

**10TH INTERNATIONAL CONFERENCE ON DRY ZONE AGRICULTURE
(ICDA 2024)**

“Navigating Dry Zone Challenges for Agricultural Excellence”

CONFERENCE PROCEEDINGS



Faculty of Agriculture, University of Jaffna, Sri Lanka

Under the sphere of

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11 September 2024

**Faculty of Agriculture, University of Jaffna
Ariviyal Nagar, Kilinochchi, 44000, Sri Lanka**

PROCEEDINGS OF THE 10TH INTERNATIONAL CONFERENCE ON DRY ZONE AGRICULTURE (ICDA 2024)

“Navigating Dry Zone Challenges for Agricultural Excellence”

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CONTENTS

Messages from Dignitaries

Message from the Chief Guest and General Chair JUICE-2024	x
Message from the Dean	xi
Message from the Conference Chair	xii
Message from the Convener	xiii
Message from the Finance Chair	xiv
Message from the Conference Secretaries	xv
Message from the Chief Editor	xvi

Addresses from the Professional Excellencies

Keynote Address

Integrating Small-holder Producers in high-value market chains through innovative approaches to achieve food security	02
Mr. Sandiford R. Edwards <small>MA, MBA, ACCA</small>	

Guest Speaker Address

Startups and Agribusiness Opportunities in Dryland	06
Prof. E. Somasundaram	

Abstracts

Agromony for resilient crop production and Improving soil and waste management for better crop growth

Comparative Effect of Organic and Inorganic Applications on Rice (<i>Oryza sativa</i>) Cultivation in Vavuniya District over Two Consecutive <i>Maha</i> Seasons	10
S. Sivaram*, D. M. D. Dissanayake and A. M. K. R. Bandara	

Physical Properties of Widely Cultivating New Improved and Traditional Rice (<i>Oryza sativa</i> L.) Varieties of Sri Lanka	11
--	----

K. N. Deshapriya, W. K. S. M. Abeysekera*, W. P. K. M. Abeysekera, S. R. Samarakoon, G. A. S. Premakumara and D. M. J. B. Senanayake

The Impact of Seasonal Drought on Tea Cultivation in Low-Country Wet Zone of Sri Lanka	12
---	----

I. L. G. Rathnayake*, D. V. D. Hemalika and S. N. C. M. Dias

Effect of Shelterbelts on Production of Good Quality Betel (<i>Piper betel</i>) Leaves	13
---	----

R. M. P. U. Rajapaksha*, K.M. Swarnalatha, R. M. S. P. Rajapaksha, and M. Thilakarathne

Physicochemical Properties of Selected Wild <i>Oryza sativa</i> (Wild Rice) Species in Sri Lanka	14
S. E. K. Fernando, W. K. S. M. Abeysekera*, A. Tennakoon, W. P. K. M. Abeysekera, D. Ratnasekera, M. N. A. Mubarak, D. M. E. Senewirathna	
Combine Effect of Vermicompost, Fish Tonic and <i>Trichoderma viride</i> with Inorganic Fertilizer Application on Groundnut (<i>Arachis hypogaea</i> L.) Growth and Yield	15
T. Nalayini*, P. Priyatharshini, A. Amirthalojanan and P. G. H. M. S. N. Herath	
Effect of Microbial Ameliorators on Quality Enhancement of Compost	16
G. P. G. S. M. Guruge, U. K. A. Indumini*, J. P. H. U. Jayaneththi and M.D.P. Nayanarangani	
Influence of Date of Sowing and Nutrient Levels Supply on Sunn Hemp Seed Production	17
A. Pon Arasan*, S. Sanbagavalli and S. Radhamani	
Enhancing Germination and Seedling Vigor in Blackgram through Organic Seed Priming	18
H. Mohamed Shafiq*, S. Sundareswaran, E. Somasundaram, K. Raja, M. Suganthy and P. Janaki	
Development of Drought Tolerant Chilli (<i>Capsicum annum</i> L.) Hybrids	19
S. Praneetha* and V. Poobalan	
<i>Transformative advances in food technology and nutrition</i>	
Effects of Fungal Growth, and Post-harvesting Techniques on Total Phenolic Content, Total Flavonoid Content, and Oil Content of <i>Myristica fragrans</i>	21
P. G. N. H. Dharmasiri, P. C. Arampath and T. Liyanage*	
Fatty Acid Profiles of Selected Peanut (<i>Arachis hypogaea</i>) Lines in Sri Lanka	22
N. S. Muthumali, W. K. S. M. Abeysekera*, M. M. N. P. Gunasekera, and U. M. A. Kumara	
Comparison of Different Starch Properties of Five Different Yam Varieties and Their Binding and Textural Characteristics in Chicken Sausage	23
W. P. C. H. Warnakulasuriya, S. Keerthini, K. A. M. N. Jothipala and C. V. L. Jayasinghe*	
Development and Evaluation of the Black clam (<i>Villorita cyprinoides</i>) Incorporated Uncooked Palmyrah Tuber Flour-based Instant Soup Mix Powder	24
J. Yathushini* and S. Simmaky	
A Developing Mushroom-based Stock Cubes as a Safe Alternative to Replace MSG in Food Flavouring	25
W. M. W. W. Kandegama*, K. H. Maduwanthi, J. M. G. M. T. Karunarathne, E. K. W. W. Weerarathna and M. A. N. Nimasha	

Formulation of Tamarind (<i>Tamarindus indica</i> L.) Pulp-based Mix Spice Cube	26
W. B. W. M. R. C. P. Aluwihare*, K. Yuhenthiran, A. G. U. M. Gamage and A. M. T. N. Adikari	
<i>Agricultural economics, extension and agribusiness management in optimizing the production</i>	
Analysis of the Willingness to Pay for Organic Fruits and Vegetables in Matara and Galle Districts in Southern Province, Sri Lanka	28
P. H. N. Rasanjalee* and K. N. N. Silva	
High-value Market Channels and Their Implications for the Actors of Pineapple Value Chain in Sri Lanka	29
G. A. U. M. Ganepola, A. A. M. D. Wickramasinghe, G. Udagedara*, S. Fernando and K. P. P. Kopyawattage	
Use of Information and Communication Technology by Rubber Extension Personnel in Monaragala District	30
P. K. K. S. Gunarathne*, K. D. K. L. Siriwardana and K. H. D. M. Premarathne	
Behavioural Factors Influencing the Adoption of the Manuring in Immature Rubber (<i>Hevea brasiliensis</i>) Cultivations of Smallholder Rubber Farmers in Monaragala District	31
P. K. K. S. Gunarathne*, K. D. K. L. Siriwardana and K. H. D. M. Premarathne	
<i>Innovative strategies in plant protection and crop improvement</i>	
Screening for Potential Anti-viral Compounds in Wild Papaya Genotypes for Eliminating Papaya Ring Spot Virus (PRSV) in Cultivated Papaya (<i>Carica papaya</i> L.)	33
J. Auxilia*, M. GohilaPriya, K. Hemaprabha, R. Nirmala Devi and S. Ramya	
Synthesis and Characterization of Oil-in-Water Nanoemulsion Using High Energy Methods Encapsulating Phytomolecule for Combating Papaya Ring Spot Virus	34
S. Ramya*, J. Auxilia and D. J. S. Sharmila	
Optimization of DNA Extraction Protocol for <i>Mormodica charantia</i>	35
P. Yathurshi*, H. M. P. S. Kumari and G. Thirukkumaran	
The Giant Praying Mantis in the Human Settlement of the Ariviyal Nagar, Northern Province, Sri Lanka	36
L. V. Samarasinghe, B. H. Hettiarachchi and S. Thanusan*	
Advancing Biofortified Sweet Corn: Evaluating High Beta Carotene Parental Inbreds for Hybrid Development	37
S. Ravichandran, K. Rathinavel, A. Chellamuthu, C. Monisha, M. Balamurugan, M. R. Ismail, S. Subburayan and S. Natesan*	

<i>Agriculture modernization, mechanization and water management strategies for increased food reserve</i>	
Soil Incorporation of a Superabsorbent Polymer with or without Organic Matter Improves Drought Tolerance Properties of Rice Varieties (<i>Oryza sativa</i> L.)	39
M. D. D. S. D. Kulasooriya*, L. K. Weerasinghe, L. V. Y. Weerathne	
Comparison of Air-conditioned and Roadside-ventilated Sales of Banana (<i>Musa</i> Sp.) and Mangoes (<i>Mangifera indica</i>) in terms of Qualitative and Quantitative Postharvest Losses in Anuradhapura	40
W. B. W. M. R. C. P. Aluwihare*, Y. M. P. Samarasinghe, A. G. U. M. Gamage and A. M. T. N. Adikari	
Determination of the Relationship Between Peelability and Water Relations of Cinnamon (<i>Cinnamomum zeylanicum</i>)	41
R. M. P. U. Rajapaksha*, H. W. C. K. S. Herath, K. M. Swarnalatha and R. M. S. P. Rajapaksha	
Soil and Water Conservation Strategies for the Tank Cascade Systems in the Dry Zone of Sri Lanka	42
P. Kowshayini*, H. B. Nayakekoralala and S. Pathmarajah	
<i>Livestock, aquaculture and fisheries for nutritious food production</i>	
Proximate Composition and Sensory Characteristics of Bee Products Incorporated Bio yogurt	44
E. Pavithira*, and N. Jeyagowri	
Antibacterial Effect of Probiotic Bacterial Strains Isolated from Locally Fermented and Commercial Products	45
R. A. N. Karunathilaka*, N. P. S. M. Arachchige and G. A. Gunawardana	
Assessing Water Quality and Plankton Abundance in Jaffna Lagoon	46
P. Karthika*, C. M. P. V. Chandrasekara, S. Gobiraj, N. Ragavan, K. Gunaalan and S. Kuganathan	
A Preliminary Study on the Preparation Method of Soya Milk Feed and Its Effect on the Survival Rate of Common Carp (<i>Cyprinus carpio</i>) Post-larvae	47
G. Anitha* and H. A. C. C. Perera	
Initial Crossbreeding to Develop Fancy Hybrids using Threatened Endemic “Cyprinid” Species	48
H. A. N. P. Chathuranga*, S. Thanusan, B. P. A. Jeyaweera and R. R. A. R. Shirantha	
Comparative Study of Egg Characteristics of White Leghorn and Naked Neck Chicken for Table Eggs	49
M. G. Mohamed Thariq* and R. M. Nikzaad	
Panel of Reviewers	50
Abstract Editing Support Team	54

Message from Dignitaries

Message from the Chief Guest and General Chair JUICE - 2024



Prof. S. Srisatkunarajah
Vice-Chancellor
University of Jaffna
Sri Lanka

Research and the dissemination of knowledge are the pathways to wisdom. As the Vice Chancellor of the University of Jaffna, where our motto embodies the pursuit of knowledge and wisdom, I am deeply honoured to extend my warmest wishes to all esteemed participants, eminent speakers, students, staff members, and guests attending the 10th International Conference on Dry Zone Agriculture (ICDA 2024), organized by the Faculty of Agriculture.

