



ICTRI-2023



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1st International Conference on Technological Research and Innovation 2023

*Technological Advancement:
Bridging the Gap Between Research and Sustainable Development*

27TH SEPTEMBER 2023

Organized by

**Faculty of Technology, Eastern University, Sri Lanka
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Innovation 2023**

*“Technological Advancement: Bridging the Gap
Between Research and Sustainable Development”*

27th September 2023
Faculty of Technology
Eastern University, Srilanka

ABSTRACTS

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Message from the Vice Chancellor

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



"It is indeed an honor for me to pen this message to the International Conference organized by the Faculty of Technology, Eastern University, Sri Lanka, with the overarching theme of 'Technological Advancements: Bridging the Gap Between Research and Sustainable Development,' scheduled in , 2023.

Research, as defined, represents a creative and systematic endeavor aimed at revisiting the existing body of knowledge. This process entails the impartial collection, arrangement, and analysis of data to rejuvenate our comprehension of a particular subject or issue. It serves as a methodical inquiry that seeks to delineate, elucidate, forecast, and govern the observed phenomena. I firmly believe that this methodology should be a universal practice in all research pursuits.

The international conference hosted by the Faculty of Technology encompasses vital thematic tracks, including Agriculture Technology and Entrepreneurship, Food Technology, Environmental Technology which engulfs Soil, Energy, and Water. Its perfectly pinned with Mycology and Microbial Technology, all aligned with the current trends prevailing within the country.

Technology is the application of scientific knowledge to create new and useful things. It is also a way of solving problems and improving our lives. Technology is very important for us in everyday life, as it helps us communicate, learn, work, play, and more. Technology is constantly changing and evolving, and there are many new and emerging technologies that have the potential to transform the world in the next few years. Self-fertilizing crops, Breath-sensing diagnostics, 3D-printed houses, Green ammonia, as well as On-demand drug manufacturing are the very latest technologies where community starts get benefited.

As the citizen of the country, we are obliged to level up the technologies from 2IR (2nd Industrial Revolution) to 4IR where most of the south Asian countries are deliberately moved forward. I am convinced that this international conference offers a valuable platform for researchers to present their new technological inventions as research findings to an audience composed of scholars and professionals. The endorsements of intellectuals will serve as robust support for the dissemination of research findings through the proceedings of abstracts and publications. These contributions will undoubtedly be remembered as a significant annual event dedicated to advancing technology-related research within the broader community. I would like to convey my heartfelt appreciation to the dedicated and enthusiastic organizing committee of this 1st International Conference on Technological Research and Innovation. I extend my gratitude to all the participants of this conference and extend my best wishes to all the researchers for the successful presentation of their findings.

Message from the guest of honor



Prof. Siril Wijesundara

National Institute of fundamental Studies

Sri Lanka's Dry Zone Vegetation - A Priceless Natural Treasure

The dry zone vegetation of Sri Lanka serves as a remarkable testament to the intricate interplay of climate, geography, and ecology. Encompassing extensive areas of the island, this distinctive ecosystem is a repository of biodiversity, a provider of crucial ecosystem services, and a frontline contender against formidable conservation challenges. From the enduring dry mixed evergreen forests to the rugged thorn forests and expansive grasslands, the vegetation of the dry zone is an integral facet of Sri Lanka's natural heritage.

Diversity and Biodiversity

Sri Lanka's angiosperm flora is defined by the prevalence of endemic species, with concentrations primarily found in the Central and South West regions of the island. While exploration of the North East and Eastern areas remains limited, discovering and conserving endemic species in these regions could enhance Sri Lanka's botanical distinctiveness. Acknowledging the distribution, vulnerabilities, and conservation statuses of these unique flowering plants is imperative for ensuring their survival and promoting sustainable ecological stewardship.

In a comprehensive endeavor to comprehend the geographical distribution of endemic species in Sri Lanka, I undertook meticulous mapping, systematically charting the occurrence of these species across a grid of 5 km x 5 km cells spanning the country with Mrs. Dakshini Perera of the Environment Ministry in 2016. This analytical approach unveiled nine distinct endemic areas characterized by heightened levels of endemism. These regions encompass the Central Highlands, South Western Wet Zone, Northern Highlands, Eastern Highlands, Ritigala, Dolu Kanda, Yala, Wilpattu, and Jaffna. Notably, Ritigala, Yala, Wilpattu, and Jaffna fall within the dry zone, highlighting the presence of endemic areas even within this region and emphasizing its significance in terms of biodiversity.

Variety and Adaptation

The dry zone's vegetation comprises a diverse array of ecosystems that have evolved in response to the formidable challenges of its climate, characterized by elevated temperatures, scant rainfall, and lower altitudes. The Tropical Dry Mixed Evergreen Forests, characterized by their sparse canopies and lush understory, are host to a rich assortment of flora and fauna. Species like *Chloroxylon swietenia*, *Manilkara hexandra*, and *Diospyros ebenum* contribute to the distinctive structural makeup of this forest type.

Thriving in arid landscapes, the Tropical Thorn Forests showcase thorny shrubs and shrub-like trees that have adapted to endure water-scarce conditions. These forests play a pivotal role in the conservation of species such as *Grewia tanax* and *Sansevieria zeylanica*, while also providing sustenance for local wildlife and cattle.

The savannahs, both at high and low altitudes, blend towering grasses with scattered trees to form a dynamic landscape. Grasses such as *Themeda triandra* and *Aristida setacea* dominate these areas, further enriching the intricate mosaic of the dry zone's vegetation.

An essential part of this ecosystem, Damana grasslands offer critical habitats for a variety of species, including diverse grasses like *Cymbopogon nardus* and *Imperata cylindrica*. The grasslands also serve as a haven for a wide array of insect species, which in turn support various bird species and other wildlife.

Ecosystem Services and Conservation Significance

The dry zone's vegetation provides an array of vital ecosystem services that benefit local communities and the broader environment. These services encompass water regulation, soil erosion control, carbon sequestration, and the provision of habitats for wildlife. The forests function as watersheds, sustaining water sources during dry spells and ensuring a steady supply for agricultural and domestic purposes.

Biodiversity within these ecosystems underpins essential ecological processes, including pollination and seed dispersal, which are crucial for maintaining robust plant populations and fostering genetic diversity. Moreover, the vegetation of the dry zone plays a role in cultural and religious practices, serving as a resource for traditional medicine and serving as sacred sites for indigenous communities.

Dry zone forests act as carbon sinks, capturing and storing carbon dioxide from the atmosphere through photosynthesis. This helps mitigate the effects of climate change by reducing the concentration of greenhouse gases and contributing to carbon sequestration.

Despite their challenging conditions, dry zone forests are often home to a diverse array of plant and animal species that have adapted to the arid environment. Protecting and restoring these ecosystems helps conserve biodiversity and maintain important genetic resources that can be crucial for adaptation to changing environmental conditions.

Dry zone forests have evolved to withstand extreme climatic conditions, making them valuable sources of information for understanding how ecosystems can adapt to changing climates. Studying their resilience and strategies for survival can inform broader climate adaptation efforts.

Dry zone forests offer unique opportunities for scientific research and education. Studying their ecology, biology, and adaptation mechanisms can provide insights into how ecosystems respond to climate change and inform conservation strategies.

Threats and Conservation Challenges

Despite its ecological significance, the dry zone's vegetation confronts various threats that jeopardize its survival. Habitat loss due to human activities such as agriculture, logging, and infrastructure development poses a substantial challenge. Unregulated grazing, frequent fires, and the encroachment of invasive species further compound the situation, leading to the degradation of vegetation and the decline of biodiversity.

Climate change adds another layer of complexity, altering precipitation patterns and elevating temperatures, thereby affecting species composition and distribution within these ecosystems.

The rising temperatures and shifting rainfall patterns can impact the capacity of plants to regenerate, intensifying the stress on the delicate equilibrium of these ecosystems.

Conservation Endeavors and Future Prospects

Preserving the dry zone's vegetation is imperative to safeguard its distinctive biodiversity and indispensable ecosystem services. Protected areas, including national parks, wildlife sanctuaries, and nature reserves, play a pivotal role in upholding these ecosystems. Restoration initiatives that engage local communities and stakeholders can counteract habitat degradation and foster sustainable land use practices.

Educational and awareness programs are pivotal in nurturing a sense of responsibility toward these ecosystems. Empowering local communities to partake in conservation efforts, such as through sustainable livelihoods linked to eco-tourism and traditional wisdom, can engender a mutually beneficial scenario for both people and the environment.

Sri Lanka's dry zone vegetation is a natural marvel that reflects the splendor of adaptation and resilience. Its diverse array of plant life, unique ecological interplay, and vital ecosystem services underscore its significance within the broader tapestry of Sri Lanka's environment. Ensuring the continuation of these ecosystems necessitates united efforts, involving governmental bodies, conservation organizations, local communities, and individuals, to ensure the flourishing of the dry zone's vegetation for generations to come.

The importance of dry zone forests in tropical islands within the context of climate change cannot be overstated. Their role in carbon sequestration, biodiversity conservation, water regulation, erosion control, and supporting local communities makes their preservation and sustainable management crucial for both mitigating and adapting to the impacts of climate change.

Message from the Chairperson

Dr. T. Mathiventhan
Dean, Faculty of Technology
Eastern University, Sri Lanka



The Faculty of Technology (FOT) at the Eastern University, Sri Lanka (EUSL), is the youngest faculty, which was established in 2017.

I am delighted to write this message for the First International Conference on Technological Research and Innovation (ICTRI 2023) under the theme of “**Bridging the gap between research and Sustainable Development**”. It is a great platform for researchers, educators, students and industries to exchange latest innovative research experiences/outputs, recent development and trends in the field of technological transformation. The future of the world lies in the hands of the researchers and I am confident that the technology will take the higher priority in any fields. Therefore, exchanging technological ideas, innovation and transformation generates much interest among scholars, practitioners, and policymakers as a critical instrument for achieving sustainable development and its goals (SDGs).

We received more than 90 research articles internationally and nationally under four themes of Agriculture Technology and entrepreneurship, Food technology, Environmental Technology and Mycology and Microbial Technology. Our rigorous review process limited 58 number of papers for this International conference. The Faculty of Technology plan to have the same ICTRI each year with new ideas, outputs and success stories for technological innovation and development.

I hope that the ICTRI 2023 offers a great opportunity to bring together researchers, scientists, engineers and academicians at regionally, nationally and internationally at large. I take this opportunity to congratulate all the faculty members who extended their fullest supports to become this event into reality.

I wish the ICTRI-2023 a grand success.

Message from the Co-Organizer

Prof. Dr. Lihong Guo
Vice President of Qujing Normal University
Qujing, Yunnan, P.R. China



I am very pleased to give this message to the proceedings of the first International Conference on Technological Research and Innovation (ICTRI-2023) by the Eastern University of Sri Lanka (EUSL). I fervently believe that this first conference will boost the quality of the research, innovations, and collaborations in the future and strengthen the ongoing MOU between EUSL and QJNU.

The ICTRI-2023 offers a special opportunity to bring together professors, researchers, and scholars around the world, and serves as a platform to deliver innovative research results and the latest trends and developments in the fields of science and technology.

This conference further enhances the exchanges between our two universities, strengthens the friendship between our two sides, and will have an important impact on the construction of disciplines and majors in our university.

I look forward to having a successful conference and hope that all the attendees enjoy and benefit from this conference.

Message from the Coordinator

Mrs. W. H. D. U. Pushpakumari
Coordinator, ICTRI - 2023
Faculty of Technology, EUSL



It is my great pleasure to deliver this welcome message as the coordinator of the prestigious 1st International Conference on Technological Research and Innovation – 2023, hosted by the Faculty of Technology at Eastern University, Sri Lanka. On behalf of the organizing committee, I extend a warm and heartfelt welcome to all of you who have gathered here to contribute to this significant occasion.

The Faculty of Technology at Eastern University, Sri Lanka (EUSL) has long been recognized as a hub of innovative research and groundbreaking findings. Within our academic programs, particularly the BBST in Agricultural Technology and Entrepreneurship, we instill a deep commitment to fostering research and development of new technologies that play a pivotal role in advancing sustainable development within our society.

The ICTRI-2023 conference is a testament to our commitment to technological advancement and sustainable development. It is a platform that brings together academics, researchers, and professionals from diverse fields to encourage and facilitate technological changes that have a lasting and positive impact on society. In a landscape filled with numerous conferences, the ICTRI 2023 stands out because of its unique focus on disseminating multidimensional research discoveries that are most pertinent to the technological transformation required for sustainable development. Moreover, this conference is an excellent opportunity for networking and forging collaborations that can further propel our collective efforts towards a more sustainable and technologically advanced future.

I would like to express my sincere gratitude to all our invitees, participants, reviewers, sponsors and partners, and who have played an integral role in making this conference a reality. Your support and dedication are deeply appreciated.

In conclusion, I encourage all of you to actively engage in the discussions, share your expertise, and seek inspiration from the wealth of knowledge that will be shared during this conference. Together, we can drive technological advancements that will pave the way for a brighter and more sustainable future.

Once again, I extend my warmest welcome to all of you. Let us make the ICTRI-2023 conference a resounding success.

Message from the Secretary

Mrs. Mohamed Rasheed Roshana

Secretary, ICTRI - 2023

Faculty of Technology, EUSL



It is a great pleasure to convey this message as the Secretary for the 1st International Conference on Technological Research and Innovation-2023 (ICTRI-2023), Faculty of Technology, Eastern University, Sri Lanka. The ICTRI-2023 has been organized with the theme of “Technological Advancement: Bridging the Gap Between Research and Sustainable Development” to provide a platform for academics, researchers and students to share high-quality research findings, and strategies for future sustainable development.

On behalf of the organizing committee, I convey my sincere gratitude to Prof. V. Kanagasigam, Vice-Chancellor, Eastern University, Sri Lanka for his encouragement, guidance and support provided in making ICTRI-2023 a reality. I express our heartfelt gratitude to Dr. T. Mathiventhan, Dean, Faculty of Technology, Eastern University, Sri Lanka, for his support, cooperation and consistent guidance throughout the planning of ICTRI-2023. Further, I would like to convey my gratitude to the co-organizer of our conference: Qujing Normal University, China for providing immense support and guidance throughout the journey. Also, it is my duty to extend thanks to all track coordinators for their dedication throughout the ICTRI-2023. Also, I thank Heads of the Departments, and academic and non-academic staff members of the Faculty of Technology for their kind cooperation shown in this event. I express my gratitude to the keynote speaker, guest of honour and resource persons of panel discussion for accepting our invitation with much enthusiasm. Also, the other members of the organizing committee and the editorial board are greatly acknowledged for their hard work in organizing the conference. In addition, a special note of appreciation is extended to the reviewers for their thorough and timely appraisal of the submissions. An event of this dimension cannot happen overnight. It requires meticulous planning and execution. I cannot thank everyone enough for the involvement they have shown and the willingness they have expressed to take on the completion of the tasks beyond their comfort zones. Most of all, I am grateful to all the authors for enriching the conference by sharing the contemporary knowledge of their research findings at ICTRI-2023.

I hope that all the presenters and participants will have fruitful discussions during the conference and I convey my best wishes for a successful and productive conference.

Message from the Editor

Eng. A. Janarth
Editor, ICTRI - 2023
Faculty of Technology, EUSL



Dear authors, reviewers, and readers.....!

It gives me immense delight to wish you all success researcher, from the proceedings of the 1st International conference.

I feel honored and fortunate to be a part of this peer-reviewed research proceedings and are working as a highly effective team to ensure it continues to be a trusted source in the relevant field of technology.

The turbulent times of 2023 have witnessed the importance and necessity of diversity, and we are proud to have diversified research findings in our proceedings.

As an editor, I do not believe in rushing into shortcuts that might work in getting more reach for the articles. Instead, we should find better articles that discuss new ideas and research directions, original articles that can create deep interest in the readership of the proceedings and content that the researchers do not want to miss, and our published papers are not an exception.

I am extremely excited to be embarking on this very important role and wish to express my gratitude to the leadership and the selection committee of the ICTRI - 2023 and our editorial board members for their great support and I would like to thank all the anonymous reviewers and contributors for their timely effort, and I would also be extending my thanks to all the academic and non-academic staffs for their valuable support.

Abstract of the keynote

ADVANCES IN FUNGAL TAXONOMY, DIVERSITY AND CONSERVATION STUDIES

Fungi are microscopic and live everywhere around us in terrestrial, extra-terrestrial, and aquatic habitats. They are achlorophyllous and their vegetative body ranges from unicellular to filamentous. They reproduce by formation of tiny spores, asexual and sexual, fungal equivalent of plant seeds, developed in microscopic to macroscopic fruiting bodies. Armored with a variety of digestive enzymes, majority of the fungi subsist as saprobes, some pathogenic on plants and animals including humans and a few live as symbionts with other organisms. Fungi are the world's best degraders of all kinds of organic matter, from simple bread or decaying plant litter to most recalcitrant hydrocarbons such as plastics or aviation fuels. Not much, however, is known about their taxonomy and diversity, especially in countries such as ours. Of the estimated 3.8 million species of fungi only about 160,000 have so far been described, world over.

Besides being part of the decomposers community, fungi offer great advantages to our well-being which include nutritious foods such as mushrooms, mycelia and yeasts, varied alcoholic beverages, fermented and enriched fodder for cattle, mycorrhizal biofertilizers, fungal biopesticides, bio-remediation tools, life-saving medicines such as antibiotics, antivirals and statins and industrial applications including defense sector.

Hitherto documentation of fungi has largely been based on morphology; that is, what we see under the microscope. The modern approach is, in addition, to use the DNA sequences to categorize, name and assign them to appropriate lineage. In other words, it is neither only what we see under the microscope but characterization of most conserved DNA markers that are related to the metabolic product produced by that species of the fungus. With morpho-molecular studies, the fungal strains can be differentiated with almost certainty.

Three distinct phases can be recognized in fungal taxonomic and biodiversity studies. From the starting point, the time of Fries (1821), the studies on fungi have been mainly on morphology of the spores and spore-bearing structures as observed under the microscope. It has been a continuous voyage wherein the fungi were collected, studied and systematically documented in different parts of the world, a task primarily done by those who had an innate passion for such exercises. P.A. Saccardo (1845-1920), in a series of compilations titled as "Sylloge Fungorum" documented all the fungi described until then from world over and that is period considered as Saccardoan era. As time moved, in addition to the structure of fruiting bodies, developmental morphology of the fungal spores and spore bearing structures got consideration as additional taxonomic criteria, the understanding being 'ontogeny recapitulates phylogeny'. Developmental morphology, especially the conidium ontogeny, as doctored by Stan Hughes in 1952, has been found a useful tool to distinguish the asexual-morph taxa both in the hyphomycetes and coelomycetes, although it was a glaring taxonomic error that these part-fungi were treated as a separate group Deuteromycetes all along the last century. This period of study has been considered as Hughesean era. By the end of last century, it was well-felt that morphology alone does not support in distinguishing the taxa at the species or higher taxonomic level and the rDNA sequence data are essential in assigning the fungi into their respective

phylogenic lineage. Use of molecular sequences in distinguishing the fungal taxa is the modern era. Marked advancements are presently happening around the world in fungal floristic studies.

This talk will narrate the efforts made by the speaker in documenting and conserving the fungi of southern India in the last four and a half decades.....

D. Jayarama Bhat, Ph.D., D.Sc.

Distinguished Scientist Fellow,

Department of Botany & Microbiology, King Saud University, Riyadh, Saudi Arabia

Biology Division, Vishnugupta Vishwavidyapeetam, Gokarna, India

Formerly, Professor of Botany, Goa University, Goa, India

Email: bhatdj@gmail.com

TRACK 01:

**Agriculture Technology and
Entrepreneurship**

Effect of Virgin Coconut Poonac on Performance and Carcass Quality of Broiler Chicken

Kularathna, RMSS¹, Thanusan, S^{2*}, Lahiru, PB¹, Kalaivizhi, V³, Jayaweera BPA²

¹Department of Livestock and Avian Sciences, Faculty of Livestock, Fisheries and Nutrition, Wayamba University of Sri Lanka

²Department of Biosystems Technology, Faculty of Technology, University of Jaffna, Sri Lanka.

