology, Sri Lanka, Value-chain

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