With the theme “Navigating Dry Zone Challenges for Agricultural Excellence,” this conference provides an invaluable platform for knowledge exchange, sharing innovative ideas, and fostering collaborative efforts essential for addressing the unique challenges of dry zone agriculture. Universities serve as centers of knowledge, where the imparting, creation, and dissemination of information are essential functions of it. Research, which demands deep contemplation and perseverance, is the basis of this process, leading to the generation of new knowledge. Researchers work diligently, often in solitude, conducting experiments and testing ideas with patience and dedication.

ICDA 2024 is designed to offer such research scientists the opportunity to present their findings, engage in discussions with peers, and maximize the impact of their work. As we gather at this conference, it is crucial to recognize the vital role that agriculture plays in sustaining food security and livelihoods in our region. The dry zones, with their distinctive ecological features, present both opportunities and challenges. Through dedicated research, technological advancements, novel thinking, and the sharing of best practices, we can overcome these challenges and unlock the full potential of dry zone agriculture.

The Faculty of Agriculture at the University of Jaffna has organized this conference for the 10th time, demonstrating the sheer commitment to excellence in education and research. We believe that the insights and discussions generated here will significantly contribute to shaping the future of agriculture in dry zones, not only in Sri Lanka but globally. I congratulate the conference organizing committee and wish you all a productive and enlightening conference. May God bless you all.

Message from the Dean



Prof. K. Pakeerathan
Dean
Faculty of Agriculture
University of Jaffna

It is indeed honor and great pleasure to convey dean's message to the proceedings of the 10th International Conference on Dry Zone Agriculture-2024 (ICDA-2024) which is being organized as a satellite conference of the JUICe-2024 under the theme of "Navigating Dry Zone Challenges for Agricultural Excellence". ICDA has been very unique and remarkable annual event of the Faculty of Agriculture, hosting its' own conference with an abundance of outstanding research papers submitted by both National and International researchers to disseminate the multifaceted groundbreaking research findings that are most appropriate to Dry Zone Agriculture since its inception in 2015. Within the economic crisis of the country and the re-emergence from the post COVID-19 pandemic catastrophe, the successful organization of ICDA consecutively for a decade demonstrates how advanced planning and coordinated work of dedicated master minded multiple human talents without considering their golden time and the strong support from the University administration.

Being the 10th in the series, ICDA's resounding success has profoundly pierced the heart of the Agricultural research community around the globe and recognized, therefore, with their support, preside its steady journey in every sense of the term. Particularly 10th ICDA-2024 glorify and remember the 50th years of University of Jaffna's academic pursuits. As dean of the faculty, I extend my heartfelt gratitude and appreciation to all volunteers who contributed to the success of the ICDA-2024. Physical presence of chief guest and the keynote speaker, session evaluators and various authors and the reviewers witness the quality content of the technical program.

I would like to acknowledge all the organizing team members, and thank all the delegates in the congregation, students and staff of the Faculty of Agriculture, University of Jaffna, the donors, the contributors, the Chief Guest, and others for your presence and support to ICDA-2024. I hope the ICDA 2024 is a huge success and contributes significantly to the growth of dry zone agriculture across the country.

Message from the Conference Chair



Prof. S. Vasantharuba

Professor in Agricultural Chemistry
Department of Agricultural Chemistry
Faculty of Agriculture
University of Jaffna

I am deeply honoured and delighted to extend a welcome to you all to the tenth International Conference on Dry Zone Agriculture-2024 (ICDA-2024) hosted by the Faculty of Agriculture University of Jaffna under the sphere of Jaffna University International Research Conference 2024 (JUICE 2024). It is with great pleasure that I deliver this message as a Conference Chair to the tenth International Conference on Dry Zone Agriculture-2024 (ICDA 2024) which is scheduled to be held on 11th September 2024. ICDA is one of the most important events in the academic calendar of our faculty and it has been a great success in the past nine years. As in previous years, ICDA 2024 provides an excellent forum to bring researchers from different disciplines and countries to a common platform to disseminate their findings, exchange knowledge and ideas, and build partnerships in a variety of disciplines related to agriculture.

The theme of ICDA 2024 is “Navigating Dry Zone Challenges for Agricultural Excellence”. Around two-thirds of the agricultural areas in Sri Lanka are located in the dry zone and around 30 percent of Sri Lankans are employed in the agriculture sector, which comprises the majority from the dry zones. However, the agriculture sector shared only around 9 percent of the country’s Gross Domestic Product (GDP). Therefore, as one of the agriculture faculty located in the country’s dry zone area, our faculty’s role is very influential in navigating the challenges of the dry zone agriculture sector and converting it into a center of agricultural excellence. I hope this ICDA 2024 conference will discuss the current challenges of dry zone agriculture and propose possible solutions and ways to convert this dry zone region into a center of agricultural excellence. We started this series of ICDA conferences in 2015 in commemoration of our faculty’s silver jubilee celebration and we successfully organized nine conferences without interruption even during the time of covid and economic crisis. ICDA 2024 holds further prominence as it is celebrated during the golden jubilee year of the University of Jaffna. I sincerely hope our faculty will successfully organize this series of ICDA conferences in the coming years. On behalf of the organizing committee of the ICDA 2024, I wish to express my profound gratitude to our Vice-Chancellor for his visionary leadership and generous support in making this conference a reality. I also wish to thank the keynote speaker, guest speaker, chair of the sessions, presenters, reviewers, sponsors, members of the organizing committee, and everyone who helped in numerous ways to make ICDA 2024 a successful event. While warmly welcoming all foreign and local delegates to ICDA 2024, I hope that participation at ICDA 2024 will be a rewarding experience for them.

Message from the Convener



Dr. (Mrs.) S. Terensan

Senior Lecturer

Department of Agricultural Biology

Faculty of Agriculture

University of Jaffna

It is with great pleasure and satisfaction, I welcome all participants, including Vice Chancellor, keynote speaker, guest speaker, sponsors, authors, staff, students, and guests to the 10th International Conference on Dry Zone Agriculture. The journey to this day has been marked by tireless efforts, and it is a joy to see it unfold with great promise. This conference is set to address critical issues related to dry zone agriculture, with the aim of finding viable solutions to improve the sector. Our theme, “Navigating Dry Zone Challenges for Agricultural Excellence,” emphasizes the importance of generating new knowledge, refining existing insights, and fostering collaboration to tackle the unique agricultural challenges of dry zone. We are particularly honored to have speakers from tropical countries, whose expertise and experiences are highly relevant to our context. Throughout this conference, a diverse range of topics will be explored, from water and soil management to climate resilience and sustainable farming practices. The insights gained here will significantly contribute to advancing dry zone agriculture. As the conference convener, I am incredibly proud of the ICDA 2024 team for their dedication in organizing such a successful event. I extend my heartfelt gratitude to all the speakers and attendees whose expertise and passion will undoubtedly drive the success of this conference. I would also like to express our deep gratitude to all the sponsors who have generously supported this conference, making it possible for us to bring together such a distinguished group of participants. Together, may we find creative solutions that enhance our environment and uplift the communities to which we are deeply committed.

Message from the Finance Chair



Mr. S. Sritharan
Farm Manager
Faculty of Agriculture
University of Jaffna

It is my privilege to write a message to the proceeding of the ICDA 2024 as the Finance Chair. The ICDA 2024 is the organized platform for researchers to present their valuable research findings for creating possible industrial collaborations. This Annual event is considered remarkable at the Faculty of Agriculture, University of Jaffna to indicate it's strong research potential. Moreover, the contribution of sponsors and donors is greatly acknowledged at this Junction. All in all, I wish the entire ICDA team to have this event systematically organized. My hearted wishes for the entire ICDA team to have this event systematically organized inorder to mark it prominently on the academic calendar of the Faculty of Agriculture.

Message from the Conference Secretaries



Dr. S. Sivashankar

Lecturer

Department of Agricultural Economics
Faculty of Agriculture
University of Jaffna



Dr. (Miss) S. Rajendran

Lecturer

Department of Agricultural Chemistry
Faculty of Agriculture
University of Jaffna

It gives us great pleasure and honor to deliver our remarks as the joint secretaries of the 10th International Conference on Dry Zone Agriculture. This conference offers invaluable opportunities to explore cutting-edge research and showcase innovations that transform the field through revolutionary technologies. We aim to bridge existing gaps in agriculture and forge new, innovative connections. The theme “Navigating Dry Zone Challenges for Agricultural Excellence” has been crafted to harness the collective expertise of this remarkable gathering. We are committed to continually enhancing our operations to meet the high publication standards of the ICDA conference. Our dedicated ICDA team and reviewers have worked tirelessly to overcome challenges. We should all take pride in how far we have come and feel excited about the voluntary support from everyone associated with ICDA. We extend our heartfelt gratitude to each of you for attending ICDA 2024 and contributing your expertise to this esteemed gathering. With a record number of participants expected this year, we are confident that these annual conferences will continue to grow in scale and impact. With your support, we hope ICDA 2024 will be an unforgettable experience for all participants.

Message from the Chief Editor



Dr. (Mrs.) S. Piratheepan
Senior Lecturer
Department of Animal Science
Faculty of Agriculture
University of Jaffna

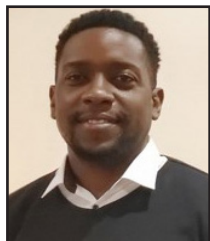
We are pleased to present the proceedings of ICDA 2024, which promises to be an exceptional exchange of scientific knowledge and innovation. This conference has long been a key platform for leading experts in sustainable agriculture, and this year's collection of papers and presentations showcases the ongoing progress and development in the field. The proceedings feature a wide range of research, from groundbreaking discoveries to new methodologies that challenge existing norms. The diversity and depth of the topics covered highlight the dynamic nature of our discipline.

As global climate change continues, the need for innovative solutions and sustainable practices in dry regions has become more urgent. This conference has brought together some of the most forward-thinking experts to address these pressing issues. We hope you find these proceedings insightful and inspiring as we work together to tackle the challenges and opportunities in sustainable agriculture. As you explore the research presented, we encourage you to consider how it might spark new questions, foster collaborations, and advance our field. Through our collective efforts, we aim to make meaningful impacts on both science and society.