³Department of Animal Science, Faculty of Agriculture, University of Jaffna, Sri Lanka.

ABSTRACT

Virgin coconut poonac (VCP) is the residue left from the extraction of virgin coconut oil. VCP was found to contain 22.75% protein, 1800 kcal/kg of energy and 2.89% fat. The effect of replacement of expensive protein sources with phytase supplemented VCP as an alternative protein source on the performance and carcass quality of broiler birds was investigated in the study. Cobb-500 (n=50) chicks were randomly assigned to five dietary treatments (T) in a completely randomized design. Maize, coconut poonac and soybean meal-based control diet (T1) and four test diets were prepared with VCP at 10% (T2), 15% (T3), 20% (T4), 25% (T5), by replacing normal coconut poonac. Feed intake was recorded daily and live weights of birds were recorded once in every five days. Percentage of carcass recovery, major meat cuts, organ to carcass ratio, feed conversion ratio (FCR), broiler performance index (BPI), and broiler efficiency index (BEI) were calculated. SAS 9.2 and SPSS 16.0 were used to analyze data statistically. There is no significant difference ($p>0.05$) between Body weights among birds of different treatments. But, all the inclusion rates of VCP improved the growth performance and carcass yield of broiler chicken compared to control. BPI of T1, T2, T3, T4 and T5 are recorded as 1.44, 13.92, 21.02, 17.74, and 17.09 respectively. T3 was the most effective treatment in improving growth performance of broiler chicken. This study concluded that replacing normal coconut poonac with phytase supplemented VCP has beneficial effects on the performance and carcass quality of broiler chicken.

Key words: Broilers, Carcass quality, Inclusion rates, Performance, Virgin coconut poonac.

***Corresponding author E-mail:** sivalingamthanusan80@gmail.com

The Green Entrepreneurship Adoption among Agro-based Industries in Weeraketiya Divisional Secretariat Division, Hambantota District

M.H.S. Sathsarani^{1*}, G. Thivahary²

¹Department of Biosystems Technology, Faculty of Technology, Eastern University, Sri Lanka

²Department of Agricultural Economics, Faculty of Agriculture, Eastern University, Sri Lanka

ABSTRACT

A study was conducted to discover green entrepreneurship adoption among agro-based industries in the Weeraketiya Divisional Secretariat [DS] division, Hambantota. Weeraketiya DS division consists of core agro-industries such as dairy-related, food and beverage, spices processing and coconut processing. By following a stratified random sampling procedure, 90 agro-based entrepreneurs were selected among 110 registered agro-based small and medium entrepreneurs. Primary and secondary data were used for the study, and a questionnaire survey was the principal primary data collection method. The components of green entrepreneurship, based on the conceptual framework obtained from the literature review, include community well-being, green innovation and knowledge, green energy and resource conservation, green certification and marketing, reduced waste and recycling and reduced operational cost and environmental impact. The collected data were analysed through SPSS (Statistical Package for Social Sciences). Descriptive statistics were used to describe the study variables with the help of frequency distribution, mean and standard deviation. The Likert scaling method was used to determine the adoption level of green entrepreneurship. According to the study results, most agro-based industries are operated by males (79%) and the rest by females (21%). The majority of the respondents (85.6%) had 1 – 10 years of entrepreneurial experience. Moreover, around 97% of the agro-based industries are micro-scale, and the balance is small-scale. Further, most agro-based industries are engaged in spices processing, followed by food and beverage, dairy, and coconut-based production. Considering the total adoption of agro-based entrepreneurs toward green entrepreneurship, the majority (77.8%) in low-level adoption, 18.9% in very low level and only 3.3% in moderate-level adoption. Furthermore, it is evident from the study that none of the entrepreneurs in the area are practicing innovative practices to treat the environment. It must be considered seriously, and relevant authorities should conduct awareness programs on green entrepreneur practices.

Keywords: Agro-based Industry, Green Attitudes, Green Entrepreneurship, Green Innovation, Sustainability

**Corresponding author E-mail:* supulsarasathsaraneel4@gmail.com

A Study on the Entrepreneurial Ability of Cinnamon Farmers in Kamburupitiya DS Division in Matara District, Sri Lanka

D. L Thalerathna ^{1*}, G. Thivahary²

¹ Department of Biosystems Technology, Faculty of Technology, Eastern University, Sri Lanka

² Department of Agricultural Economics, Faculty of Agriculture, Eastern University, Sri Lanka

ABSTRACT

A study was carried out to identify the entrepreneurial ability of cinnamon farmers in the Kamburupitiya Divisional Secretariat division of Matara district. By following a random sampling procedure, 100 cinnamon farmers were selected, and a structured interview schedule was used to collect the information through personal interviews. Secondary data for the study were gathered from relevant sources. The collected data were analyzed through the SPSS package. Descriptive statistics were used to describe the study variables with the help of frequency distribution. Entrepreneurial ability was taken as a function of five components: Decision-making ability, Risk-taking ability, Leadership ability, Knowledge of cinnamon cultivation and Cosmopolitanism. The summation of scores of all these five components constitutes the entrepreneurial ability score of the respondents. The Likert scaling method was employed to determine the scores for each component and the total entrepreneurial ability of the cinnamon farmers. The socio-economic characteristics of cinnamon farmers revealed that the majority (57%) were male, more than half of them (54%) belonged to the young adults (below 47 years) age category, and 58% were educated up to the primary level. Further, most of them had land sizes of less than 1 ac. The study further revealed that over half (68%) of the cinnamon farmers had medium entrepreneurial ability. The possible reason for the low entrepreneurial ability of cinnamon farmers might be their low financial condition, small land holdings and low level of extension services. The fact that the majority of the farmers had medium entrepreneurial ability is a clear indication of the progressiveness of the farmers. Most farmers were young adults who quickly adopted new technologies and farming practices. Therefore, the relevant authorities should give cinnamon farmers entrepreneurship educational efforts and related policy support.

Keywords: Cosmopolitanism, decision-making ability, entrepreneurial behaviour, leadership ability, risk-taking ability

**Corresponding author E-mail:* ghananjanithalerathna@gmail.com

Socioeconomic Characteristics and Their Relationship with On-Farm Income of Goat Farmers under Different Farming Systems in the Eastern Province of Sri Lanka

P. Dayananthan¹, MG Mohamed Thariq^{1*}, R.M. Nikzaad¹

¹Department of Biosystems Technology, Faculty of Technology, South Eastern University of Sri Lanka

ABSTRACT

The goat population in the eastern province is 20.7% of the total goat population in the country and most of the farmers are rural and partially or fully depend on the goats for their livelihood. The local goats are poor meat producers; thus, farmers get insufficient income from goat farming. The socio-economic characteristics of the rural goat farmers are important for the upliftment of their economy. The relationship of these characteristics with on-farm income of goat farmers in the eastern province was not explored. The present study investigated the relationship of the socio-economic characteristics of goat farmers with their on-farm income in the extensive and semi-intensive farming systems. A questionnaire survey was carried out among 100, 106 and 60 goat farmers in Ampara, Batticaloa and Trincomalee districts, respectively. The data was analyzed statistically and the study found that on-farm and off-farm incomes between extensive and semi-intensive farming systems were not significantly different ($p > 0.05$). There was a significant weak positive association between on-farm income and family size ($R^2_s = 0.298$; $p < 0.05$) whereas the correlations of age, gender, education level, occupation, integrated farming, off-farm income, and goat rearing experience weren't significant ($p > 0.05$) in the extensive management. On-farm income and goat rearing experience were weakly and positively associated with each other ($p < 0.05$) whereas the on-farm income wasn't significantly associated with the age, gender, education level, occupation, integrated farming, off-farm income and family size ($p > 0.05$). The study reveals that the increase in family size may increase on-farm income in the extensive farming system and the increase in the goat farming experience may improve on-farm income in the semi-intensive farming system.

Keywords: Education level, Family size, Goat farming experience, Off-farm income

***Corresponding author E-mail:** mgmthariq@seu.ac.lk

Growth and Yield Performance of Okra Fertilized with Azolla and Cow Dung Liquid Fertilizer

I.V.N. Thameera^{1*}, P. Hisanithy¹, N. Suthamathy¹

¹ Department of Bio systems Technology, Faculty of Technology Eastern University, Sri Lanka.

ABSTRACT

This research was conducted to evaluate the efficiency of a liquid organic fertilizer prepared by using Azolla (*Azolla pinnata*) and cow dung on growth and yield of okra. The study was designed with five treatments and four replicates. The treatments are recommended inorganic fertilizer by Department of Agriculture (RFDOA) (T₁), 2/3 of RFDOA and two times of organic liquid fertilizer application (T₂), 2/3 of RFDOA and three times of organic liquid fertilizer application (T₃), 2/3 of RFDOA and four times of organic liquid fertilizer application (T₄) and Four times application of organic liquid fertilizer (T₅). Other all agronomic practices were followed based on the recommendation. Plant height, number of leaves per plant and leaf area were measured in weekly interval and chlorophyll content, Number of flowers per plant and fresh weight of Pod were collected at the time of harvesting. T₄ had the better result compared to other treatments. The plant height, number of leaves per plants, leaf area, chlorophyll content and number of flowers were 52.02 ± 0.98cm, 7, 49.22 ± 0.20cm², 49.22 ± 0.20 and 3 respectively in T₄ on 8th week after planting. Furthermore, significant different (p>0.05) in yield was obtained in T₄ (30.85g/plant) and least value was observed in T₁ (8.50g/plant). Among the all-tested treatments, 2/3 of RFDOA and four times of organic liquid fertilizer application (T₄) could be used in okra cultivation to be obtain better yield. Usage of Azolla organic liquid fertilizer would be a better alternative organic fertilizer in vegetable cultivation.

Keywords: Azolla, Cow dung, growth, Okra, yield

*Corresponding author E-mail: nishani151@gmail.com

Effectiveness of Liquid Fertilizer Based on Mexican Sunflower Plant (*Tithonia diversifolia*) in Amaranthus Cultivation

H.A.P. Madhuwanthi^{1*}, P. Hisanithy¹, N. Suthamathy¹

¹ Department of Bio systems Technology, Faculty of Technology Eastern University, Sri Lanka.

ABSTRACT

The research study was aimed to investigate the effectiveness of liquid fertilizer prepared by using Mexican sunflower plant with Guinea pig manure in Amaranthus cultivation. This experiment had five treatments with five replicates. Treatments are recommended amount of inorganic fertilizer (RAIF) (T₁), half RAIF +3 times application of compost extract (T₂), half RAIF +3 times applications of cow dung extract (T₃), half RAIF + 3 times applications of liquid fertilizer (T₄) and 3 times applications of liquid fertilizer (T₅). The liquid fertilizers were prepared in compost tea method. Other all agronomic practices were followed based on the recommendation. Plant height, number of leaves per plant and leaf area were measured in weekly interval. Fresh and dry weight of plants were recorded at the time of harvesting. The result indicated that liquid fertilizer has effect on the growth and yield of Amaranthus. The statistical results show that the highest yield was recorded in T₅ and followed by in T₄. The plant height, number of leaves per plant, leaf area, fresh and dry weight of plants were 21.76 ± 0.29cm, 19, 29.32 ± 0.402cm², 50.14 ± 0.55g and 7.62 ± 0.139g respectively in T₅ on the 4th week after planting. The findings suggest that application of Mexican sunflower plant with guinea pig manure liquid fertilizer combined with inorganic fertilizer or alone would enhance the growth and yield of Amaranthus.

Keywords: Amaranthus, Fertilizer, Guinea pig manure, Liquid, Mexican sunflower,

***Corresponding author E-mail:** pramodika20160108@gmail.com

Determinants of Net Sale Average of Tea Factories in Low Elevations in Sri Lanka

H.L.L. Chethmini 1^{1*}, R.A.P.I.S. Dharmadasa 1¹, C.H.M. Baanagala 1¹
H.A.E. Nalaka Ariyasinghe 2²

¹ Department of Export Agriculture, Faculty of Animal Science and Export Agriculture, Uva Wellassa University, Badulla 90000, Sri Lanka

² Nildiya Valley Tea Plantation, Akuressa, Matara 81000, Sri Lanka

ABSTRACT

This study attempts to find the factors that affect the Net Sale Average (NSA) of black tea factories in low elevations. Secondary data were collected from 40 tea factories from the year 2019 to 2021 in Matara and Galle districts on a random basis that belong to agro climatic regions in low elevations and Sri Lanka Tea Board Regional offices. Pooled OLS regression model was applied to determine the variation of the Net Sale Average in the low country. Results of Pooled regression model reveals that NSA is determined by the percentage of the main grade, best leaf standard, number of brokers and number of quality certificates of factories. The results further show that NSA can be increased when the green leaf quantity with poor leaf standard is reduced. According to records, maintaining the best quality leaf, understanding the market and having quality certificates are increasing the factory Net Sale Average. Matara region has provided somewhat best leaf standard production than the Galle region. However, the results indicate Net Sale Average has been reduced gradually from 2020 to 2021.

Keywords: Low elevation, Net Sale Average, Pooled Regression

***Corresponding author E-mail:** hlchethmini123@gmail.com

Standardization of In Vitro Shoot Multiplication and Surface Sterilization Procedures of *Curcuma longa* L.

Malki Sirimanna ¹, Priyanwada Warakagoda ¹

¹Department of Biotechnology, Faculty of Agriculture & Plantation Management, Wayamba University of Sri Lanka, Makandura, Gonawila, Sri Lanka

ABSTRACT

Curcuma longa L. (Zingiberaceae) is a cash crop in Sri Lanka and other countries. Micropropagation of *C. longa* L is essential to obtain disease-free planting materials for mass cultivation in short period of time. Other advantages include year-round production and applicability in crop improvement programs to improve quality traits are some other advantages. This study was conducted to evaluate the effect of five different surface sterilization procedures on in vitro establishment and different hormone combinations in solid and liquid culture media on in vitro shoot multiplication using rhizome bud explants. The experiments were designed according to Complete Randomized Design with 20 replicates. Data were analyzed using Minitab 19.1 computer software. The results revealed that the explants treated with 1% Topsin (70% Thiophanate- methyl) for 30 minutes followed by 100% Clorox (10% sodium hypochlorite) for 10 minutes had the highest number of non-contaminated (80%) and non-browning (100%) cultures after four weeks of culture establishment period. The best shoot multiplication rate (2.4 shoots/ explant) was obtained by explants cultured on liquid Murashige and Skoog (MS) medium supplemented with 4.0mg/l Benzyl Amino Purine (BAP) and 0.25mg/l Naphthalene Acetic Acid (NAA). The highest mean shoot length (6.56 cm) was obtained by explants cultured on liquid MS medium supplemented with 1.0mg/l BAP and 0.5mg/l NAA. Continuous data collection within 4 weeks intervals at each subculture is required to analyze the growth pattern and to identify the number of subcultures that could be performed.

Keywords: *Curcuma longa* L., Explants, Micropropagation, Shoot multiplication, Surface sterilization

*Corresponding author E-mail: malkisirimanna@gmail.com

Impact of Plant Growth Regulators on Vine Length and Yield of Salad Cucumber

Perera U. D. T.

Department of Crop Science, Faculty of Agriculture, University of Ruhuna, Sri Lanka.

ABSTRACT

An experiment was conducted to determine the effect of PGRs (Plant growth regulators) on vine length and yield of salad cucumber. The Completely Randomized Design with four replicates was used as the experimental layout. There were 5 treatments with four PGRs (T1=Cycocel, T2=Sodium Nitrophenolate, T3=Ethephon, T4=Paclobutrazol) and T5=no PGRs (control). Treatments were applied once a week. As growth parameters vine length, number of leaves per vine, the length of 7th, 14th and 21st internodes, the nodes per 1m of vine length and leaf area of 15th and 30th leaves were recorded. Fresh fruit weight, length of fruits and number of fruits were measured at harvest as yield parameters. Data were subjected to analysis of variance (ANOVA) using SAS statistical software. Mean separation was done by the Dunnett's test. According to the results T3(Ethephon) and T4(Paclobutrazol) recorded significantly shorter vine length while T3(Ethephon) recorded significantly highest number of leaves per vine and T4(Paclobutrazol) had significantly lowest number of leaves per vine. In addition, T3(Ethephon) and T4(Paclobutrazol) resulted significantly shorter internodal length for 14th and 21st internodes. T4(Paclobutrazol) recorded significantly lowest leaf area in 15th leaf while T3(Ethephon) recorded significantly highest leaf area in 30th leaf. Moreover, T3(Ethephon) and T4(Paclobutrazol) recorded significantly higher number of nodes per 1m of vine length. When considering the yield parameters T3(Ethephon) recorded significantly lowest fruit weight, fruit length and number of fruits. Therefore, T4(Paclobutrazol) can be recommended to reduce the vine length and to obtain a better yield at the same time from salad cucumber plants.

Keywords: Cycocel, Ethephon, Paclobutrazol, Sodium Nitrophenolate

***Corresponding author E-mail:** pereradinusha707@gmail.com

Words from Prof M. I. S Safeena,

Faculty of Technology, Eastern University, Sri Lanka

Agriculture and entrepreneurship,

Agriculture and entrepreneurship is an emerging field. It involves analyzing and understanding the strategies of agricultural entrepreneurs, particularly in response to the institutional changes and economic and technological disruptions to which the agricultural industry is subject. In the current world, agriculture must compete with many issues, including globalization, market liberalization, climate instability, the depletion of natural resources, and urbanization. These difficulties have had a straightforward and indirect impact on the market, presenting opportunities as well as hazards for farmers, particularly smallholders. However, market-oriented agriculture is spreading as we become more conscious of the vital role that smallholder agriculture plays in economic development and rural development. Agriculture and Entrepreneurship (Agripreneurship) is one strategy for overcoming these difficulties. This strategy can promote social and economic advancement, reduce poverty, and provide food security and nutritious food. Additionally, by presenting employment and entrepreneurial opportunities, it enables the diversification of the economy and income sources.

The agriculture and entrepreneurship integrate with another sector which is evolving due to new technological advancements. Modern genetic engineering and precision farming methods are only two examples of how technology is helping farmers become more effective, productive, and environmentally friendly. The main goal of agricultural entrepreneurship is to embrace this new technology and use them to develop original solutions to contemporary issues. Some examples of technology usage in modern agriculture include Precision agriculture, automated machinery, Biotechnology, Drones usage, and Agri related Data analytics. These are just a few examples of the many ways that technology is being used in modern agriculture to improve efficiency, sustainability, and productivity.

In overall, agriculture and entrepreneurship revolve on Vertical Farming, Sustainable Livestock Farming, Precision Agriculture, Agtech Startups etc.

As a conclusion, agriculture and entrepreneurship is a vital component of modern agriculture that enables farmers and agribusinesses to continue to be successful and competitive. To create and put into exercise sustainable innovations that benefit both the farmer and the environment, it is crucial to think creatively, take calculated business risks, be resilient, and be passionate.

Socio-Economic Status and Management Strategies Practice by the Goat Farmers in Mihintale Veterinary Division: A Case Study in Anuradhapura District, Sri Lanka

R.M.H.S Rathnayake¹, H.K.R.S Kumara^{1*}, K.G.C.S Kumara²

¹Department of Food Technology, Institute for Agro-Technology and Rural Sciences, University of Colombo, Sri Lanka.

²School of Social Work, National Institute of Social Development, Sri Lanka.

ABSTRACT

This study aimed to investigate the socio-economic status and management strategies practiced by the goat farmers in Mihintale veterinary division of Anuradhapura district. A sample of 50 goat farmers was randomly selected, and data were collected and analyzed using IBM SPSS (Version 25.0). The results indicated that all the farmers in the study area rear goats for meat production, with 26% consider it as their primary source of income and 74% as auxiliary income. Locale Crosses (94%) and Jamunapari (6%) were the predominant goat breeds observed. Male farmers constituted 86% of the sample, while 14% were female. The majority of farmers (56%) had 2-6 years of goat farming experience. Free-range browsing (94%) was the prevalent farming system, with a small percentage (6%) use the semi-intensive cut and fed feeding method. Natural mating (100%) was the primary breeding method reported. Middlemen were the main source of sale animals, accounting for 58% of transactions. The major constraints identified were the high cost of veterinary drugs (31%), poor housing facilities (26%), and a lack of grazing lands (14%). Despite these challenges, the study concluded that a significant number of farmers in Mihintale veterinary division relied on goat farming as their primary source of income, demonstrating sufficient experience. However, inadequate extension services for goat production and the high cost of veterinary drugs and concentrates posed significant obstacles to successful and sustainable goat farming in the area.

Keywords: Goat farming, Socio-economic status, Management strategies, Smallholder farming

Corresponding Author Email: rasika@uciars.cmb.ac.lk

The effect of vermiwash on the growth and yield of lettuce (*Lactuca sativa*)

A.T.Dilshan ^{1*}, W.H.D.U.Pushpakumari ², D.M. Hunupolagama ³

¹Department of Bio Systems Technology, Faculty of Technology, Eastern University, Sri Lanka.

ABSTRACT

Organic farming is a cultivation technique that excludes the use of synthetic pesticides, synthetic fertilizers, or synthetic substances. The study aimed to investigate the effect of vermiwash on the growth and yield of lettuce, which is an important crop in organic farming. Vermiwash is the liquid fertilizer produced from the vermicompost bin, which is rich in nutrients and beneficial for soil health. Four different concentrations of vermiwash, T1 (20%), T2 (30%), T3 (40%), and along with the control (T4) were applied to the lettuce plants, at the field of kuliyapitiya. The experiment was laid out in a Randomized complete block design (RCBD) with twenty replicates. The plant height, leaf length, leaf width, and leaf area were measured after 4 th week of planting. The fresh weight and dry weight of the yield were measured after 45 days of planting. Data were subjected to statistical analysis, and analysis of variance (ANOVA) by using Minitab 17 software. The results showed that the 30% and 40% concentrations of vermiwash had significant effects ($p < 0.05$) on the growth and yield of lettuce, compared to the control. The application of 30% and 40% of vermiwash significantly increased the plant height (11.87 ± 0.25 cm and 11.20 ± 0.25 cm) the number of leaves (10 ± 0.2 and 10 ± 0.2), leaf area (127.6 ± 3.91 cm² and 133.45 ± 3.79), leaf length (12.47 ± 0.17 cm and 13.29 ± 0.16 cm), leaf width (12.41 ± 0.22 cm and 12.85 ± 0.6 cm), fresh weight (43.95 ± 3.11 cm and 49.23 ± 2.80), and dry weight (3.37 ± 0.36 cm and 3.96 ± 0.47) ($p < 0.05$) respectively. This finding indicates that using a 30% vermiwash concentration is not only beneficial for lettuce growth but also economically profitable. These findings suggest that vermiwash concentration can be a useful tool and profitable for improving the quality and yield of lettuce in organic farming. This study provides important insights into the potential benefits of vermiwash for sustainable and eco-friendly agriculture practices.

Keywords: Vermiwash, Organic Farming, Lettuce, Sustainable Agriculture

***Corresponding author E-mail:** atdilshan1234@gmail.com

Effects of wild sunflower (*Tithonia diversifolia*) and citronella grass (*Cymbopogon citratus*) biochar mixture on vegetative growth of tomato plant (*Solanum lycopersicum*).

R.M.R.G. Rishadi Rukshana Rathnayake^{1*}, C. Mahendranathan²

¹Department of Biosystems Technology, Faculty of Technology, Eastern University, Sri Lanka.

²Department of Botany, Faculty of Science, Eastern University, Sri Lanka.

ABSTRACT

Biochar is defined as a carbon rich material produced during pyrolysis process that is a thermochemical decomposition of biomass in the absence or limited supply of oxygen. The experiment aimed to evaluate the effects of wild sunflower (*Tithonia diversifolia*) and citronella grass (*Cymbopogon citratus*) biochar mixture on vegetative growth of Tomato plant (*Solanum lycopersicum*), which is an important cash crop and also has a good potential for export. Recently, it has been reported that biochar obtained from the carbonization of organic wastes can be a substitute that not only influences the sequestration of soil carbon but also modifies its physicochemical and biological properties. In addition, the biochar amendment to the soil proved to be beneficial to improve soil quality and retain nutrients, thereby enhancing plant growth. In this experiment, wild sunflower and citronella grass plant debris were used to make the biochar. Pyrolyzed biochar was mixed at a ratio of 1:1. Physical and chemical properties of biochar were taken such as pH (11.88), electrical conductivity (68.2 μ s/cm), water holding capacity (45.82%), bulk density (41.6g/cm³) and total negative surface anions (9.05NaOH volume= ml). Four different concentrations of biochar, T₁ (100 g), T₂ (200g), T₃ (100g +0.5l), T₄ (200g+ 0.5l), and along with the control (T₅) were applied to the potted Tomato Plants. The experiment was laid out in a randomized complete block design (RCBD) with 25 replicates. Tomato Thilina variety was potted and biochar mixture was added 15 days after transplanting. Plant height, number of leaves per plant, number of branches per plant, stem height and root length were recorded at 8th week after planting. Data were exposed to statistical analysis and analysis of variance (ANOVA) by using Minitab 17 software. The data showed that the T₃ had significant effects (P<0.05) on the vegetative growth of Tomato, compared to the control as well as other treatments. The application of 100g biochar and 0.5l water mixture significantly increased the Plant height (30.02 \pm 0.26 cm), number of leaves per plant (28.60 \pm 0.40), number of branches per plant (9.20 \pm 0.37), stem height (22.24 \pm 0.32cm) and root length (7.56 \pm 0.21cm) in T₃ on 8th week after planting. This study suggests that the Usage of bio char would be a better alternative organic fertilizer in vegetable cultivation.

Keywords: Bulk Density, Concentrations, Electrical Conductivity, Total Negative Surface Anions, Water Holding Capacity.

*Corresponding author E-mail: rishadirathnayake1996@gmail.com

Influence of Electro Magnetic Field on the Biology of Immature Stages of Swarming Armyworm (*Spodoptera mauritia*)

P. A. Shiromiya^{1*}, S. Keerthika¹, R. Thibisha¹, P. Saaroojan², P. R. Fernando³, R. F. Niranjana¹

¹Department of Agricultural Biology, Faculty of Agriculture, Eastern University, Sri Lanka

²Bio Medical Engineer Sri Sathya Sai Sanjeevani Hospital Batticaloa, Sri Lanka

³Department of Physics, Faculty of Science, Eastern University, Sri Lanka

ABSTRACT

In the Eastern region of Sri Lanka, an outbreak of the swarming armyworm, *Spodoptera mauritia*, occurred, drastically damaged the paddy cultivation from April to June 2023. Considering the human health, the electromagnetic fields are one such technical approach as opposed to chemical pest control methods. The preliminary laboratory investigation concentrated to find the impact of electromagnetic field on the biology of the larvae and pupae of *S. mauritia* was investigated at different frequencies. Four treatments, 4 Hz, 6 Hz and 8 Hz and control along with five replicates were arranged in Completely Randomized Design. Twenty experimental units were designed as one larva in each beaker. Likewise, another twenty experimental units were designed to test the effect on pupae where three pupae were placed in each beaker. The experimental units designed to treat by electromagnetic vibration were exposed at each frequency for twenty minutes by a "pulse electromagnetic device". The number of immature stages of *S. mauritia* that were transformed to pupae or adults was recorded. The statistical analysis showed that 6 and 8 Hz prevented the larvae from maturing into pupae. In contrast, the larva became a pupa though it has been exposed to 4 Hz as similar to control. Furthermore, 4 Hz and 6 Hz were significantly ineffective in the case of pupae in preventing transformation into adults, which were par with control; nevertheless, 8 Hz showed effectiveness in inhibiting adult growth. The overall findings distinctly revealed that the electromagnetic field at 8 Hz was able to inhibit the development of both larva and pupa of *S. mauritia*.

Key words: Electromagnetic field, frequency, *S. mauritia*, vibration

***Corresponding author E-mail:** shiromie1997@gmail.com

Interspecific rootstocks to mitigate *Fusarium* wilt incidence in watermelon

N.A.Tamilselvi¹ and T. Arumugam², C.Thangamani³, M.Kavitha⁴

^{1,3,4}Department of Vegetable Science, Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore-3, Tamil Nadu, India.

²Thiruvalluvar University, Velur, Tamil Nadu, India.

ABSTRACT

The experiment was conducted to identify the *Fusarium* wilt resistant interspecific hybrid rootstocks to mitigate *Fusarium* wilt incidence in watermelon. About 16 interspecific hybrid rootstocks and two watermelon scions *viz.*, Dragon King and NS 775 were artificially inoculated with a 20-day-old *Fusarium* wilt fungus grown on sand-maize medium at the rate of 100g (fungus + sand-maize medium)/pot under pot culture. The per cent disease incidence and peroxidase (POX) and catalase (CAT) activity were recorded at 15, 21 and 28 days after inoculation. Among the interspecific hybrid rootstocks, CM 44 x CMa 52, CM 28 x CMa 52 and CM 44 x CMa 49 exhibited moderately resistant reaction with plant survival per cent of 83.86, 81.45 and 75.36 at 21 days post inoculation, respectively. Among the interspecific hybrid rootstocks and watermelon scions, the highest mean peroxidase and catalase activity was recorded by CM 44 x CMa 52, followed by CM 28 x CMa 52 and CM 44 x CMa 49. Based on the plant survival per cent and defense enzymes activities, CM 44 x CMa 52, CM 28 x CMa 52 and CM 44 x CMa 49 rootstocks could be identified as the best rootstocks for grafting with watermelon scions.

Keywords: Catalase activity, Defense enzymes, Per cent disease incidence, Peroxidase, watermelon grafting

*Corresponding author E-mail: tamilaaru@gmail.com

A Review on the IoT-Powered Precision Agriculture as a Path to Tastier and Higher Yields of Watermelon (*Citrullus lanatus*)

W.M.A.M. Ranasinghe ^{1*}, A.M.A. Rajendran ¹, T. Jeyjenthana ¹

¹SenzAgro (Pvt) Ltd, 81/5, R.G Senanayake Mawatha, Colombo 07, Sri Lanka

ABSTRACT

In recent years, the agricultural industry has witnessed remarkable advancements through the incorporation of cutting-edge technologies. Precision agriculture, an innovative approach, has revolutionized farming practices by optimizing resource utilization and maximizing crop yield. This advanced summary explores the potential of an IoT-based platform for automated irrigation in improving watermelon quality, taste, and productivity, presenting a paradigm shift in the field of agriculture. Watermelon is an economically significant fruit, and poses unique challenges for growers due to its specific water and nutrient requirements throughout its growth cycle. The conventional irrigation methods often lead to several challenges. By integrating precision agriculture principles into the cultivation of watermelon, farmers can overcome these challenges and achieve substantial benefits. The proposed “SenzAgro” IoT-based platform offers real-time data monitoring and control of crucial parameters such as soil moisture, temperature, humidity, and light intensity. Through wireless sensors installed within the fields, the system ensures precise irrigation, tailoring water delivery based on the actual needs of the watermelon plants. This dynamic irrigation schedule promotes optimal root development, leading to healthier plants and higher fruit quality. Moreover, the “SenzAgro” automated irrigation system can be fine-tuned to cater to specific watermelon varieties, enabling the production of sweeter, juicier, and more flavorful fruits. By maintaining the ideal balance of water and nutrients, the platform contributes to the enhancement of watermelon taste and overall consumer satisfaction. With real-time data insights and alerts provided with the “SenzAgro” smart application tool, farmers can promptly respond to any environmental stressors or anomalies, safeguarding crops from potential losses and ensuring a consistent and bountiful harvest. Embracing this transformative technology not only benefits growers but also addresses the global challenge of food security, creating a promising future for agriculture as a whole.

Keywords: Automated irrigation, Precision Agriculture, Productivity, Sugar content, Watermelon

***Corresponding author E-mail:** asitha@senzagro.com

Identification of suitable classifier for Cotton Crop Cultivation using machine learning techniques

R.A.D.V.S Ranasinghe*

General Sir John Kotelawala Defence University

ABSTRACT

Cotton crop cultivation is an important component of agriculture, and the selection of an effective classification technique is key to optimizing crop output and resource usage. In this study, various machine learning classification approaches were investigated to determine the best way to predict the suitability of various places for cotton crop development. A dataset that includes important environmental and soil-related characteristics such as temperature, humidity, soil density, electric conductivity, and nutrient levels (N, P, K, Ca, Mg) was employed in this research. Multinomial logistic regression, Random Forest, and Artificial Neural Networks are among the classifiers investigated in this study. The dataset was preprocessed to deal with missing values, normalize the features, and correct any class imbalances. To assess the effectiveness of each classification technique, various metrics were employed, including accuracy, precision, recall, F1-score, and the confusion matrix. Additionally, we use k-fold cross-validation to assess the models' robustness and generalization capabilities. The results demonstrated that the Random Forest algorithm can be used with 98% accuracy as a suitable classifier for Cotton Crop Cultivation and Mg as the strongest predictor for cotton crop cultivation. Therefore, in future algorithms, the results obtained from this research can be used as a valid and consistent classification model to increase cotton crop yield in designing prototypes.

Keywords: Crop harvest, Classification, Algorithm, Agriculture

*Corresponding author E-mail: sanuththara98vedi@gmail.com

Effect of Different Seed Priming Agents on Growth And Development of MI 6 Variety of Green Gram (*vigna radiata*) Under Induced Drought Condition

H.A.H.A. Kumarasiri¹, M.I.S. Safeena^{1*}

¹Department of Biological Sciences, Faculty of Applied Sciences South Eastern University of Sri Lanka

ABSTRACT

Growth and yield of green gram (*Vigna radiata*) has severely affected by drought conditions in Sri Lanka. This study was conducted to compare the effect of different priming agents on seedling growth and drought resistance of MI6 variety of *Vigna radiata*. Different priming agents were used for this study such as KNO₃ (0.1%) as osmopriming agent, H₃BO₃ (0.1%) as nutripriming agent and Deionized water as hydropriming agent. Unprimed seeds were used as the control. The study was conducted using two separate experiments. One experiment for seedling growth A factorial experiment for the resistance to drought stress. The data was analysed using Analysis of Variance (ANOVA) (P<0.05) using Minitab software (17) and Microsoft Excel (2013). The average root length and seedling length , under distilled water were 31.63% and 30.18% respectively compared to the control. The average shoot length and leaf area treated with KNO₃ were 31.53% and 32.78% respectively. Priming with boric acid has increased Chlorophyll and root length by 29.72% and 29.07%. respectively compared to the control. Proline content, SOD activity and total antioxidant capacity was decreased by 18.95%, 22.8%, 19.42% respectively .Under the treatment of distilled water, chlorophyll b and relative water content was increased by 27.41% and 29.07% respectively compared to the control. Among the priming agents, KNO₃ was the most suitable for the shoot area growth, and distilled water was root growth. However, the most suitable priming agent for MI6 variety of *Vigna radiata* under drought stress is H₃BO₃.

Keywords: Seeding, Absorbance, Stress, Parameters

*Corresponding author E-mail: safeenim@seu.ac.lk

Physiological and Biochemical Responses of Cowpea (*Vigna unguiculata* L.) Against Biofilm Fertilizer and Foliar Application of Ascorbic Acid Under Drought Stress

K.A.P.H. Semini¹, M.I.S. Safeena^{1*}

Department of Biological Sciences, Faculty of Applied Sciences, Southeastern University of Sri Lanka

ABSTRACT

Evaluation of physiological and biochemical responses of Cowpea (*Vigna unguiculata* L.) affected by drought stress is essential to increase the yield of existing varieties. Present study was attempted to investigate the effect of drought stress against biofilm fertilizer and foliar application of ascorbic acid in Waruni variety on selected physiological and biochemical parameters at vegetative (growth stage, and development and differentiation stage that lead to a mature plant) and reproductive stages. Experiment was set up in completely randomized design with five replicates. All data were analyzed at a 5% confidence level using Minitab 17.0 software. Drought stress was stimulated on three weeks old seedlings, by withholding water until plants wilted at 30% of soil field capacity. 100 ppm L- Ascorbic acid (AsA) solution and Commercial Biofilm – R solution were used at a 1:150 ratio. The study found that sole application of AsA increased relative water content by 0.55%, and decreased proline content by 18.83%. Biofilm fertilizer increased chlorophyll a, chlorophyll b, and total chlorophyll content by 12.35%, 11.35%, and 12.03% respectively while decreasing malondialdehyde accumulation by 2.24%. Combining AsA and biofilm fertilizer increased stomatal density by 8.35% and sugar content by 4.85%. In general conclusion, biofilm fertilizer showed better performance among the treatments. However, the sole use of biofilm fertilizer and AsA is significant for enhancing drought tolerance of plants over the combination of both under drought stress.

Keywords: Biofilm fertilizer, Ascorbic acid, Drought, Vegetative stage, Reproductive stage

*Corresponding author E-mail: safeenim@seu.ac.lk

Influence of grafting on growth, yield and quality attributes in tomato

M.Kavitha¹, M.Prabhu¹, L. Pugalendhi¹, N.A.Tamilselvi¹,

¹Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India

ABSTRACT

In recent days, production of tomato is great challenges with change in adverse climatic conditions were in leads to much pest and diseases infestation which in turn reduces the crop yield drastically. Farmers use repeated application of fungicides and pesticides to manage the biotic and abiotic factors during the cultivation of tomato which increases threats to ecological safety. As an alternative approach the grafting technology is considered as a healthy and toxic free alternative to increase the production of tomato. This research was conducted to study the influence of rootstocks on the performance of tomato on growth, yield and quality. Seven root stocks viz., *S.torvum*, *S. sysymbriifolium*, IC 111056, Surya, *S. pimpenellifolium*, PKM 1 tomato variety and Shivam tomato hybrid were grafted on Shivam tomato hybrid. The trial was conducted with three replications at the Horticultural College and Research Institute, Coimbatore. Shivam grafted on *Solanum torvum* rootstock showed the highest success percentage of 85.77%. Tomato (Sivam) grafted on *S. sysymbriifolium* yielded highest number of fruits per plant (59.37), Fruit diameter (5.80 cm) and Average fruit weight (79.45 cm).The grafting trial on tomato revealed that tomato grafted on *S. sysymbriifolium* recorded the highest yield/plant (4.72 kg) and yield/ha (84.96 q/ha). The grafting did not affect any major significance on quality attributes.

Keywords: Rootstocks, Scion, *S. torvum*, Shivam

***Corresponding author E-mail:** kavitha.m@tnau.ac.in

Evaluation Of Mini Seed Corms Of Elephant Foot Yam (*Amorphophallus paeoniifolius* Dennst.) Under Closer Planting Systems

C.Thangamani¹, L. Pugalendhi¹, P.S.Kavitha¹, M.Kavitha¹, N.A. Tamilselvi¹

¹Department of Vegetable Science, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India

ABSTRACT

Elephant foot yam possesses high photosynthetic efficiency and high dry matter production capability per unit area. Conventionally, it is propagated through corms and cormels, about 25 per cent of the harvested corms (3500kg) is used as planting material. Through mini corm technique, multiplication ratio enhanced from 1:3 to 1:5. There is a need to produce smaller to medium sized corms in elephant foot yam under closer spacing system. An experiment was carried out at the Department of Vegetable Science, TNAU, Coimbatore during 2022 in a Completely Randomized Block Design with ten treatments and three replications. Treatment details viz., T1 - 100g 30 x 30cm, T2- 100g 45 x 30cm, T3 - 100g 45 x 45cm, T4- 150g 30 x 30cm, T5- 150g 45 x 30cm, T6 - 150g 45 x 45cm, T7- 200g 30 x 30cm, T8 - 200g 45 x 30cm, T9 - 200g 45 x 45cm, T10 (control) - 750g 90 x 60 cm. Vegetative parameters were recorded at fourth and sixth month after planting and corm yield characters were recorded during harvesting. All the data were subjected to statistical analysis (DMRT) with a AGRES software 7.1 version. Under conventional spacing T10 the highest values were recorded at four months and six months after planting for plant height (53.39 ± 1.20 cm; 63.00 ± 1.33 cm), pseudo stem girth (8.10 ± 0.06 cm; 10.55 ± 0.32 cm) and canopy spread (83.76 ± 1.14 cm; 102.23 ± 2.69 cm) which were significantly different at P level of 1% respectively. Corm diameter and corm yield per plant were significant at p 1% level, T10 with 16.78 ± 0.24 cm and 3.42 ± 0.08 kg followed by T9 with 15.90 cm and 1.74 kg respectively. T7 recorded the highest plot yield of 25.60 ± 0.15 kg and estimated yield of 49.54 ± 0.71 t/ha and it is followed by the treatment T9 with plot yield of 25.01 kg and estimated yield 48.88 t /ha respectively. Medium sized corms obtained in T7 which recorded 3.1 % yield increase over conventional spacing of 90 x 60 cm.