Addresses from the Professional Excellencies

KEYNOTE ADDRESS

Integrating Small-holder Producers in high-value market chains through innovative approaches to achieve food security



Mr. Sandiford R. Edwards MA, MBA, ACCA
Development Specialist
Program Director
USAID-funded Caribbean Agriculture Productivity Improvement Activity
Grenada

Introduction and Context

World agriculture is at a critical juncture and under pressure to meet food demand for a projected 9 billion global population by 2050. To achieve this, agri-food systems must reduce food loss and food waste, improve distribution and access, whilst simultaneously increasing food production.

Climate change and impacts of changing weather patterns: prolonged droughts, species extinction, agriculture water scarcity and cost, food loss and waste, changing diets, access, competing claims for land and raw material and intermediate inputs, including those required for animal feed, fibre for clothing and biofuels for energy have exasperated the challenges of agri-food systems with deleterious and disproportionate effects on small-holder producers.

Similar to the Caribbean, countries such as Sri Lanka, faces very significant increases in minimum temperatures which can negatively affect the yields of crops such as rice which is estimated to meet the food and nutrition security needs of 32 percent of the population. Countries are projected to experience greater incidence of agricultural output shocks in land and genetic plant and seed fragility, exacerbating the complexities of responding to the food and nutrition security (FNS) challenge.

Meeting the global FNS challenge will require both short- and long-term responses by public and private sectors including academia in advancing research and development and in-field deployment of innovative, affordable and accessible agricultural techniques for non-irrigated cultivation of crops and use in acute low rainfall zones in Sri Lanka and by extension in global food producing areas.

Further, The State of Food Security in the World Report, posited that between 713 and 757 million people may have faced hunger in 2023, one out of 11 people in the world. Additionally, the Global Food Security Index (GFSI), which measures four key food security drivers to include affordability, availability, quality and safety and sustainability and adaptability has advanced that the global food environment continues to deteriorate. In the case of Sri, Lanka, the country was ranked 79th out of 113 countries at the end of 2022.

¹'Agri-food' and 'agriculture' are used inter-changeably throughout the paper.

Achieving food security, especially in the context of dry zone farming is not a ‘one size fit all’ approach but must consider the stages on the agri-food system development continuum that each country finds itself. Example, countries such as Haiti, Venezuela, Yemen, Burundi and Madagascar with huge vulnerability to food security, have to rely on a different approach when compared to countries such as Finland, Ireland, Norway and Canada’s who are generally the better world performers on the food security index or even Colombia, Nepal, Paraguay or Sri Lanka that are at the middle of the pack.

Market Driven Approach Concept

Integration of small holder producers in high value markets as in context of Sri Lanka should consider the extent to which a market driven approach to agriculture production and planning is pursued.

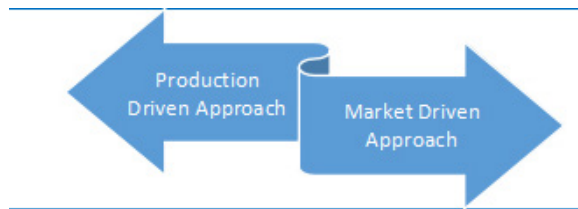


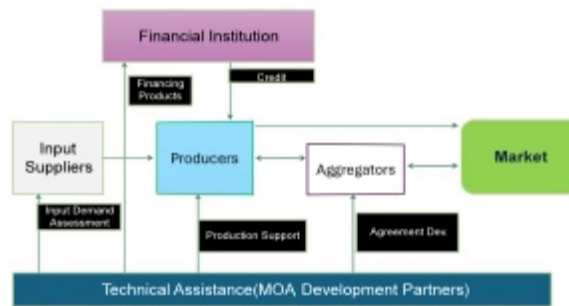
Figure 1 - Approaches to Agriculture Planning and Production

A production driven method denotes where producers plant / grow crops in the absence of a confirmed market and then approaches customers or seek customers at the point of harvest. The production driven approach relies heavily on historical farming experience and cultural traditions.

Alternatively, a working definition of being market driven means “allowing knowledge of the market, customer needs, and customer desires to influence agriculture production planning. It means seeing the type of products, quality specification, timing from the customer’s point of view”. The market driven approach uses data to prioritize products and features that customers expect.

The market driven approach towards the integration of small-holder producers into high value markets offers several advantages in include:

- Reduction of market failure risk. Market price volatility for agriculture produce can be common, especially falling prices due to over-supply or lack of demand. The market driven model relies on forward contracts, agreements (verbal but preferably written) that guide production planning.
- Use of cluster or zonal agriculture production. A natural outcome of the forward contracts is the ability to implement zonal or cluster agriculture planning and production to respond to the obligations of the agreement. Under this model small holder farmers can benefit from coop or cluster financing, can pursue joint capacity building and combine resources to build resilience to many of the challenges present in dry zone farming in include water and soil moisture management, input cost, soil nutrition management and conservation.



Integration into high value markets require small holder producers in Sri Lanka to consider

- Identification of the high-value markets to be the lead demand sectors, the main buyers to act as catalyst and aligning of value chain initiatives with these broader corporate objectives.
- Seeking out champion buyers and partner organizations with unique knowledge and expertise.
- Match supply sourcing opportunities with the needs of small farmers encouraging joint supply.
- Emphasis on value chain profitability and sustainability instead of farmers yields.

The success of the market-driven model equally relies on producers being able to draw from a menu of options for dry farming techniques.



Fundamental questions around private sector participation and signaling on market demand, quality requirements, delivery and pricing ought to be properly answered. Small holders participation in public procurement, ability to benefit from fiscal and other trade enabling incentives, as well as the level of agriculture infrastructure can further undergird progress towards achieving improved food security.

The Public sector will also be required to urgently establish the legal and policy frameworks that create economic incentives for these innovations to take place in a collaborative manner. Private sector investment in innovation for productivity and efficiency enhancement throughout the agri-food chain will be pivotal to simultaneously

raise agricultural productivity and supply-side capacity and reduce output losses and food waste. Taken together, public-private sector investments and partnerships will be critical to reverse the low levels of investment in agriculture that have created major stumbling blocks to integrating smallholders into high value markets and the achievement of national food and nutrition security.

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GUEST SPEAKER ADDRESS

Startups and Agribusiness Opportunities in Drylands



Prof. E. Somasundaram

Director at Directorate of Agribusiness Development and
Professor in Agronomy
Tamil Nadu Agricultural University, India

Dryland agriculture refers to farming practices conducted in regions where the annual rainfall is less than 500 mm. These areas are characterized by water scarcity, frequent droughts, and limited irrigation facilities. Dryland regions cover about 40% of the Earth's land surface and are home to 38% of the global population, making them crucial for global food production. The major crops cultivated in dryland areas include millets, pulses, oilseeds, wheat, sorghum, fig, karonda, custard apple, bael, jamun, aloe vera, senna, vetiver, and tamarind. However, productivity in these regions is often low due to various biotic and abiotic stresses. Dryland farming faces several challenges that hinder yield maximization, such as water scarcity, poor soil fertility, climate variability, land degradation, and limited access to technology. Despite these challenges, there are significant agribusiness opportunities in crops grown in drylands. Many startups have successfully turned dryland agricultural products into profitable ventures.

Marketing Aspects for Dryland Crops

Marketing is the process of buying and selling goods based on market demand. Dryland farmers must carefully plan cultivation and production according to market needs. There is substantial market potential for dryland crops like millets, pulses, figs, dates, cashews, and moringa in both domestic and international markets. Success in this sector requires a deep understanding of market demand, product knowledge, and the needs of the target audience.

- A) Product: Assessing the demand, quality, and competitive landscape is crucial. The quality of the product is key to market positioning and growth.
- B) Price: Pricing strategies such as skimming, premium pricing, cost-plus pricing, and demand-based pricing influence marketability.
- C) Promotion: Effective promotion through advertising, public relations, and publicity is essential to communicate product benefits.
- D) Place: Ensuring accessibility for consumers, whether through physical stores or digital platforms, is vital.

Value Addition of Dryland Crops

Food processing transforms raw agricultural products into consumable items, enhancing safety, shelf-life, taste, and nutritional value. Value-added products from dryland crops

include millet-based traditional foods, moringa-based products, and various arid zone fruit products. These value-added products help reduce food waste, extend shelf life, and provide consumers with a wider variety of foods year-round.

Smart Farming Technologies in Dryland Agriculture

Smart farming technologies, such as IoT, hydroponics, aeroponics, and greenhouse cultivation, offer solutions to global agricultural challenges like drought, water shortages, and low productivity. These technologies increase efficiency, reduce resource usage, and enhance crop output, making them particularly valuable in dryland farming.

Success Stories of Agribusiness Startups

There are numerous success stories of startups that have capitalized on dryland agricultural products:

- A) **B&B Organics:** Based in Tiruchirapalli, this company, started with an initial investment of Rs. 10 lakhs in 2021, reached a turnover of Rs. 4.7 crores by 2024, focusing on organic millet products.
- B) **Millet N Minutes:** A women-led startup from Madurai, this company grew from an investment of Rs. 2 lakhs in 2022 to Rs. 60 lakhs in 2024, offering millet-based value-added products.
- C) **Durmeric Naturaceuticals Private Limited:** This Madurai-based startup, launched in 2021 with Rs. 7 lakhs, reached Rs. 3 crores in revenue by 2024, focusing on medicinal plants from dryland areas.
- D) **EatnGreet Foods Private Limited:** Founded in Virudhunagar in 2022, this company expanded from Rs. 3 lakhs to Rs. 50 lakhs by 2024, offering healthy, millet-based snacks.

There is enormous potential for dryland agricultural products in both domestic and international markets, particularly for value-added products. Enhancing backward linkages is crucial for improving the quality of these products. Maximizing yields in dryland agriculture involves effective water management strategies, soil conservation practices, and adopting smart farming technologies. With integrated approaches and farmer education, significant improvements in crop yields and economic returns can be achieved, contributing to food security and sustainability in water-scarce regions.