Keywords: HDP - Smaller corms - Higher Yield

* *Corresponding author e mail ID:* thangamani.c@tnau.ac.in

Effect of Salicylic Acid Application on Management of Chilli Leaf Curl Complex (*Capsicum annuum* L.)

Yoniska Santhirakumar ^{1*}, Prasannath, K. ²

¹ Department of Bio Systems Technology, Faculty of Technology, Eastern University, Sri Lanka.

² Department of Agricultural Biology, Faculty of Agriculture, Eastern University, Sri Lanka.

ABSTRACT

Chilli (*Capsicum annuum* L.) is a significant cash crop in Sri Lanka, however, chilli leaf curl complex (CLCC) limits its output and productivity. Against the chilli leaf curl virus vector and the associated insect pests, several insecticides are offered for the management of CLCC. The indiscriminate use of insecticides causes dangers to human health. This study was conducted to determine the effect of salicylic acid on the treatment of CLCC. The chilli variety PC-1 was selected for this experiment with five treatments arranged in a randomized complete block design. The data on growth parameters and CLCC severity were analyzed using ANOVA, and Tukey's test was used to identify the best treatment combination. The results revealed that spraying salicylic acid along with the recommended application rate of imidacloprid insecticide, significantly lowered the CLCC severity. Therefore, the integrated application of salicylic acid and the recommended insecticide, imidacloprid, could be a better option for the effective management of CLCC.

Keywords: Chilli leaf curl complex, Disease severity, Imidacloprid, Salicylic acid

***Corresponding author E-mail:** yoniskayoni1997@gmail.com

TRACK 02:
Food Technology

Optimization Of Clean In Place Process For Cost Reduction In Milco (Pvt)Ltd

R.W.M.M.H.Rasingolla¹*, K.W.D.M.J.C. Wickremasighe², S.Arasaretnam³,

¹Department of Bio systems Technology, Faculty of Technology, Eastern University, Sri Lanka, Chenkalady

²Quality Assurance Section, Spray Dried Milk Factory, Ambewela

³Department of Chemistry, Faculty of Science, Eastern University, Sri Lanka, Chenkalady

ABSTRACT

Cleaning in place is a method used to clean the inner surfaces of equipment, piping, vessels, and fittings without disassembly. This study investigates the potential of reducing the concentration of sodium hydroxide (NaOH) in the cleaning-in-place (CIP) process within the dairy industry. The objective is to achieve cost savings and operational sustainability. The method involved conducting experimental trails using different NaOH concentration (2% and below, A clean vessel was indicated by a relative count of 2000 cfu/ml) in CIP cycles within a dairy industry. The 1.2 % concentration of solution showed that reducing the NaOH concentration while maintaining other cleaning parameters within acceptable limits resulted in comparable cleanliness. This study revealed that CIP cleaning cycles in raw milk storage tank using a 1.2% v/v dilution of caustic over 400 seconds ensured thorough cleaning. This reduction in caustic concentration (1.2%) could lead to significant cost saving for milk industries, amounting to Rs.31089.60 per week. This study concludes that it is possible to reduce the NaOH concentration used in CIP process to 1.2% (v/v) without any negative impact on cleaning and this can result in significant cost saving. It recommends dairy industry practitioners to optimize NaOH concentration in their CIP process for economic and environmental benefits. However, further research and validation in large scale are recommended to ensure compatibility with different types of dairy processing equipment and cleaning protocols.

Keywords: Clean In Process (CIP), Alkali cleaning, dairy plant, swab test

***Corresponding author E-mail:** manuja.hansini19@gmail.com

Development of Spices Incorporated Palmyrah (*Borassus flabellifer*) Jaggery and its Physicochemical Analysis

J.Jena^{1*}, N.Sobini², M.M.P.Arachi¹, S.Maathumai¹, S.Sangeetha², A.Kirushanthi²

¹ Department of Export Agriculture, Uva Wellassa University, Badulla, Sri Lanka

² Palmyrah Research Institute Kaithady Road, Jaffna, Sri Lanka

ABSTRACT

Palmyrah (*Borassus flabellifer*) jaggery plays a significant role in indigenous medicine as an anti-diabetic, anti-hyperglycemic and anti-hyperlipidemic agent. This study aimed to evaluate the physicochemical and sensory characteristics of Palmyrah jaggery incorporated with various spices. The incorporation of spices into jaggery products enhances their nutritional and medicinal value. Several formulations of jaggery were developed with the incorporation of spices such as dry ginger, cardamom and cinnamon with the concentration of 0.5% and 1.0%. Sensory evaluation, particularly spider web analysis was employed to identify the best product. Proximate analysis and nutritional analysis were compared for the selected product and control. The antioxidant activity of the products was assessed through DPPH radical scavenging activity, using gallic acid as a standard compound to measure total phenolic content. Based on the sensory evaluation, the jaggery incorporated with cardamom (1.0%) was selected as the best treatment. Significant differences ($P < 0.05$) were observed in all tested parameters among the samples. Physicochemical analysis revealed higher levels of Ca, Mg, Na, and K in cardamom- incorporated jaggery compared to jaggery without cardamom. Additionally, fat content was lower in cardamom-incorporated jaggery (0.30 ± 0.00 %). Cardamom-incorporated jaggery exhibited the highest DPPH radical scavenging activity, with an IC₅₀ value of 13.44 ± 0.88 mg/mL, as well as a higher total phenolic content (TPC) of 6.7 ± 0.02 mg GAE/100g compared to jaggery without cardamom. Furthermore, the introduction of a new packaging material, such as aluminum foil packets, improved the shelf life of cardamom-incorporated jaggery.

Keywords: Cardamom, Cinnamon, Dry Ginger, Sweet sap, Quality Improvement

*Corresponding author E-mail: jeyakumarjena52@gmail.com

Comparison of Bioactivity of the Extracts from Female and Male Palmyrah (*Borassus flabellifer*) Inflorescence

S. Hanoja^{1*}, N. Sobini², M.M.P. Arachi³, S. Maathumai¹, S. Sangeetha²

¹ Department of Export Agriculture, Uva Wellassa University, Badulla, Sri Lanka

² Palmyrah Research Institute, Kaithady Road, Jaffna, Sri Lanka

³ Department of Food Science and Technology, Uva Wellassa University, Badulla, Sri Lanka

ABSTRACT

Palmyrah (*Borassus flabellifer*) has great potential of yielding several products with good medicinal and nutritional benefits. The aim of the study was to investigate the bioactivity of Palmyrah male and female inflorescences to assess their potential of using them in the pharmaceutical and nutraceutical industry. Young inflorescences of male and female palmyrah with the same maturity, variety and size were selected for this study. Methanol and water extracts of inflorescence were prepared separately using maceration technique. The extracts were subjected to phytochemical screening, antioxidant activity and antibacterial determination. Statistical analysis was carried out using one-way ANOVA with 95% confidence level. Results of phytochemical screening revealed that tannins, steroids and phytosterols were present in all the extracts. However, carboxylic acid, alkaloid, flavonoid, and saponins were present only in the methanol extracts of both inflorescences. Meanwhile, cholesterol, anthocyanin, anthraquinones and proteins were absent in all the extracts. The antibacterial activity assessment exhibited substantial inhibition towards *Staphylococcus aureus* in all tested samples, indicating potential antibacterial properties of the palmyrah inflorescence extracts whereas the inhibition zone was not observed for *E.coli* with any of the extracts. Moreover, antioxidant activity and total phenolic content were significantly ($p < 0.05$) higher in the methanol extracts compared to water extracts. Furthermore, methanol extract of male inflorescence exhibited significantly higher IC_{50} value ($4.13 \pm 0.05 \mu\text{g/mL}$) and total phenolic content ($354.67 \pm 2.08 \text{ mg GAE/g}$) than the female inflorescence. It can be concluded, palmyrah male inflorescence could be utilized in the pharmaceutical industry as it is rich in bioactive compounds.

Keywords: Antioxidant activity, Bioactivity, Palmyrah inflorescence, Phytochemicals, Total phenolic content.

*Corresponding author E-mail: hanojasri01@gmail.com

Development of A Natural Toothpaste from Palmyrah Pulp

J.M. Arunan^{1*}, P. Robikka², N.W. Gunasekara¹, S. Maathumai¹

¹ Department of Export Agriculture, Uva Wellassa University, Badulla, Sri Lanka

² Palmyrah Research Institute, Kaithady Road, Jaffna, Sri Lanka

ABSTRACT

This research was aimed to harness the underutilized resource of palmyrah pulp in Sri Lanka to develop a natural and eco-friendly toothpaste. Although the Palmyrah Research Institute, Jaffna, previously formulated a palmyrah pulp-based toothpaste, it exhibited certain deficiencies, including oil formation and yellow colour stain on toothbrushes. The current study sought to improve the quality of the toothpaste by modifying key ingredients and their proportions. Twelve different formulations were prepared for testing, with variations in the amount of binder (Carboxyl Methyl Cellulose-CMC), turmeric powder, and citric acid, while keeping the other ingredients constant. Oil formation and toothbrush staining were not observed in formulations F5 and F6, and rest of the formulations exhibited either the oil formation or toothbrush staining. Toothpaste staining potentially attributed to the addition of turmeric. The deficiency in oil formation was likely caused by an insufficient amount of CMC. In all the formulations *Escherichia-coli* was absent, and pH, moisture content, and foaming volume were complied with SLS standards. However, total bacterial count in formulations F2, F5, F6, F9, F10 were only complied with SLS standards (SLS 275:2006.) Sensory evaluation revealed significant differences among all formulations ($p < 0.05$) for tested sensory parameters (Colour, odour, texture, taste, smoothness and overall acceptability). Formulation 5 emerged as the best formulation based on sensory analysis (using 9-point hedonic scale with 30 untrained panellist) with the properties of pH 7.65, moisture content 32.14% and forming volume 60ml. This study was successfully addressed the deficiencies observed in previous palmyrah pulp-based toothpaste formulations and presents a promising and sustainable substance for natural oral care products.

Keywords: *Carboxyl methyl cellulose, Oral care, Palmyrah Toothpaste*

***Corresponding author E-mail:** marinoarunan@gmail.com

Determination of Curcumin Content of Dried Turmeric (*Curcuma longa* L.) Grown in Different Locations of Ampara District, Sri Lanka

S.R.M.P.M. Senavirathne¹, T. Liyanage², UL. Abdul Majeed*¹, A. Karunarathne²

¹Department of Biosystems Technology, Faculty of Technology, South Eastern University of Sri Lanka, Oluvil

²Central Research Station, Department of export agriculture, Matale

ABSTRACT

Turmeric has long been valued for its therapeutic benefits and culinary applications. The medicinal qualities of turmeric are a result of wide variety of bioactive substances or phytochemicals that are abundant in the spice. Curcuminoids, essential oils, flavonoids, phenolic compounds, and polysaccharides are a few of the main phytochemicals exist in turmeric. A component of turmeric called curcumin has shown anti-inflammatory and antioxidant capabilities, suggesting it may have a number of health advantages, including lowering the risk of chronic diseases and enhancing general health. Ampara district, which is part of Sri Lanka's Eastern Province, is renowned for prevailing conducive climate and fertile soil conditions, making it a prime location for the growth of turmeric. Hence, this study was conducted to quantitatively analyze the presence of curcumin in dried turmeric rhizomes grown in Ampara district, Sri Lanka. Turmeric samples were collected from ten different cultivated areas (Namaloya, Uhana, Suhandagama, Gampaha colony, Gonagala, Wranketagoda, Deke ela, Dambe ela, Kahatagasyaya and Nmalthalawa) in Ampara district. Sample preparation was conducted according to the method described by AOAC (2000) and the SLS 613: 1983 method was used to determine the curcumin content. Based on the results, curcumin content of the turmeric samples were varied significantly ($p < 0.05$). The highest curcumin content was observed in Namaloya area samples (6.56 %) while the lowest was in Wranketagoda and Suhadagama (3.27 %). According to the ISO/ IEC 17025:2005 standard, the accepted average range for curcumin is 2%-10%. Therefore, it can be concluded that all the turmeric samples collected from Ampara district were rich in phytochemicals and with in the standard level.

Keywords: Antioxidant, Curcumin, Rhizomes, Turmeric

**Corresponding author E-mail:* ulmajeed@seu.ac.lk

Development of Nutritious Rusk from A Combination of Pumpkin Flour and Rice Flour

A.O.T.Thathsarani^{1*}, L. M. Perera¹, Kasun Hettige², B. P. Siriwardena¹

¹Department of Agro-Technology, University of Colombo Institute for Agro-Technology and Rural Sciences (UCIARS), Hambantota.

²National Institute of Post-Harvest Management, Ministry of Agriculture, Jayanthi Mawatha, Anuradhapura.

ABSTRACT

Incorporation of pumpkin flour instead of wheat flour can help to enhance the sensory characteristics of rusk and will be economical in rusk manufacturing. Rice flour incorporated product developments are available in Sri Lanka, but very few researchers have worked on the utilization of pumpkin in rusk or other confectionary production. Therefore, this study was undertaken to improve the nutrient content of rusks by incorporating pumpkin and rice flour, analyze the proximate composition of pumpkin-rice flour incorporated rusk, and assess the sensory properties of rusk that developed for analyzing most preferable ratios for evaluating the market potential. Nutritive pumpkin flour fortified rusks were prepared with four different substituted levels of pumpkin flour in rice flour (T1 =0%, T2 =20%, T3 =40% and T4 =60%), and were compared with control (T1). Data were analyzed using the Minitab 17 statistical analysis package. Data regarding sensory evaluation were analyzed according to Friedman's non-parametric test at 95 % level of significance. Overall acceptable rusk was T2 which contain pumpkin flour (20%) with 80% rice flour. Proximate analysis was done to T2 rusk and it showed moisture 7.09 ± 0.2 , protein 8.73 ± 0.2 , fat 17.16 ± 0.3 , ash 1.83 ± 0 , carbohydrate 62.31 ± 0.3 and fiber 2.84 ± 0.1 . Sensory results also revealed an increasing trend in all sensory parameters. Results showed acceptability at all levels but treatment T2 with 20 % pumpkin flour scored highest for maximum overall acceptability. It was concluded that pumpkin flour can be supplemented successfully to partially replace rice flour to prepare highly nutritious confectionaries without affecting its overall acceptability.

Keywords: Biscuit, Pumpkin flour, Proximate Analysis, Sensory Evaluation

*Corresponding author E-mail: thathsaranitharushika79@gmail.com

Words from Dr. K. Premakumar,

Faculty of Agriculture, Eastern University Sri Lanka

Food Technology is a science which deals with the techniques and principles involved in processing and preserving food substances. The application of food science helps in manufacturing safe, wholesome, and nutritious food products. The study of food technology is to develop new methods and systems for keeping food products safe and resistant from natural harms such as bacteria and other micro-organisms. Food processing helps in preservation enhances the flavor and reduces the toxins in the food product which results in better distributional efficiency and easy marketing of the food product.

The modern food processing techniques is the key to flourishing supermarkets we have today. Extra nutrients can be added while processing the food and processed food is less susceptible to spoilage. Some of the techniques used are spray drying, juice concentrates, freeze drying and the introduction of artificial sweeteners, colorants, and preservatives. Many products such as dried instant soups, reconstituted fruits and juices, and self-cooking meals were developed for the convenience of working people. The food processing industries are involved in processes such as primary and secondary processing, preservation, quality management, packaging, and labeling of a variety of products such as dairy products, fish products, fruit & vegetable products, meat & poultry products, confectionery products and food grains. It is a branch of Food Science which addresses the production, preservation, quality control and development of food products. It is the field of integrated research in Basic Science, Microbiology, Biochemistry, Human Nutrition, Biotechnology and Food Engineering for the development and management of food resources. This discipline discloses the properties, composition, properties of food materials and their behavior during processing, handling, storage, distribution, and use.

Food Technology is important to meet the growing demands of today's markets. The food industry continues to grow as the demand for specific recipes and foods, such as low-fat, low-carbohydrate, and low-sugar, increases. Food Technologists are working to understand the chemical composition of the freshest ingredients. Most foods are of organic origin. How they behave during harvesting, processing, distribution, storage, and preparation is a complex issue. Extensive education is required to fully recognize all the important aspects of the problem. Food Technology used to make foods more nutritious and better tasting, especially the convenient ready-made meals that play a large role in people's busy modern lives. It also helps cut down on food, energy, and general waste by helping to produce food more efficiently, developing more sustainable packaging, and distributing excess food to where it is needed. Our food system has evolved over centuries into a global system of immense size and complexity. The commitment of food technology professionals to advancing the science of food, ensuring a safe and abundant food supply, and contributing to healthier people everywhere is integral to that evolution. Food Technologists are versatile, interdisciplinary, and collaborative practitioners in a profession at the crossroads of scientific and technological developments.

Production of Ice Cream Using Goraka (*Garcinia Zeylanica*) Extract and Evaluation of Physical, Chemical and Sensory Parameters

V.G.S.J.Premarathne¹, M.A.F.Lufna^{1*}, U.Mathiventan²

¹ Department of Biosystems Technology, Faculty of Technology, Eastern University

² Department of Botany, Faculty of Science, Eastern University, Sri Lanka

ABSTRACT

This study aims to develop ice cream using goraka extract and to characterize the physical and nutritional properties of produced ice cream with goraka extract. The Goraka fruits have become the latest novelty to hit the health industry and have become in demand worldwide. Goraka also has been used in food fortification, especially in milk foods. Therefore, the cow milk ice cream was prepared using different percentages of Goraka extract. The treatment was as follows, T₀ ice cream formulation without Goraka extract concentration, T₁ ice cream formulation with 1% Goraka extract concentration, T₂ ice cream formulation with 3% Goraka extract concentration. T₃ ice cream formulation with 5% Goraka extract concentration, T₄ ice cream formulation with 7% Goraka extract concentration. Physio-chemical properties such as pH, total solid, total soluble solid, fat content, titrable acidity and ash content were analyzed by using the standard AOAC method. The colour, taste, texture, aroma and overall acceptability were evaluated using a seven-point hedonic scale for all treatments. The result of this study revealed that pH (6.63±0.003%), Total Soluble Solid (30.35±0.63%) and fat content (8.88±0.005%) were significantly higher without Goraka extract added ice cream and total solid (38.62±0.02%), titrable acidity (0.43±0.01%) and ash content (0.626±0.003%) were higher in 7% Gorakaextract added ice cream. As a result of sensory evaluation revealed that, 3% of Goraka extract added ice cream had the highest mean score of overall quality of all sensorial properties like taste, colour, texture, aroma and overall acceptability. Finally, it can conclude that cow milk ice cream formulation with 3%. Goraka extract is having good potential for healthy food.

Keywords: Goraka Extract

***Corresponding author E-mail:** maflufna@gmail.com

Potential of Enhancing the Aroma Profile of Hot-Water-Soluble Instant Black Tea by Incorporating Encapsulated Black Tea Aroma

H.A.I.L. Hettiarachchi^{1*}, G.A.A.R. Perera¹, K.G.N.P. Piyasena², E.N.U. Edirisinghe²

¹Department of Export Agriculture, Uva Wellassa University, Badulla, Sri Lanka

²Biochemistry Division, Tea Research Institute, Thalawakelle, Sri Lanka

ABSTRACT

The lack of tea aroma is one of the drawbacks of instant black tea. Spinning cone column (SCC) extraction machine used in instant tea manufacture, separately extracts both soluble solids and aromatic volatile compounds from tea. However, it is practically challenging to reincorporate this volatile fraction back into instant tea due to its diluted aqueous nature. This study aimed to investigate the potential of enhancing the aroma profile of hot-water-soluble instant black tea by using encapsulated tea aroma powder. Black tea aroma resulting from the SCC was mixed with maltodextrin and gum arabic and freeze-dried to obtain encapsulated black tea aroma powder. Minimum level of encapsulated black tea aroma required to perceptibly enhance the aroma profile of hot-water-soluble instant black tea was determined by conducting two triangle tests with hot-water-soluble instant black tea incorporated with 0.5% and 1.0% (w/w) encapsulated black tea aroma using thirty untrained panelists. The selected sample was evaluated for its physicochemical properties at 45-day intervals for three months. Aroma profile of the selected samples was analyzed by solid-phase microextraction-gas chromatography-mass spectrometry. This experiment was conducted in triplicate. Sensory data were evaluated using a standard table and physicochemical data were subjected to Analysis of Variance using Minitab (Version 17) software package. The panelists differentiated the hot-water-soluble instant black tea incorporated with 1.0% encapsulated black tea aroma. Pleasing aroma compounds; linalool ($10.02 \pm 0.74\%$), β -ionone ($9.86 \pm 0.81\%$), geraniol ($6.74 \pm 0.85\%$), benzaldehyde ($5.11 \pm 0.23\%$) and methyl salicylate ($4.56 \pm 0.40\%$) were more prominently available in the selected sample compared to the control sample. Aroma profile, pH (5.59 - 5.73), and turbidity (107.067 ± 1.06 NTU) of the sample were consistent during the storage. Aroma profile of hot-water-soluble instant tea can be enhanced appreciably by incorporating encapsulated black tea aroma at the 1% (w/w) level.

Keywords: Black tea, Volatile compounds, Instant black tea, Sensory properties

***Corresponding author E-mail:** iroshahettiarachchi95@gmail.com

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Nutritional and Organoleptic Evaluation of Processed Sardine (*Sardinella longiceps*) under Novelty Preservative Techniques.

A.J.M. Rikas¹, M.A. Pathima Rihani^{1*}, C. Devadason³

¹ Department of Biosystems Technology, Faculty of Technology, Eastern University

² Department of Zoology, Faculty of Science, Eastern University Sri Lanka

ABSTRACT

Fish is one of the most important animal protein sources and sardine is the popular name of a variety of tiny, oily forage fish in the *Clupeidae* family of herring sardine is a seasonal fish. Fish preservation can delay or stop spoilage. There are several methods of fish preservation. Marination is a semi preservation method. It is the process of immersing meals in a solution to allow flavour and texture development of the final product. However, sardine is a seasonally harvested in surplus amount. It should be preserved to keep long period of self- life with increase of the commercial value. This study was conducted to evaluate the physicochemical and sensory quality of marinated sardine. Therefore, Fish were marinated in salt, chilli powder and lemon in same amount for all the treatments. Based on the marination time five different treatments were conducted (T1) 0 minutes, (T2) 30 minutes, (T3) 1 hour, (T4) 1.30 hours, and (T5) 2 hours with control 0 minutes (T1) were conducted. Prepared fish samples (Organoleptically- colour, smell, texture, taste and overall acceptability) were tested randomly (CRD) with three replications. After the preservation technique sensory evaluation (9 point hedonic scale was conducted through 10 untrained panelists) was conducted based on the scores. The most preferred was T4 (marinated for 1 hour 30 minutes). Crude protein of the treatment T1, T2, T3, T4 and T5 were 14.5 ± 0.214 g, 14.493 ± 0.215 g, 14.477 ± 0.218 g, 14.465 ± 0.216 g and 14.448 ± 0.216 g respectively. The results reveal that there was no significant difference in crude protein content over time among the five forms of treatments. Fat content of the treatment were (T1) 3.7875 ± 0.0962 , (T2) 3.7350 ± 0.0968 , (T3) 3.7200 ± 0.0917 , (T4) 3.7075 ± 0.0923 , and (T5) 3.6975 ± 0.0937 . There is no significant difference were observed in the fat content.

Keywords: *Fat content, Marination, Protein content, Sardine fish*

***Corresponding author E-mail:** rihaniansar@gmail.com

TRACK 03:
Environmental Technology

Dual Membrane - Adsorption Hybrid System as a Sustainable Water Reuse System

S. Devaisy^{1*}, S. Vigneswaran²

¹Department of Bio-science, Faculty of Applied Science, University of Vavuniya, Sri Lanka

²University of Technology, Sydney, Australia

ABSTRACT

Dual membrane hybrid systems are becoming emergent in the production of high-quality reclaimed water for reusable purpose where microfiltration (MF) followed by Reverse Osmosis (RO) is commonly used worldwide. However, the attention towards the detection of micro pollutants (pharmaceuticals and pesticides) are lacking and this results to several toxicological and mutagenetic effects when the organisms are exposed to the reclaimed water. Therefore, the feasibility to apply nano-filtration (NF) membranes and MF-GAC (Microfiltration-Granular Activated Carbon) hybrid system to reduce micro pollutants load from the reclaimed water was studied. The MF-GAC was found to remove majority of the micro pollutants from the reclaimed water and the micro pollutants having Log Kow >3 were generally shown more than 90% removals by GAC. However the removals depend on molecular size, charge, other physic-chemical interactions, GAC dosage, other competitors etc. NF (especially NTR729HF) also was effective in removing micro pollutants (70-90%) equally as good as MF-GAC. The removal mechanisms by NF are explained by electrostatic interactions and size exclusion mechanisms. The development of sustainable hybrid systems for the removal of all micro pollutants of different chemical and physical properties is the key for the water reclamation. This study suggested to send a portion of the MF permeate to either the MF-GAC hybrid system or NF membrane (NTR 729HF) before blending with the RO permeate to reduce the micro-pollutants in the reclaimed water. A proper monitoring mechanism should be developed to monitor the micro-pollutants levels in the reclaimed water at regular intervals to ensure environmental safety.

Keywords: adsorption, dual membrane, hybrid, micro pollutants, reuse

**Corresponding author E-mail:* sukanyahdev@vau.ac.lk

Sustainable Waste Management Solution for Distillery Spent Wash in Sugar Manufacturing Plants

AMPC Amarasinghe^{1*}, ERJMDDP Wijesekara¹, YAPK Dayasena¹, GAPKGG Warnakulasooriya¹

¹Department of Biosystems Technology, Faculty of Technology, Sabaragamuwa University of Sri Lanka, Belihuloya, Sri Lanka

ABSTRACT

The spent wash is generated as waste in the sugarcane-based ethanol production process. This waste cannot be released into the environment without treatment due to the high COD (Chemical Oxygen Demand) and BOD (Biological Oxygen Demand) values. Production of one liter of ethanol generates about 10-15 liters of spent wash. Therefore, a higher volume of spent wash is collected inside the ethanol production plants as waste. As a sustainable waste management solution, spent wash is heated at 110 °C for 20 minutes and converted into semisolid form by evaporating the excess water and volatile matters. The semisolid spent wash is mixed with bagasse, according to different weight ratios, and generates energy-dense solid material, which is used as a fuel for combustion operations. Although different ratios were used, the calorific values are greater than 11,000kJ/kg for all mixtures. While heating the spent wash, volatile matter and moisture were removed, and waste quantity was reduced by 86.5% w/w. These solid portions can be mixed with bagasse in 1:4 ratio and used as a fuel for the boiler operations in sugar manufacturing plants. It will help to reduce the fuel cost of the boiler operation. In addition to that, the solid portion can be used to create densified pellets as another form of fuel that provides many advantages, such as easy to transport, handle and increasing the heat density. Some biomasses, like rice straw and rice husk, are challenging to densify like this because the materials do not have enough self-binding ability. This semisolid spent wash can be used as a binding agent to bind these types of unbind biomass. Moreover, the large volume of spent wash accumulation in ethanol production plants can be reduced by applying the above-mentioned techniques as a sustainable waste management solution.

Keywords: Spent wash, Bioethanol, Alternative fuel, Sustainable, Waste management.

**Corresponding author E-mail:* prasad@tech.sab.ac.lk

Analyzing Slope Stability: A Comparative Study between Limit Equilibrium and Shear Strength Reduction Methods

W.M.T. Sachinika¹, K.H.S.M. Sampath^{1*}

¹Department of Civil Engineering, University of Moratuwa

ABSTRACT

Slope stability, which refers to the ability of inclined surfaces to resist sliding or collapsing, is crucial for ensuring the safety and integrity of the slopes. Analyzing slope stability is a critical aspect of geotechnical engineering, requiring careful consideration of factors such as soil shear strength, stress conditions, and pore-water pressure. The focus of this study is on utilizing the Shear Strength Reduction (SSR) method to analyze slope stability in a more reliable manner. A comparative analysis between the SSR method and the conventional limit equilibrium (LE) method is conducted to evaluate their strengths and limitations. The comparison provides insights into the advantages and limitations of each approach, enabling a comprehensive evaluation of slope stability. The research revealed that the shear strength reduction technique is more convenient and reliable than limit equilibrium method in slope stability analyzing, because in SSR method the failure surface is not pre-defined as in LE method. In fact, since the resulting factor of safety values and the critical failure surfaces in SSR method are generated by stress distribution and mesh deformation, the outcomes give more generalized and accurate results than the conventional method. The findings of the research can be used to the advancement of slope stability assessment methodologies, enabling the development of improved slope stabilization strategies and mitigation measures.

Keywords: Factor of safety, Failure Surface, Finite Element Analysis, SIGMA/W, SLOPE/W

**Corresponding author E-mail:* sampathkh@uom.lk

Value Addition of Plastic with Clay to Manufacture Plastic-Clay Bricks

D.Ranjanidevi ¹, P. Rodney Fernando²

¹ Department of Biosystems Technology, Faculty of Technology, Eastern University, Srilanka

² Department of Physics, Faculty of Science, Eastern University, Srilanka

ABSTRACT

Plastic play a crucial role in modern society and is utilized often in various applications, leading to the enormous waste generation. Plastic waste poses a major environmental challenge, as it is non-biodegradable and pollutes the air, water, and land. This research project aims to solve the problem in an innovative and efficient manner by utilizing waste plastic to produce plastic-clay bricks. In this research, PET plastic was incorporated with clay to create building bricks. The plastic served as a binding agent for replacement of cement. The bricks were prepared by taking plastic and clay in different weight ratios of 1:1, 1:2, 1:3 and 1:4. Each ratio consisted of a specific proportion of plastic and varying amounts of clay. Water absorption and compressive strength were investigated to evaluate the quality of prepared plastic-clay bricks. The bricks should have a minimum compressive strength of 3.50 N/mm² and water absorption less than 20% if they used for construction purposes. However, the results showed that the prepared bricks exhibited satisfactory compressive strength with minimal water absorption, compared to the other commercially available bricks. The ratios 1:1 and 1:2 demonstrated strong compressive strengths of 12.05 N/mm² and 6.16 N/mm², as well as with water absorption rates of 2.85% and 3.24% respectively. These ratios were preferable for construction usage due to their high compressive strength and minimum water absorption. Overall, these plastic-clay bricks were a creative and effective solution for waste problem, as well as these are alternative and affordable construction materials.

Keywords: Plastic waste, pollution, Polyethylene Terephthalate [PET], compressive strength, Water Absorption

**Corresponding author E-mail:* ranjanidevi97@gmail.com

Nutrient Optimization for Dwarf Varieties of Coconut for Achieving Higher Yield and Profitability in Tamil Nadu

C. Sudhalakshmi^{1*}, P.Latha¹, R.Arulprakash¹, B.Meena¹

¹Coconut Research Station, Tamil Nadu Agricultural University, Aliyarnagar – 641 003, Tamil Nadu, INDIA

ABSTRACT

Dwarf varieties occupy 30 - 40 % of the total coconut area in Tamil Nadu as there is a great boom for tender coconut water throughout the world, but there is no specific nutrient recommendation for dwarf varieties. Research was envisaged at Coconut Research Station (TNAU), Aliyarnagar during 2017- 2022 in two dwarf coconut varieties viz., ALR (CN)3 and Chowghat Orange Dwarf with nine treatments, in Randomized Block Design and each treatment replicated three times accommodating six palms per replication. Treatments include existing nutrient recommendation of N₅₆₀P₃₂₀K₁₂₀₀ g per palm per year (T₁), -25 % N of T₁ (T₂), +25 % N of T₁ (T₃), -25 % P₂O₅ of T₁ (T₄), +25 % P₂O₅ of T₁ (T₅), -25 % K₂O of T₁ (T₆), +25 % K₂O of T₁ (T₇), +50 % N, P₂O₅ and K₂O of T₁ (T₈) and 2-3-4-5 kg of urea, SSP, MOP and neem cake (T₉) per palm per year. Weight of tender nut and the volume of nut water was highest in T₈. Highest nut yield in both the varieties was witnessed in T₈ followed by T₉ and the lowest in T₅. Cost of cultivation was lowest in T₆ in which potassium was lowered by 25 %. Considering the pest incidence (Rugose Spiraling whitefly and Eriophid mite) due to abundant supply of nitrogen, physical and economic optima, 25 % incremental dose of N, P and 50 % that of K (N₇₀₀P₄₀₀K₁₈₀₀ g per palm per year) can be considered for increased nut yield and economic returns in dwarf varieties of coconut.

Keywords: Nut yield, Optima, Pest Incidence, Potassium,

***Corresponding author E-mail:** soilsudha@yahoo.co.in

Words from Dr. Daniel Subramaniam,

Faculty of Engineering, University of Jaffna, Sri Lanka.

In the 21st century, water has earned the nickname "blue gold," highlighting its unparalleled importance in ensuring the well-being and sustainability of the generations that will follow. This brief emphasizes the crucial role of water in shaping the future of humanity. Foremost, water stands as the fundamental cornerstone of human survival. The availability of clean, safe water is indispensable for essential needs such as drinking, cooking, and personal hygiene, constituting the very basis for health, growth, and overall well-being for the generations yet to come.

Additionally, water serves as the lifeblood of agriculture, a fundamental pillar of human civilization. With the ongoing global population growth, future generations will heavily rely on water to produce enough food for their sustenance. Hence, sustainable water management becomes pivotal in guaranteeing food security for the future. Water also acts as a linchpin for economic prosperity. A multitude of industries, ranging from manufacturing to energy production, depend on water for their operational processes. A stable and thriving economy is an essential prerequisite for the well-being of succeeding generations, and water plays a pivotal role in fostering economic growth.

Beyond its human-centric significance, water is a critical force for sustaining diverse ecosystems, offering a habitat for innumerable species. Preserving rich biodiversity is an inheritance that the future generations rightfully deserve, and it hinges on the responsible conservation of water resources. As climate change intensifies, the effective management of water resources assumes paramount importance. The upcoming generations will need to confront increasingly frequent and severe weather events. Therefore, ensuring resilience in the face of these challenges necessitates the implementation of proper water management and infrastructure. Access to water has, historically, been a source of tension and conflict. Consequently, ensuring fair and peaceful access to water resources is not only a matter of practical necessity but also a key factor in promoting the peaceful coexistence of future generations.

Remarkably water is not simply a resource for sustaining life; it stands as the cornerstone of prosperity and well-being for the generations yet to come. The principles of sustainable water management, conservation, and equitable distribution serve as the foundation for ensuring that the world inherited by future generations is one where clean and abundant water is a reality rather than a privilege.

Goat Based Integrated Farming System in Coconut on Soil Fertility, Net Returns and Green House Gas Emission

C.Sudhalakshmi^{1*}, P.Latha¹, R.Arulprakash¹

¹Coconut Research Station, Tamil Nadu Agricultural University, Aliyarnagar – 641 003, Tamil Nadu, INDIA

ABSTRACT

Coconut is an inevitable horticultural crop which holds significant promise on the livelihood security of small and marginal farmers across the globe. Ever fluctuating price chart of copra together with resurgence of pests and diseases draws roadmap for the farming community to integrate animal component in coconut plantation. An experiment was initiated during 2015 – 16 at Coconut Research Station, Aliyarnagar over an area of 0.40 ha to study the effect of integration of livestock component (Goat) on soil fertility, system productivity, economics of coconut and on greenhouse gas emission. The treatments include T₁ – Coconut + Fodder trees (*Sesbania grandiflora* (Agathi), *Leucaena leucocephala* (Subabul), Glyricidia) + Pasture Crops (Cumbu Napier Hybrid, Desmanthus) + Goat (Telicherry Breed) and T₂ – Monocrop of coconut. Annual leaf production, total number of leaves and total number of inflorescence per palm were higher in IFS (T₁) plots compared to monocrop of coconut. Total of 18360 nuts/ha/year and 28,400 kgs of fodder were realized from one ha of coconut. A total of 15 numbers of lamb were laid by the goats. Integration of coconut with pasture crops resulted in net income of Rs. 2,18,650 per ha as compared to Rs. 1,17,600 per ha in the monocrop of coconut. In IFS, there was positive balance for P and K and negative balance for nitrogen whilst in monocropping system, there was negative balance for N, P and K. Green House Gas (GHG) emission from Integrated Farming System was negative and hence it is environmentally safe.

Keywords: Economics, Fodder, Monocrop, Soil Fertility, System Productivity

***Corresponding author E-mail:** soilsudha@yahoo.co.in

Design, Simulation and Real-Time Monitoring of a Microgrid: A Pilot Study at the Rajarata University of Sri Lanka

A. Gowthaman ^{1*} and L. T. Jayasuriya ¹

¹Department of Electrical and Electronic Technology, Faculty of Technology, Rajarata University of Sri Lanka

ABSTRACT

Amidst Sri Lanka's forex crisis and rising generation costs, prolonged power shortages have impacted daily life. The power disruption has also endangered costly laboratory equipment at the new Faculty of Technology (FoT), posing a substantial financial risk. This study proposes a microgrid for both FoT and the neighboring Faculty of Applied Sciences (FAS) at Rajarata University. By connecting decentralized energy sources and loads of the two faculties, the microgrid is regulated by an Energy Management System (EMS). The EMS governs power supply source selection according to their technical and economic limitations, alternating between the CEB grid and islanded mode. Additionally, the EMS facilitates Peer-to-Peer (P2P) energy trading between the two faculty buildings when excess energy is generated. The design of the microgrid requires an accurate estimation of the electricity demand, which was initially computed using CEB monthly bills and subsequently through manual meter readings during office hours. The EMS's decision-making system was mathematically modeled in HOMER. The model minimizes the total investment and operating cost of the microgrid to enhance profitability. Implemented through an ESP32 microcontroller, the EMS provides data on energy consumption, fault alerts, and backup generator status of both faculties. A user-friendly GRAFANA desktop visualization for the EMS was developed using Influx DB to manage data of the microgrid and monitor Peer-to-Peer trading. HOMER simulations revealed that the microgrid, coupled with the P2P energy trading framework, ensures a reliable electricity supply at a Cost of Energy of 21.37 rupees/kWh to both faculties. Moreover, the simulations demonstrated the microgrid's ability to generate profits by selling surplus electrical energy generation to the utility grid while managing the use of expensive diesel generators.

Keywords: Microgrid, Peer-to-Peer, Energy trading, Energy Management

**Corresponding author E-mail:* gowthaman2013@gmail.com

The potential of Phenol monomer production through the Base Catalyst Depolymerization of Rice Straw Lignin

Wijesekara ERJMDDP¹, Amarasinghe AMPC¹, Dayasena YAPK¹, and Dias PGI²

¹ Department of Biosystems Technology, Faculty of Technology, Sabaragamuwa University Sri Lanka, Sri Lanka.

² Faculty of Applied Sciences, Sabaragamuwa University Sri Lanka, Sri Lanka.