ABSTRACTS

**Agronomy for resilient crop production
and
Improving soil and waste management for better crop growth**

Comparative Effect of Organic and Inorganic Applications on Rice (*Oryza sativa*) Cultivation in Vavuniya District over Two Consecutive *Maha* Seasons

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Rice production in the Vavuniya district has increased over the last three decades due to high-yielding varieties, the use of plant nutrients and irrigation. The Sri Lankan government has supported stimulating rice production by introducing new policies on fertilizer subsidies. On May 6, 2021, the government restricted and banned the import of fertilizers and agrochemicals; however, the government lifted the restriction and ban before the onset of the *Maha* season of 2022/2023. This study attempted to evaluate the comparative effect of organic and inorganic applications on rice cultivation in Vavuniya district over two consecutive *Maha* seasons: *Maha* season of 2021/2022 and *Maha* season of 2022/2023. A paired t-test was used to analyze and compare the yield of rice estimated by the crop cut survey conducted in Vavuniya district. Meanwhile, GPS location was recorded, and locations were locked in the GIS system. The results of paired t-test showed that there was a significant ($p < 0.01$) difference between yield under the organic application during *Maha* season of 2021/2022 (Mean yield = 1049.4 kg, SD = 263.2) and the inorganic application during *Maha* season of 2022/2023 (Mean yield = 1429 kg, SD = 298.6). This study also found that the farmers faced 4% loss to produce 1 kg of rice during the *Maha* season of 2021/2022 and the farmers received 4% to 19% profit to produce 1 kg of rice during *Maha* season of 2022/2023.

Keywords: Crop cut survey, *Maha* season, Organic and inorganic fertilizer, Rice cultivation

Physical Properties of Widely Cultivating New Improved and Traditional Rice (*Oryza sativa* L.) Varieties of Sri Lanka

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Physical properties of rice are important for rice varietal identification and one of the important aspects of the rice grain quality. This study evaluated the physical properties (PP) of 24 widely cultivated new improved and traditional rice varieties (RVs) of Sri Lanka. The selected RVs included 13 new improved (Bg 300, Bg 352, Bg 358, Bg 94-1, At 362, Bg 359, At 353, Bg 357, Bg 360, Bg 379-2, Bg 366, Bg 403, and At 307) and 11 traditional RVs (Suwandal, Kuruluthuda, Pachchaperumal, Kahawanu, Kalu Heeneti, Sudu Heeneti, Goda Heeneti, Madathawalu, Dik Wee, Pokkali, and Masuran). As PP, grain length (n=6), width (n=6), size (n=5), shape (n=5), and colour (n=5) were evaluated using internationally accepted standard protocols. The grain length, width and length to width ratio of selected RVs ranged from 3.97±0.04-6.25±0.04 mm, 2.08±0.03-2.87±0.03 mm, and 1.56±0.00-2.82±0.00, respectively. The size of the selected RVs was mostly short (62.5%), while rest were medium (37.5%). The short grain RVs were Bg 352, Bg 358, Bg 359, Bg 360, Bg 379-2, Bg 403, At 307, Suwandal, Kuruluthuda, Pachchaperumal, Kahawanu, Kalu Heeneti, Goda Heeneti, Madathawalu, and Masuran. The shape of the selected RVs was mostly bold (83.3%), while rest were round (16.7%). The round shape RVs were Bg 358, Suwandal, Kuruluthuda, and Kahawanu. The L*, a*, and b* values of whole grain (pericarp) and paddy (husk) ranged from 34.15±0.64-69.63±1.36, 34.15±0.41-69.63±0.35 and 18.25±0.29-23.57±0.24, and 37.59±0.94-59.87±0.80, 4.41±0.15-13.66±0.54 and 14.95±0.76-32.66±0.39, respectively. The pericarp colour was either white (54.2%) or red (45.8%). The white pericarp RVs were Bg 300, Bg 352, Bg 358, Bg 94-1, Bg 359, Bg 357, Bg 360, Bg 379-2, Bg 366, Bg 403, At 307, Suwandal, and Kahawanu. The husk colour ranged from light brown to black. Only Kalu Heeneti had black husk colour, while Masuran, Pokkali, and Suwandal had dark brown husk colour. It can be concluded that the selected RVs of Sri Lanka were mostly short and bold.

Keywords: Physical properties, Pachchaperumal, Traditional rice varieties

The Impact of Seasonal Drought on Tea Cultivation in Low-Country Wet Zone of Sri Lanka

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Drought affects significantly on various crops, including tea (*Camellia sinensis* (L.) Kuntze). Sri Lankan tea cultivation faces frequent challenges of seasonal drought. In the present study, the impact of seasonal drought on tea cultivation in the Deniyaya area, which belongs to the low -country wet zone of Sri Lanka, was evaluated to identify the economic and social impacts of drought on the Sri Lankan tea industry, employing a mixed-methods approach. As quantitative data, soil parameters (pH, electrical conductivity, moisture and phosphate concentration) and climatic parameters (air temperature, rainfall and relative humidity) were used in the study. Qualitative data were obtained through interviews and surveys with tea industry stakeholders. Regression analysis was used to quantify relationships between soil parameters, climate variables, and tea outcomes. Warmer temperatures (27.2 °C - 29.6 °C) during 09/30 -10/03 in 2023 led to a higher tea yield of 149 kg per week in acre. Consistent temperature (27.6 °C) during 10/03 - 10/07 resulted in a stable yield of 125 kg. However, higher temperatures (29.2 °C – 34 °C) led to reduced tea yield critically. In another way, higher soil phosphate levels retained during the period of one month resulted in mitigation of the low crop yield. Soil pH level and conductivity did not show an observable effect on tea yield in this period. Soil moisture directly depends on average rainfall and soil moisture percentage involves tea outcomes. Optimizing environmental conditions and implementing effective agricultural practices are essential for maximizing tea yield in drought periods.

Keywords: Seasonal drought, Phosphate level, Soil, Climatic parameters, Tea cultivation

Effect of Shelterbelts on Production of Good Quality Betel (*Piper betel*) Leaves

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Betel is considered as one of the export agriculture crops with a high economic value. Shelterbelts are used to change the microclimate around cultivated crops, which could influence the physiological processes of crops. The betel farmers are used to having shelterbelts for their cultivation as a tradition, and the porosity of the shelterbelt differs from farmer to farmer based on their preferences. This study was conducted to evaluate the effect of shelterbelts on the growth and yield of betel and to identify the ideal porosity level of the shelterbelts. The porosity of shelterbelts was manipulated by changing the distance between coconut Cadjan, which was established 6" (T2), 12" (T3), and 24" apart (T4) to make shelterbelts. Plots without shelterbelts were the controls (T1). The experiment was laid out in a RCBD with three replicates and was conducted at the Intercropping and Betel Research Station, Narammala, in the year 2023. Results showed that leaf width, leaf length, number of leaves, number of lateral branches and vine height were significantly ($p < 0.05$) higher in all treatments compared to the control. The three shelterbelt treatments were non-significant. The study clearly shows that there was a significant effect of shelterbelts on the growth performance and quality parameters of betel vine. This study suggests betel farmers use any of the tested porosity levels for effective cultivation and further studies are required for the validation of results on different climatic zones of Sri Lanka.

Keywords: Betel, Coconut Cadjans, Porosity level, Shelterbelts

Physicochemical Properties of Selected Wild *Oryza* (Wild Rice) Species in Sri Lanka

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Crop wild relatives are taxonomically related to domesticated crop cultivars that survive in the wild and serve as possible contributors to crop improvement. The genus *Oryza* has 22 wild *Oryza* species with a broad geographic range; out of which, five wild *Oryza* species have been reported in Sri Lanka. Some wild *Oryza* species have been studied for growth and yield attributes in rice crop improvement to ensure food security globally. However, limited studies focused on the physicochemical properties of the wild *Oryza* species, which has a direct relevance to the grain quality. Thus, the objective of the present study was to evaluate the physicochemical properties of selected wild *Oryza* species in Sri Lanka. *Oryza nivara*, *Oryza rufipogon*, *Oryza eichingeri* and *Oryza granulata* were used in the study. Physicochemical properties such as grain length, width, length to width ratio, size, shape, colour and gelatinization temperature were studied using internationally accepted standard protocols. The results showed that physicochemical properties varied significantly ($p < 0.05$) among the studied species. The grain length, width and length to width ratio of selected species ranged from 3.8 ± 0.1 to 6.4 ± 0.0 mm, 1.6 ± 0.0 to 1.9 ± 0.0 mm and 2.2 ± 0.0 to 3.6 ± 0.0 , respectively. The size of the grains ranged from short (*O. eichingeri* and *O. granulata*) to medium (*O. nivara* and *O. rufipogon*), while shape ranged from bold (*O. eichingeri* and *O. granulata*) to slender (*O. nivara* and *O. rufipogon*). The grain colour of the species varied from red to reddish-brown having L^* , a^* and b^* values in the ranges of 38.7 ± 1.3 to 49.1 ± 0.8 , 8.0 ± 0.3 to 13.0 ± 0.4 and 19.9 ± 0.5 to 24.3 ± 0.5 , respectively. All the selected species demonstrated high gelatinization temperature ($74.5 - 80$ °C). In conclusion, the studied wild *Oryza* species had varying desirable physicochemical properties. Thus, the selected wild *Oryza* species could be useful in rice crop improvement to ensure global food security.

Keywords: Crop improvement, Food security, Physicochemical properties, Wild Rice

Combine Effect of Vermicompost, Fish Tonic and *Trichoderma viride* with Inorganic Fertilizer Application on Groundnut (*Arachis hypogaea* L.) Growth and Yield

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This research was conducted at the Regional Agriculture Research and Development Centre in Kilinochchi to evaluate the combine effect of vermicompost, fish tonic and *Trichoderma viride* with inorganic fertilizer (NPK) application on groundnut (*Arachis hypogaea* L.) growth and yield. The field experiment was laid out in RCBD, with 3 replicates and 9 treatments: T1 (control), T2 (vermicompost + fish tonic + *T. viride*), T3 (vermicompost + fish tonic), T4 (vermicompost + *T. viride*), T5 (vermicompost), T6 (NPK + fish tonic + *T. viride*), T7 (NPK + fish tonic), T8 (NPK + *T. viride*), T9 (NPK). The application of fish tonic was carried out at weekly intervals. Growth parameters such as days to 50% flowering, plant height, number of branches and plant width, and yield parameters such as number of total pegs with pods, number of matured pods, one plant yield and plot yield were taken. The data was analyzed using SAS (9.4) package. Results of the growth parameters indicated that the T4 showed better performance with days to 50% flowering, plant height, number of branches and plant width and for yield attributes. The T8 showed the highest number of total pegs with pods (51) and matured pods (44). Furthermore, the T8 resulted in the highest yield per plant (52.33 g) and the highest plot yield (5.01 ton/ha). It could be concluded that the application of vermicompost with *T. viride*, and NPK with *T. viride* have a significant ($p < 0.05$) impact on groundnut growth and yield, respectively.

Keywords: Fish tonic, Groundnut, Growth and yield parameters, NPK fertilizers, *Trichoderma viride*, Vermicompost

Effect of Microbial Ameliorators on Quality Enhancement of Compost

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The application of microbial ameliorators (MA) is a promising method to improve compost quality. Hence, this study was conducted at the Faculty of Agriculture, Rajarata University of Sri Lanka, to investigate the effect of incorporating MA into compost production. A commercially available MA was added to the compost prepared following the standard procedures (SP). Two treatments were tested: T1-compost SP (control) and T2-compost SP + MA with three replicates for each. The experiment was conducted in a Complete Randomized Design and data were analyzed by t-test using R software. The experiment involved measuring various chemical properties, including pH, electrical conductivity (EC), total nitrogen (TN), total phosphorus (TP), total potassium (TK) and organic carbon (OC) over two months at 10-day intervals. The temperature of the compost piles was recorded daily. Moisture content (MC), and C:N ratio were assessed at the end and all measured parameters were compared against Sri Lanka Standards (SLS) for compost. The results revealed that the MA-added compost exhibited higher nutrient levels with TN ($1.69\% \pm 0.18$), TP ($1.11\% \pm 0.06$) and TK ($1.68\% \pm 0.11$) with exceeding SLS for compost (SLS: TN-1%, TP-0.5% and TK-1%). The EC of the MA-added compost was 3.47 dSm^{-1} (SLS: max 4.0 dSm^{-1}) and pH remained within the acceptable range at 7.16 (SLS: 6.5-8.5). The C:N ratio of MA-added compost was 17 (SLS: 10-25) and MC was 46% (SLS: 40-60%). Throughout the compost production, pile temperature fluctuated between 30-37 °C. Overall, MA-enriched compost proved to be a greater plant nutrient source compared to conventional compost, achieving SLS maturity indices and proving its potential as an effective organic fertilizer. However, further research is recommended to validate these findings.

Keywords: Compost, Chemical properties, Microbial ameliorators, Sri Lankan standards

Influence of Date of Sowing and Nutrient Levels Supply on Sunn Hemp Seed Production

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Application of chemical fertilizers results in adverse effects on soil health, which could be replenished by incorporation of organic amendments *viz.*, green manure, green leaf manure, farmyard manure, etc. The unavailability of good agronomic practices is the main problem in cultivating green manure crops. In summer, many agricultural lands are fallowed in the tropical region due to environmental constraints, and these can be effectively utilized for the cultivation of green manure to produce quality seeds. In this regard, a field experiment was conducted in Sunn Hemp during summer with different sowing dates (D_1 - January 4th week, D_2 - February 1st week and D_3 - February 2nd week) and nutrient levels (N_1 - 20:40:20 kg NPK ha⁻¹, N_2 - 25:50:25 kg NPK ha⁻¹, N_3 - 30:60:30 kg NPK ha⁻¹ and N_4 - 12.5 t FYM ha⁻¹). Field investigation results revealed that all growth characters were relatively higher in February second week sown Sunn Hemp with the nutrient application of 30:60:30 kg NPK ha⁻¹. However, yield attributes such as the number of capsules per plant, number of seeds per capsule, seed index, pod weight per plant, pod setting percentage, pod filling percentage, flower shedding percentage, seed yield, stalk yield, and harvest index and economics were significantly ($p < 0.05$) higher in Sunn Hemp sown in the 4th week of January coupled with the nutrient application rate of 30:60:30 kg NPK ha⁻¹. The yield increase of 32.1 percent was associated with Sunn Hemp sown in the 4th week of January over February 1st week. Hence, Sunn Hemp sown in the 4th week of January with the nutrient application of 30:60:30 kg NPK ha⁻¹ could be highly beneficial to the farming community in the western agroclimatic zone of Tamil Nadu.

Keywords: Date of sowing, Green manure, Growth characters, Nutrient level, Sunn Hemp

Enhancing Germination and Seedling Vigor in Black gram through Organic Seed Priming

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Seed priming is an approach for enhancing seed germination and seedling vigor that involves controlled hydration and drying of seeds. This process initiates the early stages of germination without allowing radical emergence, which leads to uniform crop stand and improved yield. The present study was conducted to find out the possibility of utilizing organic seed priming treatment for the improvement of seed germination and seedling vigour in black gram using various bio-formulations. Medium vigour seeds of black gram cv. VBN 11 was primed with various concentrations of bio-formulations such as seaweed (*Turbinaria conoides*) extract, fermented fish extract, "Panchagavya", "Beejamrutha", vermiwash along with hydropriming, and ZnSO₄ at 100 ppm was used as chemical priming agent to compare the efficiency of organic seed priming with conventional priming. The control was prepared without the treatment. Primed seeds were analyzed for physiological and biochemical seed quality parameters. The results of the present study revealed that the black gram seeds primed with 5% fermented fish extract showed significant ($p < 0.05$) improvement in physiological parameters such as germination percentage (96%), speed of germination (21.67), vigour index (3574), dry matter production (292 mg/10 seedlings), and biochemical seed quality parameters such as protein content (22.7%), dehydrogenase activity (2.95), peroxidase activity (0.74 m moles of tetra guaiacol formed/min/g of seeds), catalase activity (1.5 $\mu\text{g H}_2\text{O}_2 \text{ mg}^{-1} \text{ min}^{-1}$) and α -amylase activity (13.14 mg maltose/min) among organic seed priming treatments and on par with conventional chemical seed priming treatment. Thus, 5% fermented fish extract can be used as a potential organic seed priming treatment for the improvement of seed germination and seedling vigour in black gram.

Keywords: Black gram, Fermented fish extract, Physiological parameters, Seed priming, Seedling vigour

Development of Drought Tolerant Chilli (*Capsicum annuum* L.) Hybrids

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Chilli is grown as a rainfed crop in many parts of Tamil Nadu and India. Drought stress causes early flowering in chilli plants and many other phenotypic changes that lead to poor growth and yield. To date, there is no chilli variety or hybrid exclusively developed for drought tolerance in India. Therefore, a study on climate resilient chilli (*Capsicum annuum* L.) hybrid development was carried out in the Department of Vegetable Science, Horticultural College and Research Institute, Tamil Nadu Agricultural University, India. The wild relatives of chilli viz., *Capsicum chinense*, *C. baccatum* var. *pendulum* and *C. eximium* are recognized as drought tolerant species used for the development of inter and intra-specific F1 hybrids with a special emphasis to thrive under high water deficit regimes along with the production of high yielding and better-quality fruits. In view of the above considerations, chilli germplasm consisted of *C. annuum*, and their related species was chosen to develop F1 hybrids, and screening was carried out at the laboratory level using PEG and then under pot culture studies. Hybridization was done among the screened drought tolerant chilli genotypes and wild species. The results showed that the *C. annuum* hybrids viz., IC-119233 x Arka Lohit, IC-045986 x Arka Lohit and IC-119233 x IC-119231 and the inter-specific hybrid IC-119233 x EC-362917 (*C. annuum* x *C. baccatum*) were identified as promising and best-performing hybrids for drought tolerance.

Keywords: Chilli, Climate resilient, F1 hybrids, Drought tolerant

Transformative advances in food technology and nutrition

Effects of Fungal Growth, and Post-harvesting Techniques on Total Phenolic Content, Total Flavonoid Content and Oil content of *Myristica fragrans*

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Myristica fragrans (Nutmeg) is one of the significant exporting spice crops in Sri Lanka. The aim of this study was to examine the impacts of post-harvest methods and fungal growth on the oil, phenol, and flavonoid contents of *M. fragrans*. Seeds (1200) were divided into two groups based on the nature of fruit during harvesting (closed or split-opened) and the nature of fungal growth; with fungi or without fungi. They were again divided into two portions, and one was blanched at 80 °C for 3 minutes. Blanched and unblanched samples were dried using three different drying methods such as cabinet drying, greenhouse solar drying, and open sun drying. Phenolic, flavonoid and oil contents were determined using the Folin-Ciocaltue, the aluminium chloride colorimetric, and the hydrodistillation methods, respectively. This study revealed that nature of fruit during harvesting, blanching, drying methods, and fungal growth had a statistically significant ($p < 0.05$) impact on the oil content and phytochemicals in *M. fragrans*. The oil content varied from 2% to 12%, with greenhouse solar-dried and closed nutmeg fruits exhibiting significantly ($p < 0.05$) higher oil content. The cabinet-dried samples showed significantly ($p < 0.05$) lower oil content. Total flavonoid content ranged from 21 to 117 mg of quercetin equivalents per gram of dried kernel, while total phenolic content ranged from 20 to 135 mg of gallic acid equivalents per gram of dried kernel across the different treatment groups. The greenhouse solar-dried samples and open sun-dried samples resulted in higher total phenolic and flavonoid contents, respectively. Importantly, the blanching treatment significantly ($p < 0.05$) decreased the total phenolic content, while fungal growth significantly ($p < 0.05$) reduced phytochemicals. Therefore, it is essential to note that making it free from fungal infections and applying good post-harvest practices are critical for preserving the quality of nutmeg.

Keywords: *Myristica fragrans*, Oil content, Phytochemicals, Post-harvest methods

Fatty Acid Profiles of Selected Peanut (*Arachis hypogaea*) Lines in Sri Lanka

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Peanut is one of the most important oil seed crops cultivated in the world. It is used in variety of food products, especially in the production of peanut oil. Thus, identification of healthy fatty acid profile (FAP) containing varieties is important for human nutrition and health. The total FAP of some peanut varieties are reported globally. However, extremely limited studies have been conducted on FAPs of peanut varieties/lines in Sri Lanka. Therefore, objective of this study was to evaluate the saturated, monounsaturated and polyunsaturated FAPs of selected peanut lines (to be released as varieties) in Sri Lanka. Peanut lines, namely *ICGV 3089*, *ICGV 04195*, *ICGV 4118*, *ICGV 3098*, *ICGV 00068*, *ICGV 06214*, *ICGV 87187*, *ICGV 00073*, *ICGV 06233*, *ICGV 05198*, *ICGV 3090* and *Red Spanish* were used in this study. Fat was extracted from peanut flour, derivatized to methyl esters and analyzed by gas chromatography. Results showed that saturated, monounsaturated and polyunsaturated fatty acids (FAs) of selected peanut lines were in the range of 18.94±0.00 to 23.42±0.01%, 40.98±0.00 to 56.98±0.01% and 24.08±0.01 to 8.38±0.02%, respectively by total FAs content. The saturated FAs in selected peanut lines were Palmitic (C16:0), Heptadecanoic (C17:0), Stearic (C18:0), Arachidic (C20:0), Behenic (C22:0) and Lignoceric (C24:0) acids. The monounsaturated FAs found were Palmitoleic (C16:1), Oleic (C18:1), Vaccenic (C18:1) and Eicosenic (C20:1) acids, while polyunsaturated FAs were Linoleic (C18:2) and Linolenic (C18:3) acids. Interestingly, among these FAs, Palmitic, Oleic and Linoleic acids were the major FAs found in all the studied peanut lines. These three FAs contributed to 88.73±0.02 to 91.18±0.10% by the total FAs contents. It is concluded that the best lines in terms of total FAP (highest unsaturated FAs) were *ICGV 04195* and *ICGV 00073*. Thus, these two peanut lines can be recommended as the best lines in terms of healthy FAP for varietal release.