ABSTRACT

Bioenergy generation from lignocellulose biomass is a vital renewable energy generation concept in the current domain. Rice Straw is one of the most significant agricultural residuals available in Sri Lanka, which can be incorporated as a renewable Biomass source, and lignin is one of the critical components in the Biomass. This study studied the isolation of lignin from Rice Straw and the potential of converting the isolated lignin to valuable phenolic monomers. Also, the optimum operation parameters in the overall conversion process were identified. The Rice Straw was pretreated using ammonia soaking techniques with different concentrations, and black liquor was filtered and separated. The Sulfuric acid dilution techniques were used to precipitate the lignin. The separated lignin from rice straw was identified through Fourier-transform infrared spectroscopy (FTIR) analysis. NaOH was used as the base-catalyzed depolymerization agent to depolymerize complex lignin structures into monomeric compounds like Phenol. The different NaOH concentrations, temperatures, and pressure values were studied to identify the optimum De-polymerization condition with gaining maximum phenolic compound output. Total phenolics of the depolymerized lignin were measured using the Folin Ciocalteu reagent technique. Based on the FTIR results of absorbency band location (cm^{-1}) for the lignin-based components, such as $3400 - 3200 \text{ cm}^{-1}$ for phenolic-OH, 1605 cm^{-1} for aromatic rings, and $1125-1150 \text{ cm}^{-1}$ for guaiacyl rings and syryngyl rings, the lignin separation level observed. The 5 % (w/w) NH_3 soaking technique reaches the maximum lignin separation. Henceforth, it will be an ideal solution to achieve the required pretreatment activity by providing low-cost and chemical-consumed lignin separation. From the total lignin weight, 2.32 % (w/w) can be extracted as the phenolic compound at $150 \text{ }^\circ\text{C}$ and 3.5 bar Autoclave base catalyst depolymerized conditions. Based on the 2018 rice straw generation, Sri Lanka has 17,404 tons of Phenol production capacity, which can be used to produce valuable end products like phenol-based biofuel additives.

Keywords: De-polymerization, Lignin, Lignocellulose biomass, Phenol, Rice Straw.

***Corresponding author E-mail:** dasith@tech.sab.ac.lk.

Assessment of Ground Water Quality in Kirankulam Area of Batticaloa, Sri Lanka with Special Reference to Cation Concentrations, pH, EC, TDS, and Turbidity

K. Sanjayan¹, R. Yathusa^{2*}, M.Sugirtharan²

¹ Faculty of Technology, Eastern University, Sri Lanka

² Dept. of Agricultural Engineering Faculty of Agriculture, Eastern University, Sri Lanka

ABSTRACT

This study was intended to evaluate the suitability of groundwater for agriculture and drinking purposes in Kirankulam village of Batticaloa district. To achieve this, groundwater samples were collected from 60 sampling locations from February to March 2023 and analyzed for Physico-chemical parameters such as pH, EC, TDS, Ca, Mg, Na, K, Bicarbonate, Carbonate, turbidity as well as derived parameters such as SAR, SSP and Ca^{2+}/Mg^{2+} . The results revealed that, the pH of the irrigation and drinking water used on land sides varied from 6.4 to 8.6 and 7.3 to 8.4 respectively. Similarly, in sea side it was found as 6.0-8.3 and 7.6-8.4 respectively. As far as the EC is concerned irrigation and drinking water from land-side and sea side ranged from 0.094 to 0.911 dS/m, 0.3 to 0.927 dS/m and 0.469 to 1.376 dS/m, and 0.344 to 1.349 dS/m respectively. Comparatively higher EC and TDS values were observed in the water at sea side than the land side. However, turbidity of irrigation and drinking water at land-side and seaside ranged from 0.04 to 328 NTU, 0.01 to 14.35 NTU, 0.38 to 23.64 NTU, and 0.01-2.23 NTU, respectively. It shows higher values in land side areas. According to the results, parameters such as Ca, Mg, K, Na, carbonate and bicarbonate were within acceptable range for irrigation and drinking purpose. Based on the Water Quality Index, it shows, nearly 23%, 67% and 10% of well water samples fall into the excellent, good and poor categories for water quality. Therefore, it is essential to pay more attention to the locations with poor water quality and find the cause and implement remedial measures.

Keywords: Electrical conductivity, Groundwater, Salinity, Total dissolved solids, water quality

***Corresponding author E-mail:** yathusaravi@gmail.com

Developing a low - cost technology for the removal of manganese from drinking water in mannar district

K. Dinakshan ^{1*}, S. Saravanan ², C. K. Hemachandra ¹

¹ Department of Environmental Technology, Faculty of Technology, University of Colombo, Sri Lanka.

² National Water Supply and Drainage Board – Vavuniya, Sri Lanka.

ABSTRACT

Manganese is one of the most prevalent element that occurs naturally in soil. Manganese leaches into the groundwater through soil due to natural and anthropogenic sources. Higher concentrations of manganese in drinking water may cause adverse health effects in consumers. This study focuses on the removal of manganese from source water extracted from groundwater using various oxidation methods namely: aeration, dosing of chlorine and aeration/dosing of chlorine following filtration. The groundwater samples were collected from the boreholes in Murunkan well field area and various physio – chemical parameters were analyzed. The water samples were subjected to aeration/chlorination along with filtration. The study revealed that 20 minutes of aeration process removed 56% and 79% of manganese following 20 and 60 minutes of retention period under 8.3 of pH. Further 60 minutes of aeration process removed 73% and 82% of manganese following 20 and 60 minutes of retention period respectively under 8.3 of pH. Moreover, 1ppm concentration of chlorine removed 47% of manganese at lowest retention time (20 minutes) under 8.7 of pH. Filtration along with aeration and chlorination (20 minutes' retention time) could remove 75% and 65%. Based on the study the 8.3 as optimum pH and 60 minutes of retention period is efficient with 20 minutes of aeration process to remove manganese in an optimum manner. Therefore, aeration along with filtration under optimum conditions could enhance the removal of manganese as economically in an efficient way.

Key Words: aeration, chlorination, filtration, pH, retention.

**Corresponding authors Email:* dinakshandinaki@gmail.com.

Effects of Different Water Sources on Growth and Yield of Okra (*Abelmoschus esculentus*)

K. Thevatharshan¹, D.M.J.K.K. Dissanayake^{1*}, M. Sugirtharan²

¹ Department of Biosystems Technology, Faculty of Technology, Eastern University, Sri Lanka.

² Department of Agricultural Engineering, Faculty of Agriculture, Eastern University, Sri Lanka.

ABSTRACT

The conservation of water is crucial for sustainable agricultural production during the dry season, when there is little rainfall for crop production. Since the majority of farmers rely on groundwater, there is a water deficit during that time of year. In order to reduce the amount of groundwater used for irrigation, there are a number of alternate ways to use water from diverse sources, such as lagoons (Sinna Kalappu), ponds, and wastewater. The aim of this study was to determine the impact of various water sources on the development and production of okra. The experiment had three treatments with three replications each and used a randomized complete block design. The treatments were well water irrigation (T₁), National Water Supply Drainage Board (NWSDB) water (T₂), and lagoon water (T₃). For this investigation, the okra variety "Haritha" was chosen, and it was planted in polythene bags. The results showed that, at 60 days after planting (DAP), the plant height was observed as 99.2cm, 96.0cm and 113.9cm, number of leaves per plant 29, 28, and 25, stem diameter was 3.87cm, 3.57cm, and 3.23cm, root length 36.2cm, 35.2cm, and 34.4cm and the fresh weight of shoot was recorded as 60.33g, 60.33g, and 53.43g for T₁, T₂, and T₃, respectively. Further, the number of flowers per plant was observed to be 7.3, 6.7, and 5.7, the number of pods per plant varied as 5, 4.7 and 4.3, number of seeds per fruit 47.7, 46.7, and 45.7, and the length of the fruit 15.53cm, 15.03cm, and 14.8cm for treatments T₁, T₂, and T₃, respectively, at 60 DAP. The statistical analysis revealed that there were significant differences ($P < 0.05$) between T₁ and T₃ in the stem diameter and root length parameters of okra in 60 DAP, although there were no significant differences ($P > 0.05$) in other growth parameters. Notably, irrigating okra with lagoon water and NWSDB supply water did not adversely impact the optimum yield compared with well water. Therefore, with appropriate management, the lagoon water can be used for irrigation, especially during the times of water scarcity.

Keywords: Ground water, Lagoon water, Water conservation, Water scarcity.

*Corresponding author E-mail: jithmikavi@gmail.com

Assessing the Potential of Composting Sludge Generated From Water Treatment Plant

M.J. Fathima Rawzana¹, M.A. Pathima Rihani^{1*}, M. Rajendran²

¹ Department of Biosystems Technology, Faculty of Technology, Eastern University, Sri Lanka

² Department of Agricultural Engineering, Faculty of Agriculture, Eastern University, Sri Lanka

ABSTRACT

Water treatment plants produce large amounts of sludge as by-product during the water treatment process. The use of sludge in soil is influenced by the crops being planted, the soil chemistry, and the sludge's qualities. The present study aimed to assess the potential of water treatment sludge (WTS) for compost making. Sludge generated by Vavunathivu water treatment plant, Batticaloa was collected in February 2023 and characterized based on pH, moisture content (MC), organic matter (OM), nitrogen(N), phosphorus(P), potassium(K) contents and C:N ratio. Further, sludge was used at different ratios for compost making and the quality of final compost was assessed based on the major quality parameters. Five treatments viz. T1- control, T2- 250g sludge + bulking agents, T3- 500g sludge + bulking agents, T4- 750g sludge + bulking agents and T5-1000g sludge + bulking agents, with 3 replicates were set up in CRD design. Sludge was slightly alkaline in nature with 78% MC. OM content was 43% whereas N, P, and K were 1.2%, 0.9% and 0.1%, respectively. C:N ratio was 17.5. Addition of sludge in compost making showed variations in the quality of the final compost. Total organic carbon (OC) decreased with curing time in all the treatments. The highest OC of 28.7% was observed in T1 whereas T5 recorded the lowest level of 24.1%. N, P and K content increased with increased amount of sludge. T5 showed highest levels of N (1.89%), P (0.07%) and K (1.1%) with C:N ratio of 12.8. However, other treatments showed C:N ratio ranged from 20-30. This study concludes that the WTS has the potential to improve the quality of the compost. However, its suitability depends on the level of pollutants, particularly heavy metals.

Keywords: *Compost, Sludge, Water treatment plant*

***Corresponding author E-mail:** rihaniansar@gmail.com

Water Quality Assessment at Some Selected Farming Villages of Eravur Pattu DS Division, Batticaloa District, Sri Lanka

R.Yathusa^{1*}, M. Sugirtharan¹

¹Dept. of Agricultural Engineering Faculty of Agriculture, Eastern University, Sri Lanka

ABSTRACT

Degradation of groundwater quality is a growing concern throughout the world, particularly in agricultural areas. The effectiveness of irrigation water has a direct impact on plant growth and development, plant yield, and soil fertility. The present study examined the physical and chemical characteristics of well water from the selected villages in Eravur Pattu DS Division to determine its quality and suitability for irrigation. Water samples from randomly selected 50 wells which are currently used for irrigation were collected during the period from July to September 2022. Water quality parameters such as pH, EC, TDS, Nitrate, Phosphate, Fe, Cu, Cd, Mn and derived parameters such as SSP, SAR, RSC, and Ca:Mg ratio were analysed. Finally, the Water Quality Index for each sample was calculated to check the suitability of water for domestic use. According to the results, parameters such as pH, NO_3^- , PO_4^{3-} , Fe, Mn and SAR were within the FAO recommended range for irrigation purpose while other parameters such as EC, Carbonate, Bicarbonate, Cd, Cu, RSC, SSP and Calcium Magnesium Ratio were slightly exceeded the acceptable ranges for irrigation purposes. The WQI revealed that 28% of the well water studied was found as excellent water quality, and 62% of the well water was good for human consumption whereas, 10 % of the samples were unsuitable for drinking. The study indicated that, it is crucial to be aware of how to manage the land against poor irrigation water quality. The study further recommend that ground water in Eravur Pattu DS division can be used for irrigation with proper salinity management techniques.

Keywords: Irrigation, salinity, Sodium Adsorption Ratio, water quality, Water Quality Index

Corresponding author E-mail: yathusaravi@gmail.com

Treatment Efficiency of The Biological Treatment Plant at Biyagama for The Brewery Wastewater in Terms of Chemical Oxygen Demand and The Quality of Treated Water for Its Disposal

W.K.R.P Wijesinghe^{1*}, N.Chathuranga², M. Sugirtharan³

¹Faculty of Technology, Eastern University Sri Lanka

²Lion Brewery (Ceylon) PLC

³Faculty of Agriculture, Eastern University Sri Lanka

ABSTRACT

Nowadays, water resources are becoming increasingly scarce and many of them are polluted by anthropogenic sources such as industries, agriculture, and households. With the rapid development of the food industry, a huge volume of wastewater is discharged, which poses a great threat to the environment. In fact, beer is the fifth most popular beverage drunk worldwide next to tea, carbonated drinks, milk, and coffee. The majority of the ingredients in beer are made up of water. The brewing process often generates a large volume of wastewater and solid waste that must be disposed off or treated in the least cost and safest way. As a result, many brewers are today searching for ways to cut down this water usage during the beer brewing process because of water scarcity. Lion Brewery Ceylon PLC is one of the leading companies in Sri Lanka producing beer at Biyagama area with the wastewater treatment facilities including biological treatment. In this view, this study was conducted to evaluate the performance of the biological treatment plant of a brewery located at Biyagama, Sri Lanka and find the suitability for its disposal. The biological treatment consists of anaerobic treatment through an anaerobic hybrid reactor (AHR) and conventional aerobic treatment (Activated Sludge Process (ASP)). The COD removal efficiency of the anaerobic A digester (D101A) was found around 72 -98% with an average efficiency of 78.9% whereas, anaerobic digester B (D101 B) shows the COD removal efficiency around 72-94% with an average of 80.4% and aerobic digestion around 90-99%. The final treated water contained the E-coli and coliform up to a certain level and it was not harmful to discharge into the surface water based on the Central Environmental Authority standards.

Keywords: Aerobic treatment, Anaerobic digester, Treatment efficiency, Removal efficiency, Up-flow anaerobic sludge blanket

***Corresponding author E-mail:** rprabuddha9@gmail.com

TRACK 04:
**Mycology and Microbial
Technology**

Diversity of Freshwater Fungi in Anuradhapura District, Sri Lanka

S.D.M.K. Wimalasena^{1,2}, D.Q. Dai³, N.N. Wijayawardene^{2,3,4}, R.G.U. Jayalal^{5,*}, A.N. Ediriweera^{4,6,7}

¹Faculty of Graduate Studies, Sabaragamuwa University of Sri Lanka, Belihuloya 70140, Sri Lanka.

²Department of Bioprocess Technology, Faculty of Technology, Rajarata University of Sri Lanka, Mihintale 50300, Sri Lanka.

³Center for Yunnan Plateau Biological Resources Protection and Utilization, Qujing Normal University, Qujing, Yunnan Province 655011, P.R. China.

⁴Tropical Microbiology Research Foundation, 96/N/10 Meemanagoda Road, Pannipitiya 10230, Sri Lanka.

⁵Department of Natural Resources, Faculty of Applied Sciences, Sabaragamuwa University of Sri Lanka, Belihuloya 70140, Sri Lanka.

⁶Centre for Mountain Futures, Kunming Institute of Botany, Chinese Academy of Sciences, Kunming 650201, China.

⁷Center of Excellence in Fungal Research, Mae Fah Luang University, Chiang Rai 57100, Thailand.

Abstract

Sri Lanka is a biodiversity rich country. Given the vast array of plant species in Sri Lanka, it is reasonable to estimate that the country is home to approximately 34,000 fungal species, assuming a ratio of 1:9.8 plant to fungal species. Fungal diversity in aquatic ecosystems in Sri Lanka is still unknown. Hence, this study aims to document the fungal diversity of freshwater habitats in the Anuradhapura district, Sri Lanka. Accordingly, submerged decaying leaves, wood, and other organic materials were collected from Mihintale tank, Nachchaduwa tank, Mahakandarawa tank, small Kaludiya pond, and from seasonal tanks in the Mihintale area. Obtained samples were taken to the laboratory and single spore isolation and direct transfer of mycelia were used to isolate fungi. Consequently, out of a total collection of 50 submerged decaying samples, we successfully isolated 30 fungal strains. Nine strains were selected (based on their culture characters) since they were frequently occurring, they were identified using both macro and micro-morphological characters and ITS sequence data. Among them, *Aureobasidium melanogenum*, *Coniochaeta velutina*, and *Trichoderma harzianum* were recognized as freshwater fungi. The other identified fungi including *Hypoxylon lenormandii*, *Lasiodiplodia crassispora*, *L. pseudotheobromae*, *Neurospora crassa*, *Rhytidhysterium neorufulum*, and *T. lentiforme*, were previously reported as terrestrial fungi. These fungal species are preserved as living cultures at the culture collection of Rajarata University of Sri Lanka. This study contributes to the documentation of Sri Lanka's freshwater fungal diversity, providing insights into the country's rich biodiversity and highlighting the need for further conservation efforts to protect these valuable resources.

Keywords: Dry zone, Freshwater ecosystems, Morphological characters, Taxonomy

*Corresponding author E-mail: jayalal@appsc.sab.ac.lk

Taxonomic study of *Xylariales* in Southern China

Q.R. Li^{1,2}

¹The Department of Pharmacognosy, School of Pharmaceutical Sciences, Guizhou Medical University, University Town, Guiyan New District, Guizhou 550025, People's Republic of China.

²The State Key Laboratory of Functions and Applications of Medicinal Plants, The High Efficacy Application of Natural Medicinal Resources Engineering Center of Guizhou Province, The Key Laboratory of Optimal Utilization of Natural Medicine Resources, Guizhou Medical University, University Town, Guiyan New District, Guizhou 550025, People's Republic of China.

ABSTRACT

Fungi of *Xylariales* are widely distributed in nature and possess significant ecological and economic value. The order *Xylariales* encompasses a group of unitunicate, perithecial ascomycetes, including 15 families such as *Xylariaceae*. The genus *Xylaria*, which serves as a type genus, is primarily found in tropical and subtropical forest regions. Its distinctive morphological feature is the upright, rod-like carbonized stromata. Fungi in the order *Xylariales* play important roles in the cycling of forest ecosystems. In recent years, numerous bioactive compounds with pharmaceutical potential have been discovered within this order. Isolated compounds from *Xylariales* fungi have exhibited diverse activities, such as cytotoxicity, antibacterial effects, anticancer properties, and antimicrobial and nematocidal activities. Here, we introduced the species diversity of *Xylariales* in Southern China and the potential application value of *Xylariales* based on the literature and the research results of our research group.

Keywords: New species, Phylogeny, Taxonomy, Diversity

***Corresponding author E-mail:** lqrnd2008@163.com

Fungi associated with *Malus* spp. in Qujing, Yunnan Province, China

G.Q. Zhang¹, X. L. Fan², Q.R. Li³, L.S. Han¹, D.Q. Dai^{1*}

¹ Center for Yunnan Plateau Biological Resources Protection and Utilization, Yunnan Engineering Research Center of Fruit Wine, College of Biological Resource and Food Engineering, Qujing Normal University, Qujing 655011, P. R. China.

² The Key Laboratory for Silviculture and Conservation of the Ministry of Education, Beijing Forestry University, Beijing 100083, P. R. China.

³ State Key Laboratory of Functions and Applications of Medicinal Plants, Guizhou Medical University, Guiyang 550004, P.R. China

ABSTRACT

Malus spp. (Rosaceae) are one of the important temperate fruits in China. Annually, more than 600,000 tons of crops are produced, mainly in the Yunnan Province. Compared to other temperate fruits, such as grapes, and pears, the fungal studies (in Yunnan) associated with *Malus* spp. are less in number. This study was carried out to identify the different life modes of fungi associated with *Malus* spp. in Qujing City, Yunnan Province, China. One hundred and fifteen samples (115) (healthy leaves for endophytic fungi, dead and leaf litter for saprobic fungi and diseased leaves for black spot fungi) were collected from the apple gardens in different locations in Qujing City. Morphological studies of saprobic fungi were carried out using a Leica DM1000 microscopes. Single spore isolation (for saprobes) and tissue isolation method (for endophytes and black spot fungi) were carried out to isolate different species. Molecular analyses based on multiple gene sequences (ITS and LSU) were carried out to determine the phylogenetic placement of the new isolated species. Among 40 total cultures isolated, six and eight strains were belonging to endophytes and saprobes respectively; twenty-six strains were belonging to apple black spot fungi. Based on morphology and molecular phylogeny, two novel species, *Cytospora qujingensis* (Z4), and *Hypoxyton malongensis* (Z60; Z72), and eleven new host and geographical records were reported.