Keywords: Monounsaturated fatty acids, Polyunsaturated fatty acids, Saturated fatty acids, Sri Lankan peanut lines

Comparison of Different Starch Properties of Five Different Yam Varieties and Their Binding and Textural Characteristics in Chicken Sausage

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Starch is a major ingredient used in food the industry as binder, colloidal stabilizer, coating material, thickening agent, gelling agent, etc. Starch can be extracted from cereals, legumes, kernels, root and tubers. Yam is under the root and tuber that contain high content of starch but limitedly use for starch extraction, however, commonly consume after boiling or cooking as an energy supplier. The present study aimed to evaluate the properties of starch extracted from five different yam varieties, namely Nattala, Maha Hingurala, Agili ala, Jamburala (*Dioscorea alata*) and Raul Kukulala (*Dioscorea esculanta*). These varieties were collected from the same place, Rambukkana. Further, this study analyzed their binding properties and potential to improve the texture of chicken sausage as a replacement for cassava (*Manihot esculenta*) starch. Cassava exhibited the highest starch yield (33.21% (w/v)), while Jamburala yielded the lowest (7.62% (w/v)). Starch extracted from selected yams showed various results for swelling power range from 14.30±0.20 to 7.03±0.23, solubility index ranges from 1.87±0.01 to 0.98±0.01, and viscosity ranges from 14.62±0.02 to 8.56±0.01 mPas. Sausages made with yam starches were analyzed for hardness, chewiness, cohesiveness, and gumminess. Jamburala starch sausages closely resembled cassava starch sausages in these properties. Further, Agili ala starch incorporated sausage showed a soft texture and the cohesiveness is not significantly difference ($p>0.05$) to the Jamburala starch, while other starches showed significant differences ($p<0.05$). These findings have been confirmed by the sensory evaluation as all types of yam starches can be used as a binder of manufacturing of chicken sausage. Overall, results revealed that starch extracted from Jamburala yam can be used for manufacturing chicken sausage with the similar properties of cassava starch.

Keywords: Binding property, Chicken sausage, Starch, Texture parameters, Yams

Development and Evaluation of the Black clam (*Villorita cyprinoides*) Incorporated Uncooked Palmyrah Tuber Flour-based Instant Soup Mix Powder

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Palmyrah tuber soup is a popular and traditional dish among the Northern Sri Lankan population. Palmyrah tuber flour is rich in fiber, which can increase body strength and reduce hunger. Black clam (*Villorita cyprinoides*) is a good source of protein, vitamins, and minerals, and also contains high levels of antioxidants. Therefore, this study focused on developing an instant soup mix incorporating uncooked palmyrah tuber flour (UPTF) and black clam. The physicochemical, nutritional, and sensory parameters of the soup mix were evaluated. Before preparing the soup mix, the Palmyrah tuber flour was debittered. Additionally, fresh black clam meat was boiled at 95 °C for 15 minutes to reduce microbial contamination. Three different ratios of black clam powder to UPTF (5:45, 10:40, 15:35) were tested. Based on sensory evaluation by 30 untrained panelists using a 7-point Hedonic scale, the formulation with a 10:40 ratio of black clam powder: UPTF was selected as the best formulation. The proximate composition of the selected soup mix revealed the following: moisture (3.62±0.025%), protein (7.57±0.03%), ash (1.88±0.07%), fat (7.87±0.07%), fiber (10.1±0.25%), and carbohydrate (66.86 ± 0.16%). In the overall formulation, bulk density, moisture content, and pH increased with the addition of black clam meat, whereas water absorption, solubility, swelling power, and viscosity increased with the inclusion of UPTF.

Keywords: Black clam, Debittering, Sensory evaluation, Uncooked palmyrah tuber flour

A Developing Mushroom-based Stock Cubes as a Safe Alternative to Replace MSG in Food Flavouring

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Artificial food flavouring agents such as mono sodium glutamate (MSG) containing stock cubes are commonly consumed worldwide; however, this may lead to non-communicable diseases that threaten human health. A natural substitute for stock cubes has not yet been identified, presenting a great potential to produce a natural food-flavouring cube from oyster mushrooms. This study aimed to introduce a food-flavoured spice cube from oyster mushrooms. Spiced cubes were developed with four formulations, T1: 25% Corn flour (CF)+75% Stock cube mixture (SCM); T2: 30% CF+70% SCM, T3; 35% CF+65% SCM, T4; 40% CF+60% SCM, and commercial stock cube was the control (C). 350 g of prepared chicken extract, 20 g of oyster mushroom powder, 110 g of corn flour (binding agent), and 4 g of prepared spices mixture were used for the solid stock cube mixture. Arranged in a completely randomized design (CRD) and analysed using the Friedman test using SAS statistical package. According to the seven-point hedonic scale for sensory evaluation, C and T4 showed the highest organoleptic properties. Therefore, T4 was used for further analysis: proximate analysis; T4 showed significantly higher ($p < 0.05$) carbohydrate content ($44.36 \pm 0.70\%$) and energy (333 Kcal/100 g) compared to the C ($14.20 \pm 0.45\%$ and 268.6 Kcal/100 g, respectively), significantly lower crude protein content ($8.46 \pm 0.20\%$) compared to C ($9.50 \pm 0.26\%$), lower ash (6.40 ± 0.26) and fat contents (6.36 ± 0.25) compared to C ($45.40 \pm 0.45\%$ and $26.46 \pm 0.20\%$, respectively). The total antioxidant capacity (TAC) tested using ferric ion reducing antioxidant power (FRAP) assay, C (0.57 mg TE/g DW) was significantly ($p < 0.05$) higher than T4 (0.44 mg TE/g DW). These results proved the potential of oyster mushroom spiced cubes to promote as a healthier alternative to commercial stock cubes because they contain natural spice flavour and are free from MSG.

Keywords: Healthy food, Monosodium glutamate, Oyster mushroom, Stock cube, Spice

Formulation of Tamarind (*Tamarindus indica* L.) Pulp-based Mix Spice Cube

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Tamarind (*Tamarindus indica* L.) is an abundantly found underutilized fruit tree in the Dry Zone, Sri Lanka. However, most of the fruits go to waste due to a lack of technologies for processing and storage. This study was conducted to reduce postharvest losses of tamarind fruits and production of value-added ready-to-use mix spice cubes for culinary purposes. Fat, crude fiber, ash and moisture content, pH, total soluble solids (TSS), colour, and total phenolic content (TPC) were determined. Sensory evaluation was done using the five-point hedonic scale with tested attributes of appearance, colour, aroma, texture, taste, mouth feel, dissolvability, spiciness, and overall acceptability. Three cubes and spice mixture were prepared according to the weight proportions, namely T1 (tamarind pulp 25: salt 1: spice mixture 2), T2 (tamarind pulp 25: salt 1: spice mixture 3), and T3 (tamarind pulp 25: salt 1: spice mixture 5). The spice mixture was prepared by mixing coriander 40: black pepper 10: cumin 10: red chili 6: garlic 3. The microbiological stability (total plate count) of the final product, which was packed (PP pouches (55 µg)) and stored under ambient conditions (32 ± 2 oC/ RH 65-75%) was also determined. The T3 sample cubes had significantly ($p < 0.05$) higher moisture content (16.11±1.71%), crude fiber (5.65±0.62%), pH (3.12±0.36), fat content (2.65±0.47%) and colour variation (31.60±0.93). However, ash content (9.82 ± 0.96%) was significantly ($p < 0.05$) higher in the T1 cubes, whereas TPC (0.39±0.15 mg GAE/g) was higher in the T2 sample and TSS (3.37±0.21) was lower in T2 sample. According to the results, it can be concluded that the T3 cubes significantly ($p < 0.05$) differ from the T1 and T2 cubes in terms of moisture content, crude fiber, pH, fat content, colour variation and sensory attributes. As well, T3 cubes have a greater shelf life for the tested period of four months than other samples under evaluated conditions. Further studies should be conducted to determine the texture development of cubes.

Keywords: Postharvest loss, Nutitive quality, Shelf life, Spice mixture, Tamarind

Agricultural economics, extension and agribusiness management in optimizing the production

Analysis of the Willingness to Pay for Organic Fruits and Vegetables in the Matara and Galle Districts in Southern Province, Sri Lanka

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Growing fruits and vegetables organically can be introduced as an eco-friendly farming type. Promoting the consumption of organic fruits and vegetables is very useful to improve healthy lifestyles among Sri Lankan citizens. Producing high-quality fruits and vegetables by using nature-friendly farming practices without harming the environment is the main concept of organic farms. There are numerous factors that affect the consumer's willingness to pay for organic fruits and vegetables. Recently, Sri Lankans have been eager to buy organic fruits and vegetables due to their health concerns. The present study is conducted to analyze the preference patterns and the willingness to pay for organic fruits and vegetables in the Matara and Galle districts of the Southern province of Sri Lanka. A sample of forty five organic fruits and vegetables consumers in the Galle and Matara districts was selected for the study due to limited resources. A structured questionnaire was used to collect data from consumers of organic fruits and vegetables. The SPSS software package was used to analyze the data. Descriptive statistical methods and Chi-Square test were used to analyze the data. According to the analysis of the study, the highest percentage, 88.9% of the respondents, are willing to pay higher prices for organic fruits and vegetables. Furthermore, most respondents (97.7%) prefer to buy organic fruits and vegetables from a separate organic marketplace. According to the study, most of them prefer organic fruits and vegetables with the intention of achieving a healthy and long life. Due to the data limitation of this research, it can be suggested to the Sri Lankan government to give more attention to conducting more research on the organic fruit and vegetable market island-wide in the future.

Keywords: Organic fruits, Organic vegetables, Preference, Willingness to pay

High-value Market Channels and Their Implications for the Actors of Pineapple Value Chain in Sri Lanka

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Access to high-value markets is one of the major challenges faced by the smallholder producers in developing countries. The study applies value chain analysis to the pineapple sub-sector in Sri Lanka to identify ways of improving the access of smallholder farmers to the global fresh pineapple market since it has a fast-growing export demand. The value chain analysis was carried out to identify its nature, actors, and sources of inefficiency along the value chain. The study employed a qualitative research design, and structured and unstructured interviews were held, respectively, with 30 farmers and 5 exporters. Study shows that pineapple production is dominated by smallholder farmers with limited access to information (export price, quality, and standard), healthy and quality planting materials, inputs such as fertilizer, credit and technology (best practices), and a short supply of lands with unique soil properties favorable to cultivate pineapple. Low productivity, high cost of production, and quality reduction of pineapple (reduction in fruit size) in subsequent harvests after the first crop drained farmers' competitiveness. Irregularity of payments and time taken to settle dues by collectors on the other hand deteriorated farmers' trust. On the other hand, the competitiveness of the exporters on the other hand was undermined by the upsurge of export tax and lack of a reliable supply of quality consistent fruits in adequate quantities. Policy interventions are required to develop market institutions for smallholders, such as producer societies, cooperatives, contract farming, or out-grower schemes. Moreover, revitalizing the extension service to transfer the specific knowledge required to produce export-quality pineapples, organizing credit schemes to provide operational capital to both farmers and collectors and conducting research on development of planting materials and varieties would improve the efficiency along the chain.

Keywords: Export market, Pineapple, Smallholder farmer, Sri Lanka, Value chain

Use of Information and Communication Technology by Rubber Extension Personnel in Monaragala District

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This study focused on understanding the present status of use of the Information and Communication Technology (ICT) among extension personnel serving rubber smallholders in Monaragala. The questionnaire survey was conducted in 2022 with a study sample of 47 rubber extension personnel. The perception of extension personnel on perceived usefulness and perceived ease-of-use of ICT was measured using a Likert scale technique. The weighted values on the Likert scale were used to derive the mean score of each indicator. Availability of internet connectivity was reported by 78%, while 11% used email accounts and 67% had access to VCD/DVD. All the respondents used mobile phones for about 3-4 days per week to get information on Rubber Farming (RF). Extension personnel had not used the internet (55%), email (55%), and VCD/DVD (65%) to get information of RF. Most extension personnel have perceived the usefulness and ease-of-use of mobile phones at a satisfactory level, whereas fixed telephones, internet, email and VCD/DVD are not at a satisfactory level to get information on RF. There was a significant correlation in the usage of mobile phones, the internet, and VCD/DVDs with the perceived usefulness and ease-of-use to get information on RF. Sixty-five percent of the extension personnel have not participated in any kind of in-service training in ICT in their career. There was a significant correlation between the use of mobile phones, internet, email, and VCD/DVD facilities to obtain information on RF and in-service training on ICT. Implementing an in-service training in ICT on a regular basis is a key factor in enhancing the usage of ICT among extension personnel to improve the extension service in the smallholder rubber sector in Monaragala.

Keywords: Communication, Extension service, ICT, and Rubber smallholders

Behavioural Factors Influencing the Adoption of Manuring in Immature Rubber (*Hevea brasiliensis*) Cultivations of Smallholder Rubber Farmers in Monaragala District

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This study was carried out to examine behavioural factors that influence smallholders in the adoption of manuring in immature rubber (*Hevea brasiliensis*) cultivations (MIRC) introduced to Monaragala by the Rubber Research Institute of Sri Lanka. The data were collected employing a self-administered survey from 798 rubber smallholders in Monaragala in 2023 using stratified random sampling. The conceptual model was developed based on the decomposed theory of planned behaviour. The responses of rubber smallholders for validated items were captured on a five-point Likert scale. The conceptualized model was empirically tested using partial least square structural equation modelling by a bootstrapping procedure using the SMART-PLS 3.2 software. The composite nine-predictor conceptual framework and structural model were validly and reliably capable of explaining 78% of the variance in the adoption by rubber smallholders. This study identified seven behavioural factors; attitude, perceived usefulness, perceived ease of use, behavioural intention, facilitation condition, subjective norms, and perceived behavioural condition that act as drivers for the adoption of MIRC. The most significant influential factor is the facilitation condition and policymakers should pay more attention to improving it, which could be helped by improvement in the advisory services. In order to enhance the adoption of MIRC, a favourable environment contributing to these psychological factors should be improved among the rubber smallholders in Monaragala.

Keywords: Advisory service, Decomposed theory of planned behaviour, Manure adoption, Rubber farmers

Innovative strategies in plant protection and crop improvement

Screening for Potential Anti-Viral Compounds in Wild Papaya Genotypes for Eliminating Papaya Ring Spot Virus (PRSV) in Cultivated Papaya (*Carica papaya* L.)

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The study aimed to analyse the secondary metabolites in wild papaya genotypes for Papaya Ring Spot Virus (PRSV) resistance. In this study, two cultivated papaya varieties viz., CO.7, TNAU papaya CO.8 and two wild genotypes viz., *Vasconcellea cauliflora* and *Vasconcellea candamarcensis* with seven different solvents including polar (aqueous, ethanol, methanol, acetone and ethyl acetate) and non-polar (hexane and chloroform) were used for phytochemical analysis. The qualitative analysis for alkaloid, phenol, saponin, tannin, flavonoids, steroids, glycosides, and terpenoids and quantitative analysis for total phenol, tannin, alkaloid, and flavonoids were determined along with the characterization of secondary metabolites using Gas Chromatography and Mass Spectrometry (GC-MS). The results indicated that wild genera (*V. cauliflora* and *V. candamarcensis*) possessed extraneous phytoconstituents which were absent in cultivated papaya varieties (CO.7 and TNAU papaya CO.8). Among all the phytoconstituents examined in the study, it was concluded that three compounds viz., Dodecanoic acid, Squalene, and 9,12-Octadecadienoic acid were reported to possess antiviral activity against plant viruses.

Keywords: Anti-viral activity, Bioactive compounds, Papaya ring spot virus

Synthesis and Characterization of Oil-in-Water Nanoemulsion using High Energy Methods Encapsulating Phytomolecule for Combating Papaya Ring Spot Virus

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Bioactive compounds play a pivotal role in orchestrating the defense mechanisms of plants, one such potent bioactive compound is dodecanoic acid, which is found to be present in wild papaya genotypes like *Vasconcellea candamarcensis* and *Vasconcellea Cauliflora*, but conspicuously absent in cultivated varieties of papaya. This compound demonstrates promising antiviral activity against Papaya Ring Spot Virus (PRSV). This study concentrated on synthesis of nanoemulsion of this bioactive compound which is known for its inherent hydrophobic properties, necessitating conversion into a hydrophilic form through advanced techniques such as High Energy Homogenization and Ultra-Sonication. The resulting nanoemulsion exhibited remarkable characteristics, with a z-average diameter of 52.30 nm, showcasing a distinct spherical droplet structure, as corroborated by TEM imaging. In assessing its efficacy, plant bioassays with eight treatments each replicated thrice, were conducted under controlled glasshouse conditions using mechanical inoculation methods with 45 days old seedlings of TNAU papaya CO.8 variety. Strikingly, pre-inoculation and co-inoculation with the nanoemulsion prevented any manifestation of PRSV infection symptoms in papaya seedlings and also has positive effects on plant growth. However, in the post-inoculation, seedlings treated with the dodecanoic acid nanoformulation displayed symptoms of PRSV infection. Further rigorous investigations are underway to pinpoint the optimal concentration of the nanoformulation for effectively combatting PRSV infection across various growth stages. Additionally, comprehensive analysis of its molecular properties is being pursued to unravel the mechanisms underlying its antiviral activity.

Keywords: Papaya ring spot virus, Phytomolecules, Dodecanoic acid, Nanoformulation

Optimization of DNA Extraction Protocol for *Mormodica charantia*

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Bitter gourd is a monoecious crop that belongs to the Cucurbitaceae family. It has significant agricultural and medicinal value. High levels of bioactive substances such as phenolic compounds and polysaccharides, along with other contaminants, restrict obtaining high-quality and higher-quantity DNA from these plants. To minimize contaminants and to ensure the integrity of extracted DNA, extraction protocols must be modified. The aim of this study is to optimize the DNA extraction protocol for *Mormodica charantia* by using variations of the CTAB method. This protocol mainly depends on the buffer that is used to lyse cells and separate DNA from other cellular compounds with phenol, chloroform, and isoamyl alcohol. Three variations of the protocol were followed. Tender leaves were used for DNA extraction. UV spectrophotometry was used in the following wavelengths, A230, A260, A280, and A320, to evaluate the quantity and quality of the isolated DNA obtained through each protocol, and the results were compared. The results from UV spectrophotometry were further validated by agarose gel electrophoresis. The first protocol was the standard CTAB extraction method, which yielded 0.884 ± 0.245 ($\mu\text{g}/150\text{mg}$) DNA with a concentration of 17.68 ± 4.89 ($\text{ng}/\mu\text{l}$). The second protocol was the modified CTAB with cold treatment. Leaves were ground in a cold motor and pestle, which was surrounded by ice cubes, that yielded 0.3 ± 0.079 ($\mu\text{g}/150\text{mg}$) DNA with a concentration of 5.994 ± 1.582 ($\text{ng}/\mu\text{l}$). The third protocol was modified CTAB with cold treatment and RNase treatment; this method yielded 0.461 ± 0.265 ($\mu\text{g}/150\text{mg}$) DNA with a concentration of 13.23 ± 6.92 ($\text{ng}/\mu\text{l}$). The optimized protocol 3 was found to be more suitable and comparatively gave high yields of pure DNA with minimal RNA contamination in the presence of the RNase enzyme, as ensured by Agarose gel electrophoresis. Furthermore, the DNA templates generated using the modified method could facilitate genetic studies, marker-assisted breeding, and molecular breeding efforts in bitter gourd to enhance desirable traits in the future. This protocol can be further refined and applied to other plants that have similar biochemical properties.

Keywords: DNA extraction, *Momordica charantia*, Spectrophotometer, Gel Electrophoresis, CTAB

The Giant Praying Mantis in the Human Settlement of the Ariviyal Nagar, Northern Province, Sri Lanka

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The giant praying mantis is a general term used to describe several species of large praying mantises found in different parts of the world. Giant praying mantises are fascinating creatures that belong to the order Mantodea, which contains over 2,400 species worldwide. This case study is based on the behavior and adaptation of the giant praying mantis in the human settlement of the Iranamadu, Northern province, Sri Lanka, conducted from June 2023 to March 2024. The selected study area was observed through visual encounters and the opportunistic observations and the photographs captured using a Redmi Note 11E mobile phone. The chosen human settlement was observed at random intervals on random days during the study period. There were 12 individuals recorded in the study period categorized as two species; *Hierodula unimaculata* (Olivier, 1792) and *Mantis religiosa* (Linnaeus, 1758). All of those individuals were recorded from 17.30 h to 04.00 h. During this study, light bulbs were used to trap the insects to prey on them. They were not attracted to light bulbs and only feed on the species belong to the order Coleoptera. There were no individuals found in the months of December and January with the end of the north-east monsoon. Furthermore, the modified ambush behavior was commonly observed during the study period, where predators would choose a fixed location and wait for a few minutes to several hours to fulfill their feeding requirements. They frequently polished their pair of antennae and the pair of grasping legs before and after each meal.