Keywords: two new species, *Cytospora*, *Hypoxyton*, diversity

*Corresponding author E-mail: cicidaidongqin@gmail.com

Fairy Ring Fungi: A Review

B. M. Premarathne^{1,2}, S. C. Karunarathna^{1,3}, A. N. Ediriweera⁴, S. Madawala⁵, S. Wijesundara^{1,*}

¹National Institute of Fundamental Studies, Hantana Road, Kandy 20000, Sri Lanka

²Postgraduate Institute of Science (PGIS), University of Peradeniya, Peradeniya 20400, Sri Lanka

³Center for Yunnan Plateau Biological Resources Protection and Utilization, Qujing Normal University, Qujing City 655011, Yunnan Province, P.R. China.

⁴Tropical Microbiology Research Foundation, 96/N/10, Meemanagoda Road, Pannipitiya, 10132, Sri Lanka

⁵Department of Botany, Faculty of Science, University of Peradeniya, Peradeniya, 20400, Sri Lanka

ABSTRACT

Soil fungi play a crucial role in determining soil biodiversity. With relevance to the fruiting patterns of mushrooms, “fairy rings” occupy a specific concern. Fairy rings are a unique type of fungal growth that spread out from an initial point of inoculation, forming colonies in an annular pattern. Fairy rings are formed by more than 50 species of soil-dwelling fungi, most of which belong to Basidiomycota. Basidiomycetous genera that form fairy rings include *Agaricus*, *Agrocybe*, *Amanita*, *Boletus*, *Bovista*, *Calvatia*, *Cantherellus*, *Chlorophyllum*, *Clitocybe*, *Cortinarius*, *Disciseda*, *Hygrophorus*, *Lactarius*, *Lycoperdon*, *Marasmius*, *Scleroderma*, and *Tricholoma*. This review discusses the fairy ring types, favorable edaphic conditions, and vegetation types favoring their growth. The soil ranges from gravels, which facilitate excellent drainage, to silts with seepage, and the climate ranges from subtropical to arid, providing suitable habitats for their growth. At varying depths below the surface, most of the mycelium was concentrated in a band 50–60 cm wide and 5–8 cm thick. Most *Marasmius oreades* rings have been observed with a less than 3% slope. In arid areas, *Agaricus argenteus*, *Disciseda candida* and *Calvatia* spp., form in median range elevation, while *Marasmius oreades* prefers higher elevations in mesic regions. Most of the time, the fairy ring fungi remain in vegetative growth mode, allowing mycelia to penetrate soil and spread laterally to break down organic debris and release nutrients. Most fairy ring forming fungi are saprotrophs while some are ectomycorrhizal. Fairy ring fungi have a significant impact on soil quality. However, they show some adverse impacts on the surrounding habitat and human endeavors, including reducing the aesthetic beauty of lawns and competition with co-occurring plants. This review synthesizes many studies on fairy rings and elucidates the current knowledge.

Keywords: *Agaricus*, Annular pattern, Basidiomycota, *Marasmius*, Soil-dwelling

*Corresponding author E-mail: siril.wi@nifs.ac.lk

Eco-sustainable Management Practices For Controlling *Phytophthora palmivora* Induced Palm Bud Rot In Coconut Nurseries Of Tamil Nadu, India

P. Latha^{1*}, C. Sudhalakshmi¹, J. Suresh¹

¹Coconut Research Station, Tamil Nadu Agricultural University, Aliyarnagar- 642101, Tamil Nadu, India

ABSTRACT

Phytophthora palmivora, an oozyte and a dreadful disease of coconut, inflicted huge loss to coconut farmers across Globe. Keeping in mind, the importance of the bud rot disease in coconut, a study has been conceptualized and conducted in Coimbatore District of Tamil Nadu state in India with the twin objective of ascertaining the optimal combination of biocontrol agents to suppress and control bud rot disease in coconut and to provide the farmers with suitable non-chemical means of control of the disease. The study results indicated that among the treatments which were experimented, in Coconut nurseries, the application of 25g/cent of *Trichoderma asperellum* at the time of sowing coupled with crown application of 10 g of *Bacillus subtilis* in 1 liter of water followed by application of 50 gram/cent of Arbuscular Mycorrhizal (AM) fungi at an interval of three and six months after sowing was found to effectively control the pathogen causing bud rot. In young coconut gardens, the treatments were arranged in a completely randomized design with three replicates. The significant result of the experiment involved the soil and crown application of 10 gram of *B. subtilis* twice, first before the monsoon period (last week of May) and second after the monsoon period (September). Additionally, soil application of *Trichoderma asperellum* at a rate of 50 g per palm, along with AM fungi at the same rate per palm per year during January, significantly reduced the incidence of bud rot in young coconut gardens.

Keywords: Biocontrol agents, Arbuscular Mycorrhizal fungi, *Trichoderma asperellum*, *Bacillus subtilis*, Soil application

*Corresponding author E-mail: patlathaa@gmail.com, latha.p@tnau.ac.in

Colour Variation of KOH Extractable Pigments in Hypoxylaceous Species (Ascomycota) in Anuradhapura, Sri Lanka

W. H. Jayathunga¹, A.I. Rathnayake^{1, *}, M. C. Samarakoon²

¹Department of Bioprocess Technology, Faculty of Technology, Rajarata University of Sri Lanka, Mihintale, 50300, Sri Lanka

²Department of Entomology and Plant Pathology, Faculty of Agriculture, Chiang Mai University, Chiang Mai 50200, Thailand

ABSTRACT

Hypoxylaceae is one of the largest families in *Xylariales* and members of it are widely distributed. Identification of hypoxylaceous species mainly relies on morpho-molecular and chemotaxonomic characters. Among the morpho-taxonomic characters, the color of the pigments extracted with KOH is considered to be important. While several pigment colors have been identified in previous studies, the diversity of the Sri Lankan hypoxylaceous fungi and their pigments are poorly understood. This study aimed to comprehensively screen and identify the KOH extractable pigments from hypoxylaceous species in the Anuradhapura district of Sri Lanka. Fungi were collected from decaying wood materials, and the pigments were obtained by dissolving fruiting bodies with 10% KOH. Color analysis was performed using L*, a*, and b* coordinates obtained from the chromometer. Herbarium specimens and isolated fungal cultures were deposited in the Rajarata University Herbarium (RUSLH) and Rajarata University Culture Collection (RUFCC), respectively. The results revealed that the pigment color with KOH was different from the color of the stroma. Most of those pigments resulted in high L* values, so the pigments are lighter in color. The color variation of KOH-extractable pigments could be applied for the preliminary identification of hypoxylaceous species. There is a need to link the color variation of hypoxylaceous species with molecular characters and phylogenetic analysis in future studies for accurate species identification.

Keywords: Chromometer, *Hypoxylon*, Identification, RGB values

***Corresponding author E-mail:** airathna@tec.rjt.ac.lk

Isolation, Identification, and Characterization of Fungi from Kanniya and Rangiri Hot Springs in Sri Lanka

M.N.F. Nifla.¹, A.I. Rathnayake^{1*}, W.H. Jayathunga¹, J.M.A.I.K. Jayamanna¹, S.D.M.K. Wimalasena¹,
M.S. Gunasekara¹

¹ Department of Bioprocess Technology, Faculty of Technology, Rajarata University of Sri Lanka, Mihintale, 50300, Sri Lanka

ABSTRACT

Fungal diversity in hot springs in Sri Lanka remains unveiled. Thermophilic and thermotolerant fungi inhabiting hot springs are vital in industrial biotechnology due to their ability to provide thermostable enzymes. Hence, the present study aims to find the fungal diversity in the Kanniya and Rangiri hot springs in Sri Lanka. The water and sediment samples were collected from the hot springs in Gomarankadawala and Kanniya in Trincomalee district. Potato dextrose media and direct pour culture technique were used to isolate fungi. The culture characteristics of the fungal isolates were examined. Temperature tolerance experiments were also conducted to find the upper and lower limits of thermal growth for each isolate. The preliminary results suggest that all the isolates from the hot springs of Rangiriya and Kanniya are mesophilic fungi that thrive between 15°C and 40°C. Morphological and molecular characteristics will be conducted for the precise identification of the isolates. This ongoing study provides insights into the fungal diversity in the hot spring ecosystem in the Trincomalee district of Sri Lanka.

Keywords: Culture-dependent technique, Temperature assay, Thermophilic fungi, Thermotolerant fungi

**Corresponding author E-mail:* airathna@tech.rjt.ac.lk

The novel species of sooty blotch and flyspeck fungi in Yunnan, China

Hai-Xia Wu^{1*}

¹International Fungal Research and Development Centre, Institute of Highland Forest Science, Chinese Academy of Forestry, Kunming 650224, PR China

ABSTRACT

Sooty blotch and flyspeck fungi commonly occur on the surface of leaves, stems, and fruits in tropical and subtropical and do not cause direct damage to host plants, however, may affect the economic value of fruit saleability and reduce photosynthesis in plants. Sooty blotch fungi can form dark mycelial mats, whereas flyspeck fungi lack mycelial mats but form shiny and small, black spots. The sooty blotch and flyspeck fungi are poorly known because it is difficult to obtain the strain, which is growing slowly. We found a novel species of this group during a survey of the diversity and taxonomy of microfungi in Yunnan, China. Combining morphological characters and phylogenetic tree inferred by large subunit and internal transcribed spacer rDNA sequences to show new species classification status. The new species belongs to *Translucidithyrium*. We inferred the maximum clade credibility (MCC) tree from large subunit rDNA of *Translucidithyrium-related* species to estimate the evolutionary history *Translucidithyrium*. The divergence time of the only existing and from different areas two species of *Translucidithyrium* crown age at 19 (6–39) Mya. Our results provide new insights into species of *Translucidithyrium* and how ecological adaptation and speciation occurred in two separate areas. The diversity of sooty blotch and flyspeck fungi are poorly studied. Yunnan is rich in fungal diversity. We should focus on this group fungus in Yunnan, China.

Keywords: Divergence times; Evolution; new species, phylogeny, taxonomy

**Corresponding author E-mail:* aileen2008haixia@gmail.com

Words from Prof Danny Haelewaters ,

Ghent University, Belgium & University of Colorado Boulder, USA

Unexplored fungal diversity in unusual habitats

The number of species of fungi is estimated at 1.5 to 6 million. However, 250 years of fungal taxonomy have resulted in the description of “only” 148,000 species. This is less than 10% of the estimated diversity, which bears the question: Where are all the missing fungi? In this presentation, I will dive into some of the answers to this question—including the exploration of habitats that are poorly studied such as cloud forests and the leaf surface of fresh produce, cryptic taxa, fungal collections that may contain cryptic or new species hidden under current names, molecular novelties, and natural history collections of organisms other than fungi.

Baculoviruses as an Effective and Safe Biopesticide for Controlling Agricultural Pests in Sri Lanka

Dayasena YAPK^{1*}, Alahakoon AMPD¹, Polwaththa KPGDM¹, Wijesekara ERJMDDP¹, Amarasinghe AMPC¹, Gunasena MDKM¹

¹Department of Biosystems Technology, Faculty of Technology, Sabaragamuwa University Sri Lanka, Belihuloya, Sri Lanka.

ABSTRACT

The viruses in the family *Baculoviridae* infect over 700 species of insects mainly belonging to orders Lepidoptera, Hymenoptera, and Coleoptera. The viruses are highly virulent and have a narrow range of host specificity on respective insect species. This natural phenomenon has been identified and used for making baculovirus pesticides for controlling important agricultural pests due to its high host specificity, effectiveness, and eco-friendliness. This paper discusses the potential of Baculovirus as a biopesticide for controlling agricultural pests in Sri Lanka. Many successful Baculoviral biocontrol programs have been conducted worldwide to control pests which are also recognized as common pests in Sri Lanka. *Spodoptera exigua*, and *Spodoptera littoralis* in cotton, corn, and tomatoes, and *Spodoptera frugiperda* in corn have been effectively controlled by using baculoviral biopesticides worldwide. *Oryctes rhinoceros*, and *Buzura suppressaria* are the two key pests in coconut and tea respectively that were successfully controlled by Baculovirus biopesticide. In addition, Baculovirus biopesticide could be effective on the larvae of key lepidopteran insects such as *Chilo sachhariphagus* in sugarcane *Plutella xylostella* in cabbage, and many other caterpillars because almost identical pest species reported in the same crops have been effectively controlled. In addition, genetically modified commercial formulations with more virulent, UV-protected, highly host-specific, and more infective are also available as new-generation Baculovirus biopesticides. Furthermore, more virulent, host-specific, and effective new Baculovirus strains could be discovered locally and their effectiveness on local pests could be tested. Hence, there is enough potential for the use of commercial baculoviral biopesticides for controlling local agricultural pests or identifying effective virus strains locally to formulate new baculovirus pesticides. However, proper preliminary studies and risk assessment should be done before introducing, commercially formulated or locally prepared baculoviral biopesticides to avoid the effect on eco-friendly insects since there are many supportive insect species that have been recognized as friendly in agricultural ecosystems.

Keywords: *Eco-friendly, Pest control, Viral Biopesticide, Virulent*

***Corresponding author E-mail:** prasanna@tech.sab.ac.lk

Exploring Lignicolous Ascomycota in India's Central Western Ghats: A Preliminary Study of Diversity, Classification and Lignin Modifying Enzymes

Onden Paraparath Sruthi¹, K. C. Rajeshkumar^{1*}

¹National Fungal Culture Collection of India (NFCCI), Biodiversity and Palaeobiology (Fungi) Group, MACS Agharkar Research Institute, Pune, Maharashtra 411 004, India

ABSTRACT

In the central Western Ghats of India, specifically in the Agumbe and Kudremukh regions, the diversity of lignicolous Ascomycota was studied during the post-monsoon season of September 2022. Around 41 samples of litter, consisting of decaying stems and leaves, were collected, and 45 fungal strains were identified through morphological methods. The identified strains were found to belong to an unspecified number of species, and were classified into 27 different genera. These genera were further categorized under 17 various families, all of which were part of four classes of the Ascomycota (Dothideomycetes, Eurotiomycetes, Leotiomycetes, and Sordariomycetes). In the study, four strains were classified under Ascomycota incertae sedis. Additionally, a rare strain of *Shrungabeeja* sp. SOP16 was discovered, as well as one new record, *Kionochaeta castaneae* SOP22 unique to India. Preservation of most of the strains was carried out at NFCCI. For DNA isolation, both direct and indirect techniques were utilized. The phylogenetic placement of the identified strains was confirmed through combined sequence analysis employing Maximum likelihood and Bayesian posterior probability methods. In qualitative screening, the *Shrungabeeja* sp. SOP16 was observed to exhibit production of Lignin Modifying Enzymes (LMEs).

Keywords: Mycological Diversity, Lignicolous fungi, New record, Ligninolytic enzymes, Phylogenetics

*Corresponding author E-mail: rajeshfungi@gmail.com

Fungi Associated with Termites and Their Combs

Y. Er-fu^{1,2}, S. C. Karunarathna², S. C. Shao³, I. Promputtha¹, D.Q. Dai², S. Tibpromma^{2*}

¹Department of Biology, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand

²Center for Yunnan Plateau Biological Resources Protection and Utilization, College of Biological Resource and Food Engineering, Qujing Normal University, Qujing 655011, China

³Gardening and Horticulture Department, Xishuangbanna Tropical Botanical Garden, Chinese Academy of Sciences, Xishuangbanna, 666100, China

ABSTRACT

The termite nests of the *Termitomyces*-growing termites were collected from Xishuangbanna and Chuxiong, Yunnan, China. In addition, the fruiting bodies of *Termitomyces* and *Xylaria* were also collected. All involved samples were transferred into sterilized zip lock bags and tubes quickly in the field and taken back to the microbiology laboratory at Qujing Normal University, China. The culture-dependent method was used to analyze the microbial communities harbored in the termite nests. Phylogenetic analyses were carried out on the resultant isolates based on multi-gene sequences (ITS, SSU, LSU, *rpb2*, and *tub2*). The phylogenetic results confirmed that three asexual *Termitomyces* strains, one *Xylaria* species, and six interesting comb-associated fungi, and *Paecilomyces* species are present in active termite combs. Morphological characteristics were also used to identify the fungal taxa. Photo plates, full descriptions, and phylogenetic trees showing the fungal species' placements are provided.

Keywords: Microfungi, phylogeny, taxonomy, *Termitomyces*, *Xylaria*

***Corresponding author E-mail:** saowaluckfai@gmail.com

Collection, Isolation, and Identification of Bioluminescent Fungi from Yunnan Province of China

W. H. Lu^{1,2}, S. Tibpromma^{2*}, S. C. Shao³, N. Suwannarach⁴, S. C. Karunarathna^{2*}

¹Department of Biology, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand

²Center for Yunnan Plateau Biological Resources Protection and Utilization, College of Biological Resource and Food Engineering, Qujing Normal University, Yunnan 655011, P.R. China

³CAS Key Laboratory of Tropical Forest Ecology, Xishuangbanna Tropical Botanical Garden, Chinese Academy of Sciences, Menglun, Mengla, Yunnan 666303, China

⁴Research Center of Microbial Diversity and Sustainable Utilization, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand

Abstract

Over 700 taxa of bioluminescent creatures are an integral component of the living world. Of these, luminescent fungi form a major part, contributing 113 taxa. All bioluminescent fungi belong to the division Basidiomycota except for one species, *Xylaria hypoxylon* (L.) Grev., which belongs to the division of Ascomycota. Most bioluminescent fungi belong to Mycenaceae, Omphalotaceae, Pleurotaceae, and Physalacriaceae. Only mycelium or fruiting bodies emit light for some species, whereas others have luminescence in both mycelia and fruiting bodies. Yunnan is exceedingly rich in mushrooms; however, the knowledge of Yunnan's bioluminescent fungi is scanty, sporadic, and incomplete. This study aims to collect, isolate, and identify bioluminescent fungi in Yunnan, China. During surveys of bioluminescent mushrooms in Yunnan, China, three glowing mushroom fruiting bodies and four luminous decaying pieces of wood were discovered in 2023. High-resolution environmental images and detailed field recordings of the samples were taken. In addition, the glowing mushrooms and mycelia on decaying wood were isolated into a Potato Dextrose Agar (PDA) medium for further analyses. Morphological characteristics and molecular phylogenetic analyses of nrITS and nrLSU are used to identify the bioluminescent fungi collected in this study.

Keywords: Glowing mushrooms, Luminescent mushrooms, Morphology, Taxonomy, Tropical and subtropical regions

*Corresponding author E-mail: saowaluckfai@gmail.com, samanthakarunarathna@gmail.com

Morphology and Phylogenetic Analyses Reveal *Neocorylicola* Gen. Nov. (Bambusicolaceae) on *Macadamia integrifolia* in Yunnan Province, China

X. Zhang^{1,2}, T.Y. Du², S. Lumyong³, D.Q. Dai², S.C. Karunarathna^{2,3,*}, S. Tibpromma^{2,*}

¹Department of Biology, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand

²Center for Yunnan Plateau Biological Resources Protection and Utilization, College of Biological Resource and Food Engineering, Qujing Normal University, Qujing, Yunnan 655011, P.R. China.

³Institute of Fundamental Studies (NIFS), Hantana Road, Kandy, 20000, Sri Lanka

ABSTRACT

Macadamia integrifolia, is one of the cash crops widely grown in the tropical and subtropical regions and produces edible kernels with high oil content. Several fungal pathogens and endophytic fungi have been reported from this host, but very few studies on saprobic fungi have been carried out. As a part of the saprobic fungal studies on edible nuts, dead branches of *M. integrifolia* with fungal fruiting bodies were collected from Yunnan Province, China. The molecular phylogenetic analyses of combined SSU, ITS, LSU, *RPB2*, and *TEF1- α* regions showed that our collection belongs to Bambusicolaceae, and forms a distinct branch with other genera in the Bambusicolaceae. In morphology, our fungal collection fits well with the Bambusicolaceae concept and it is different from other genera in the Bambusicolaceae due to its unique morphological characteristics of dome-shaped ascomata, slightly curved asci, and ascospores with thin appendages or mucilaginous sheath. Therefore, we introduce our collection as a new genus *Neocorylicola* gen. nov., with *N. macadamiae* as the type species based on both molecular and morphological evidence.

Keywords: novel genus, novel species, morphological characteristics, molecular phylogenetic analyses

*Corresponding authors E-mails: samanthakarunarathna@gmail.com / saowaluckfai@gmail.com

Common Fungal Contaminations in Abalone Mushroom Cultivation: A Case Study from Hingurakgoda, Sri Lanka

J.M.A.I.K. Jayamanna¹, W. H. Jayathunga¹, A.I. Rathnayke^{1,*}

¹Department of Bioprocess Technology, Faculty of Technology, Rajarata University of Sri Lanka, Mihintale, 50300, Sri Lanka

ABSTRACT

Mushroom cultivation is an emerging industry in Sri Lanka, but contamination is a major challenge and contamination can lead to the reduction of mushroom harvest, which can result in significant economic losses. This study investigated the different fungal contaminations found in abalone oyster mushroom farm in Hingurakgoda, Sri Lanka. Six contaminated mushroom bags were collected and cultured on potato dextrose agar and growing colonies of the contaminated fungi were observed and photographed. Mycelia and spores of each contaminated fungus were examined under a high-powered inverted microscope and scanning electron microscope. The results showed that the different colors of the contaminations were likely due to the different species of fungi that were present. *Trichoderma* species were prominent in the grow bags. Further molecular characterization is needed to identify all the contaminations. Therefore, it is important to develop methods to prevent contamination in abalone grow bags. The study also found that most of the contaminations were soil-born fungal species which may highly associate with the substrate or the filling materials of the grow bags. Those contaminations were reduced by sun drying the substrate materials, increasing the sterilizing time of the grow bags, and usage of UV treated water for the spraying. The findings of this study can help abalone mushroom growers to prevent contamination in their grow bags and improve their yields.

Keywords: Cultivation, Grow bags, Prevention, Soil, *Trichoderma*

*Corresponding author E-mail: airathna@tec.rjt.ac.lk

A *Eucalyptus* Foliar Pathogen Reported from Sri Lanka

R. S. Brahmanage^{1,2}, S. Wijesundara², D.Q. Dai³, C. M. Nanayakkara¹, C.K. Muthumala⁴, K.G.S.U. Ariyawansa^{1*}

¹ Department of Plant Sciences, Faculty of Sciences. University of Colombo, Sri Lanka, Colombo, 00700, Sri Lanka

² National Institute of Fundamental Studies, Hantana, Kandy, 20000, Sri Lanka

³ Center for Yunnan Plateau Biological Resources Protection and Utilization, Qujing Normal University, Qujing, Yunnan Province, 655011 P.R. China

⁴State Timber Corporation Sri Lanka, No.82, "Sampath Paya", Rajamalwate Road, Sri Jayawardenepura Kotte, 10100 Sri Lanka

ABSTRACT

Diaporthe, a genus of fungi, has been found to contain 1241 species names and 985 names that are attributable to its asexual form *Phomopsis*, according to the Index Fungorum 2023. It is distributed worldwide and associated with a wide range of host plants. Some members of this genus are significant pathogens that cause stem, root, fruit rots, gummosis, cankers, leaf spots, blights, diebacks, decay and wilts on host Plants. *Eucalyptus* is an exotic plant genus that was introduced to Sri Lanka in the 19th century. It is popular throughout the world for its fast growth, timber value, essential oils, and paper pulps. However, *Eucalyptus* is also susceptible to many root, trunk, and foliar diseases. In Sri Lanka, only a few studies have been conducted on *Eucalyptus*-related pathogenic fungi. This study reports the first occurrence of a pathogenic *Diaporthe* species in *Eucalyptus* trees in Sri Lanka. *Diaporthe* is a well-known fungal pathogenic genus that infects many economically important trees and crops, leading to huge economic losses. The fungus was isolated from *Eucalyptus camaldulensis* leaves showing symptoms of necrotic irregular spots collected from the Polonnaruwa district of Sri Lanka. The fungus was isolated and identified to the genus level using micromorphology and the DNA sequences of the rDNA ITS and LSU loci. The pathogenicity of the *Diaporthe* sp. on *E. camaldulensis* was confirmed. This study provides evidence that *Diaporthe* sp. is one of the causal agents of the leaf spot disease seen in *E. camaldulensis* trees in the Polonnaruwa district of Sri Lanka. It is important to perform pathogenicity tests on other *Eucalyptus* species in Sri Lanka to evaluate the future threats posed by this pathogen.

Keywords: *Diaporthe*, Future threats, Plant pathogens, rDNA, Timber.

*Corresponding author E-mail: sameera@pts.cmb.ac.lk

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Prof. D.Q. Dai	College of Biological Resource and Food Engineering, Qijing Normal University
Prof.R.Kapilan	Faculty of Science,University of Jaffna
Prof. K L Wasantha Kumara	Department of Agriculture Biology, Faculty of Agriculture, Mapalana, Kamburupitiya
Prof. S. Arasaretnam	Faculty of Science, Eastern University, Sri Lanka

Prof. M. Sithambaresan	Faculty of Science, Eastern University, Sri Lanka
Prof. R.G.U. Jayalal	Faculty of Applied Sciences, Sabaragamuwa University of Sri Lanka
Dr. T. Mathiventhan	Faculty of Technology, Eastern University, Sri Lanka
Dr. M. Sugirtharan	Faculty of Agriculture, Eastern University, Sri Lanka
Dr. Nattawut Boonyuen	National Center National Center for Genetic Engineering and Biotechnology (BIOTEC) National Science and Technology Development Agency (NSTDA) 113 Thailand Science Park
Dr Tharanga Aluthwattha	Xishuangbanna Tropical Botanical Garden, Chinese Academy of Sciences, Mengla, Yunnan, China
Dr. (Mrs.) D M Hunupolagama	Faculty of Technology, Eastern University Sri Lanka
Dr. Nadarajah Suthamathy	Faculty of Technology, Eastern University Sri Lanka
Dr. K. C. RajeshKumar	National Fungal Culture Collection of India, B&P (Fungi) Group, MACS Agharkar Research Institute, Pune
Dr. T. Geretharan	Faculty of Agriculture, Eastern University, Sri Lanka
Dr. M. M. Mahusoon	Faculty of Agriculture, Eastern University, Sri Lanka
Dr. ADNT. Kumara	Faculty of Technology, South Eastern University of Sri Lanka
Dr. Ishara S. Manawasinghe	Innovative Institute for Plant Health, Zhongkai University of Agriculture and Engineering

Dr (Mrs) Thivahary Geretharan	Faculty of Agriculture, Eastern University, Sri Lanka
Dr. Jayani J. Wewalwela	Department of Agricultural Technology, Faculty of Technology, University of Colombo
Dr. Dhanushka Nadeeshan Wanasinghe	Kunming Institute of Botany, Chinese Academy of Sciences
Dr Chandima Gajaweera	Dept of Animal Science, Faculty of Agriculture, University of Ruhuna, Sri Lanka
Dr. K. W. Thilini Chethana	School of Science, Mae Fah Luang University
Dr. Asha J. Dissanayake	School of Life Science and Technology, University of Electronic Science and Technology of China
Dr. Belle Damodara Shenoy	CSIR-National Institute of Oceanography, Regional Centre, Visakhapatnam, India
Dr. Aseni Navoda Ediriweera	Faculty of Agriculture, University of Ruhuna
Dr. Amani Mannakkara	Faculty of Agriculture, University of Ruhuna
Dr. T.C. Bamunuarachchige	Faculty of Technology, Rajarata University of Sri Lanaka
Dr. M. Koneeswaran	Faculty of Science, Eastern University, Sri Lanka
Dr. G.A.A.R. Perera	Faculty of Animal Science and Export Agriculture, Uva Wellassa University, Sri Lanka
Dr.K .Premakumar	Faculty of Agriculture, Eastern University, Sri Lanka

Dr. Kandeeparoopan Prasannath	Faculty of Agriculture, Eastern University, Sri Lanka
Dr. K. G. Sameera U. Ariyawansa	Faculty of Science, University of Colombo
Dr (Mrs.) B. Raveendrakumaran	Faculty of Agriculture, Eastern University, Sri Lanka
Dr. P. Rodney feranando	Faculty of Science, Eastern University, Sri Lanka
Dr. Amani Mannakkara	Faculty of Agriculture, University of Ruhuna
Dr. M.S. Nijamudeen	Faculty of Agriculture, Eastern University, Sri Lanka
Mr.R.Thivyatharsan	Faculty of Agriculture, Eastern University, Sri Lanka
Mr. M. Rajendran	Faculty of Agriculture, Eastern University, Sri Lanka
Mrs.U.Mathiventhan	Faculty of Science, Eastern University, Sri Lanka
Mrs.S.Amuthinie	Faculty of Agriculture, Eastern University, Sri Lanka
Mrs. Delina j. prince	Faculty of Agriculture, Eastern University, Sri Lanka
Mr. S. Srikrishnah	Faculty of Agriculture, Eastern University, Sri Lanka
Mr. T.M.S.A. Tennakoon	Faculty of Technology, Eastern University, Sri Lanka

Mrs. Vanitha Prasannath	Faculty of Technology, Eastern University, Sri Lanka
Mr. Eng. A. Janarth	Faculty of Technology, Eastern University, Sri Lanka
Mrs.W.H.D.U.Pushpakumari	Faculty of Technology, Eastern University, Sri Lanka
Ms.M.R.Roshana	Faculty of Technology, Eastern University, Sri Lanka
Mr. G. Niroash	Faculty of Agriculture, Eastern University, Sri Lanka
Mrs. T. Kirupanathan	Faculty of Agriculture, Eastern University, Sri Lanka
Mrs. Vanajah Liyinthan	Faculty of Agriculture, Eastern University, Sri Lanka
Mr.S.T.D.De.Silva	Faculty of Agriculture, Eastern University, Sri Lanka
Ms. A.P.Hashini	Faculty of Technolgy, University of Ruhuna
Ms. HAPW. Hettiarachchi	Faculty of Technology, South eastern University, Sri Lanka
Ms.Maathumai Sivaji	Faculty of Animal Science and Export Agriculture, Uva Wellassa University, Sri Lanka
Ms. Fathima Jemziya Baseer	Faculty of Technology, South Eastern University of Sri Lanka

Oral Presentations,

ICTRI -2023-FOT-A1	Effect of Virgin Coconut Poonac on Performance and Carcass Quality of Broiler Chicken
ICTRI -2023-FOT-A3	The Green Entrepreneurship Adoption among Agro-based Industries in Weeraketiya Divisional Secretariat Division, Hambantota District
ICTRI -2023-FOT-A4	A Study on the Entrepreneurial Ability of Cinnamon Farmers in Kamburupitiya DS Division in Matara District, Sri Lanka
ICTRI -2023-FOT-A5	Socioeconomic Characteristics and Their Relationship with On-Farm Income of Extensive and Semi-Intensive Goat Farmers in The Eastern Province of Sri Lanka
ICTRI -2023-FOT-A6	Growth And Yield Performance of Okra Fertilized with Azolla and Cow Dung Liquid Fertilizer
ICTRI -2023-FOT-A7	Liquid Fertilizer from Mexican Sunflower Plant (<i>Tithonia diversifolia</i>) And Effectiveness in <i>Amaranthus</i> Cultivation
ICTRI -2023-FOT-A9	Determinants of variation of net sale average of tea factories in low elevation
ICTRI -2023-FOT-A10	Standardization of In Vitro Shoot Multiplication and Surface Sterilization Procedures of <i>Curcuma longa</i> L.
ICTRI -2023-FOT-A11	Effect of Plant Growth Regulators on Vine Length and Yield of Salad Cucumber
ICTRI -2023-FOT-A12	Socio-Economic Status and Management Strategies of Goat Farmers in the Mihinthale Veterinary Division: A Case Study in Anuradhapura District, Sri Lanka.
ICTRI -2023-FOT-A13	The effect of vermiwash on the growth and yield of lettuce (<i>Lactuca sativa</i>)
ICTRI -2023-FOT-A14	Effects of wild sunflower (<i>tithonia diversifolia</i>) and citronella grass (<i>cymbopogon citratus</i>) biochar mixture on vegetative growth of tomato plant (<i>Solanum lycopersicum</i>).
ICTRI -2023-FOT-A15	Effect of salicylic acid application on management of chilli leaf curl complex (<i>Capsicum annuum</i> L.)
ICTRI -2023-FOT-A17	Growth and Yield of Salad Cucumber (<i>Cucumis sativus</i> L.) Vine Cuttings Under Protected House Conditions
ICTRI -2023-FOT-A19	Influence of Electro Magnetic Field on the Biology of Immature Stages of Swarming Armyworm (<i>Spodoptera mauritia</i>)
ICTRI -2023-FOT-A21	Evaluation of mini seed corms of elephant foot yam under closer planting systems
ICTRI -2023-FOT-A22	Influence of grafting on growth, yield and quality attributes in tomato
ICTRI -2023-FOT-A23	Interspecific rootstocks to mitigate fusarium wilt incidence in watermelon
ICTRI -2023-FOT-A24	A Review on the IoT-Powered Precision Agriculture as a Path to Tastier and Higher Yields of Watermelon (<i>Citrullus lanatus</i>)
ICTRI -2023-FOT-A25	Identification of Suitable Classifier for Cotton Crop Cultivation using machine learning techniques
ICTRI -2023-FOT-A27	Effect of different seed priming agents on growth and development of mi 6 variety of <i>vigna radiata</i> under induced drought condition
ICTRI -2023-FOT-A28	Physiological and biochemical responses of cowpea (<i>vigna unguiculata</i> l.) against biofilm fertilizer and foliar application of ascorbic acid under drought stress

ICTRI-2023-FOT-F02	Development of Spices Incorporated Palmyrah (<i>Borassus flabellifer</i>) Jaggery and its Physicochemical Analysis
ICTRI-2023-FOT-F03	Comparison of the Bioactivity of Extracts from Female and Male Palmyrah (<i>Borassus flabellifer</i>) Inflorescence
ICTRI-2023-FOT-F05	Determination of Curcumin Content of Dried Turmeric (<i>Curcuma longa</i> L.) Grown in Different Locations of Ampara District, Sri Lanka
ICTRI-2023-FOT-F06	Development of nutritious rusk from a combination of pumpkin flour and rice flour
ICTRI-2023-FOT-F07	Production of ice cream using goraka (<i>Garcinia zeylanica</i>) extract and evaluation of physical, chemical and sensory parameters
ICTRI-2023-FOT-F08	Potential of Enhancing the Aroma Profile of Hot-Water-Soluble Instant Black Tea by Incorporating Encapsulated Black Tea Aroma
ICTRI-2023-FOT-F09	Nutritional and Organoleptic Evaluation of Processed Sardine Under Novelty Preservative Techniques
ICTRI-2023-FOT-MMT 16	A <i>Eucalyptus</i> foliar pathogen reported from Sri Lanka
ICTRI-2023-FOT-MMT 01	A Preliminary Study Shows Higher Diversity of Freshwater Fungi in Anuradhapura District, Sri Lanka
ICTRI-2023-FOT-MMT 06	Color Variation of KOH Extractable Pigments in Hypoxylaceae species (<i>Hypoxylaceae-Ascomycota</i>) in Anuradhapura, Sri Lanka
ICTRI-2023-FOT-MMT 07	Isolation, Identification, and Characterization of Fungi from Kanniya and Rangiri Hot Springs in Sri Lanka
ICTRI-2023-FOT-MMT 02	Taxonomic study of Xylariales in Southern China
ICTRI-2023-FOT-MMT 08	The sooty blotch and flyspeck fungi in Yunnan, China
ICTRI-2023-FOT-MMT 10	The potential of the Baculoviral biopesticide as a safe and effective pest control method in Sri Lanka
ICTRI-2023-FOT-MMT 11	Lignicolous Ascomycota from the Central Western Ghats of India and In vitro Screening for Lignin Modifying Enzymes (LMEs)
ICTRI-2023-FOT-MMT 12	Fungi associated with termites and their combs
ICTRI-2023-FOT-MMT 13	Collection, isolation, and identification of bioluminescent fungi from Yunnan province of China
ICTRI-2023-FOT-MMT 14	Morphology and phylogenetic analyses reveal <i>Neocorylicola</i> gen. Nov. (<i>bambusicolaceae</i>) on <i>Macadamia integrifolia</i> in Yunnan province, China
ICTRI-2023-FOT - ET 01	Dual Membrane - Adsorption Hybrid System as a Sustainable Water Reuse System
ICTRI-2023-FOT - ET 02	Sustainable waste management solution for distillery spent wash
ICTRI-2023-FOT - ET 13	Supplementation Of Selenium And Silica Enhanced The Yield And Nutrient Quality Of Rice (<i>Oryza sativa</i> L.) By Reducing The Arsenic Uptake And Accumulation.
ICTRI-2023-FOT - ET 04	Value Addition of Plastic with Clay to Manufacture Plastic-Clay Bricks
ICTRI-2023-FOT - ET 05	Nutrient optimization for dwarf varieties of coconut for achieving higher yield and profitability in tamil nadu
ICTRI-2023-FOT - ET 11	Developing a low - cost technology for the removal of manganese from drinking water in mannar district
ICTRI-2023-FOT - ET 07	Goat based integrated farming system in coconut on soil fertility, net returns, and green house gas emission
ICTRI-2023-FOT - ET 10	Assessment of ground water quality in kirankulam area of batticaloa, sri lanka with special reference to cation concentrations, ph, ec, tds, and turbidity
ICTRI-2023-FOT - ET 12	The Effects of Different Water Sources on Growth and Yield of Okra (<i>Abelmoschus esculentus</i>)

ICTRI-2023-FOT - ET 08	Design, Simulation and Real-Time Monitoring Of A Microgrid: A Pilot Study At The Rajarata University Of Sri Lanka
ICTRI-2023-FOT - ET 14	Development of corn starch-based bioplastic with addition of tea waste
ICTRI-2023-FOT - ET 15	Assessing the potential of composting sludge generated from water treatment plant
ICTRI-2023-FOT - ET 16	Water Quality Assessment at Some Farming Villages of Eravur Pattu DS Division in the Batticaloa District, Sri Lanka
ICTRI-2023-FOT - ET 17	Treatment efficiency of the biological treatment plant for the brewery wastewater in terms of chemical oxygen demand and the quality of treated water for its disposal

Poster Presentations,

ICTRI -2023-FOT-A16	Improvement of Anther Culture Techniques for Capsicum (Capsicum annum L.)
ICTRI-2023-FOT-F01	Achieving greater benefits and efficiency by reducing chemicals used in the clean in process in milco (pvt) ltd
ICTRI-2023-FOT-F04	Development of A Natural Toothpaste from Palmyras Pulp: Overcoming Formulation Challenges and Sensory Optimization
ICTRI-2023-FOT-F05	Determination of curcumin content of dried turmeric (Curcumina longa l.) grown in different location of Ampara district, Sri Lanka
ICTRI-2023-FOT-MMT 03	Fungi associated with Malus spp in Qujing, China
ICTRI-2023-FOT-MMT 04	Fairy Ring Fungi: A Review
ICTRI-2023-FOT-MMT 05	Eco-sustainable management of bud rot disease in coconut nursery garden
ICTRI-2023-FOT-MMT 15	A Challenge For Abalone Mushroom Growers: Common Fungal Contaminations
ICTRI-2023-FOT - ET 03	Analyzing Slope Stability through Shear Strength Reduction Method
ICTRI-2023-FOT - ET 09	Base Catalyst De-polymerization of Rice Straw Lignin to produce Phenol Monomers.