Keywords: Giant praying mantis, Behaviour, Human settlement, Northern province

Advancing Biofortified Sweet Corn: Evaluating High Beta Carotene Parental Inbreds for Hybrid Development

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Addressing global malnutrition through the biofortification of staple crops is essential for improving public health and nutritional security. Sweet corn (*Zea mays*), a widely consumed vegetable, offers a unique opportunity to enhance dietary intake of essential nutrients, particularly beta carotene, a precursor to vitamin A. This study focuses on evaluating sweet corn inbreds with elevated beta carotene content to identify optimal parental lines for developing superior hybrids. The sweet corn lines developed in Tamil Nadu Agricultural University were utilized. Four sweet corn inbred lines, DBT 15, DBT 18, DBT 23, and DBT 25, were selected for their high beta carotene and sugar content during Summer 2024. The total sugar content and beta carotene levels were quantified in the 24th day after flowering, using the anthrone method and High-Performance Liquid Chromatography (HPLC), respectively. Additionally, marker analysis was performed to confirm the presence of the *crtRB1* gene, which is crucial for beta carotene biosynthesis. The evaluations revealed the following results for total sugar content (%): DBT 15 with 15.26%, DBT 18 with 14.19%, DBT 23 with 14.9%, and DBT 25 with 15.2%. The beta carotene concentrations ($\mu\text{g/g}$) were: DBT 15 with 8.369, DBT 18 with 8.381, DBT 23 with 8.389, and DBT 25 with 7.894. Among these lines, DBT 15 and DBT 25 exhibited the highest sugar content, while DBT 18 and DBT 23 had the highest beta carotene levels. This research highlights the potential of these inbred lines as valuable parents for breeding nutritionally enhanced sweet corn hybrids. By identifying and utilizing superior parental lines, future hybrids can be developed to combine high beta carotene and sugar content, addressing both nutritional deficiencies and consumer preferences. Our findings contribute to the broader effort of food biofortification, promoting better health through enriched diets.

Keywords: Biofortification, Sweet Corn, Beta Carotene, *crtRB1* Gene, Parental Inbreds

Agriculture modernization, mechanization and water management strategies for increased food reserve

Soil Incorporation of a Superabsorbent Polymer with or without Organic Matter Improves Drought Tolerance Properties of Rice Varieties (*Oryza sativa* L.)

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Superabsorbent polymer (SAP) application can be used as a sustainable soil amendment method for relieving drought impacts on crops. Combining SAPs and organic matter (compost; COM) may boost soil available water, thereby dehydration tolerance (DT) capacity of rice. Therefore, this study was conducted under microcosmos conditions in two experiments to: (E1) explore the effects of SAPs on DT strategies of Bg 314 (a designated DT rice variety) and Bg 352 (a general cultivar) and (E2) examine the cumulative impact of both SAP (50 kg_{ha}⁻¹) and COM (COM: Soil=1.5:2.5) on the drought adaptations of Bg 314. In both experiments, similar drought cycles were imposed (i.e.70-40% field capacity; FC) while control plants were kept above FC. Continuous growth measurements and two sets of morpho-physiological measurements including photosynthetic gas exchange (GE), chlorophyll fluorescence (CF), electrolyte leakage (EL), relative water content (RWC) and, chlorophyll content (Chl), were taken between maximum tillering and panicle initiation (M1) and, between grain filling and maturity (M2). Yield, thousand-grain weight (TGW), plant dry weight (PDW), water-use efficiency (WUE), soil moisture content (SMC), and root dry weight at two depths (RDWt; 0-40 cm, RDWd; 40-75 cm) were recorded at harvest. In both experiments, the SAP effect was significant ($p<0.05$). However, the SAP effect was not significant for CF, Chl, PDW, growth, and yield or TGW in both experiments ($p>0.05$). The current results demonstrate that SAP stimulates rice DT and combining SAP with organic matter improves DT, WUE, and GE in rice under drought conditions.

Keywords: Dehydration tolerance, Drought, Organic matter, Superabsorbent polymer, Water use efficiency

Comparison of Air-conditioned and Roadside-ventilated Sales of Banana (*Musa Sp.*) and Mangoes (*Mangifera indica*) in terms of Qualitative and Quantitative Postharvest Losses in Anuradhapura

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Fruits have huge postharvest losses at different stages of the traditional supply chain due to their perishable nature. The retailer is directly linked to the consumer and plays an important role in the fruit supply chain. This study was conducted to identify variations in qualitative and quantitative losses of selected fruits at different retail sites located in Anuradhapura. Two fruit spp. including bananas (*Musa sp.*) var. seeni and mangoes (*Mangifera indica*) var. Tom EJC were purchased from roadside retailers (T1) and air-conditioned outlets (T2) located from Thalawa to Thambuththegama. Readings of total soluble solids (TSS), physiological weight loss percentage (PWL%), firmness, pH, and color differences were taken daily while purchasing 4 kg from each fruit sample initially and keeping them in the same locations. A comparison between the two treatments was carried out according to an independent sample t-test and the data were analyzed using SPSS. Each treatment contained six replicates, and each replicate consisted of three fruit samples. The mean temperature and RH of T1 and T2 during the study period were 32±2 °C, 62±5% and 25±1 °C, 65±2%, respectively. The results showed that PWL% increased with time in both fruits, and the weight-decreasing rate was significantly higher in T1 than in T2 throughout the storage period. The firmness of both fruits decreased as the storage period progressed, irrespective of the type of retailer site. There was a significant difference in the TSS content of bananas over the past three days, while the TSS content of mangoes in both treatments increased during storage. In conclusion, the postharvest loss of bananas and mangoes in T1 and T2 were 21.7%, 9.4%, 15.7% and 9.8%, respectively. Comparatively, T2 fruit samples had good quality characteristics and could be kept longer periods (banana: 4 days and mango: 7 days). Air-conditioned retailer outlets are comparatively more efficient than roadside retail shops in terms of low postharvest losses.

Keywords: Fruits, Postharvest loss, Roadside retailers, Storage period

Determination of the Relationship Between Peelability and Water Relations of Cinnamon (*Cinnamomum zeylanicum*)

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Cinnamon (*Cinnamomum zeylanicum*) is one of the highest-earning spice crops exported from Sri Lanka. Peeling cinnamon bark is a highly skilled technique that has been handed down from generation to generation. The peelability of cinnamon bark is known to change with the weather, maturity of the stem, and variety; however, the physiological reasons behind the peelability have not been identified yet. Therefore, the present study was conducted to determine the relationship between peelability and water relations of cinnamon. Cinnamon sticks and leaves were sampled from 30cm above the bottom of the plant. A total of 50 peelable and 50 non-peelable samples were collected from 3-year-old plants in Kamburupitiya, Sri Lanka in 2023. The peelability of cinnamon sticks was measured by a texture analyzer, which estimated the force required to remove the bark. Leaf water potential and hydraulic conductivity were measured by pressure chamber and flow-through method. Soil moisture content and moisture content of leaves were measured using the gravimetric method and oven drying method. The statistical analysis was conducted using a t-test and interpreted by R. There were significant differences between the treatments in the de-barking force, hydraulic conductivity, and leaf water potential values ($p < 0.05$). Hydraulic conductivity exhibited a significant, strong negative correlation with de-barking force ($p < 0.05$). There were no significant correlations between the leaf water potential, soil moisture content, leaf moisture content, and stem moisture content with the de-barking force ($p < 0.05$). It can be concluded that the peelability is strongly associated with the hydraulic conductivity of the stem. The factors influencing the hydraulic conductivity in cinnamon stems need to be studied further.

Keywords: Cinnamon, Hydraulic conductivity, Peelability, Soil moisture

Soil and Water Conservation Strategies for the Tank Cascade Systems in the Dry Zone of Sri Lanka

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Tank cascade systems (TCSs) in the dry zone have played a vital role in water resources and agricultural sustainability for centuries in Sri Lanka. However, in recent times, soil erosion and sedimentation have posed a significant threat to this system due to inappropriate land use practices. This study focuses on the Yakandagaswewa sub-watershed within the Palugaswewa TCS in the Anuradhapura District, aiming to identify the primary contributors to soil erosion and propose conservation measures. The Revised Universal Soil Loss Equation (RUSLE) model, integrated with ArcGIS 10.8, was utilized to assess soil erosion patterns. The sediment delivery ratio was estimated using an accepted method proposed in the literature. A detailed slope map was generated to facilitate the development of conservation plans. Yakandagaswewa has a watershed area of 1.73 km², where factors like rainfall, slope, and soil type exhibit minimal variation, while vegetation emerges as the primary determinant of soil erosion. The watershed exhibited a potential annual sediment yield of 6203.5 t/ha. *Chena* (a seasonal highland crop cultivation area) contributes 50% to the total soil loss, while homesteads account for 20%. Other land use types, including forest, scrub, and paddy, also play a role in soil erosion dynamics, but to a lesser extent. Soil cover and land management, such as cover cropping and contour bunding, can be introduced to reduce soil erosion in these areas. A comprehensive sediment control plan must be implemented across the entire watershed area. This includes establishing a surface water drainage system with grassed waterways, installing sediment traps in all streams carrying runoff to the tanks just before they enter, regularly removing accumulated sediments, and maintaining a grass filter and tree belt around the tanks to directly trap any sediments flowing towards them.

Keywords: Conservation measures, RUSLE, Soil erosion and Sedimentation, Tank cascade systems

Livestock, aquaculture and fisheries for nutritious food production

Proximate Composition and Sensory Characteristics of Bee Products Incorporated Bio yogurt

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Consumption of probiotic yogurt offers several health benefits, including aiding digestion, strengthening the immune system, and improving bone health. Bee products, such as bee honey, royal jelly, and bee pollen, are recognized for their nutritional richness and functional properties. The current study evaluated the proximate composition and sensory attributes of bee products incorporating Bio yogurt. This involves replacing synthetic preservatives with natural alternatives to counteract food deterioration. Yogurts were prepared with the addition of 2% probiotic culture (ABT-5) and refrigerated at 4°C. The experiment was conducted with four treatments, including a control without any bee products (T1) and enriched variants with 0.6% royal jelly (T2), 5% bee honey (T3), and 0.5% bee pollen (T4). Proximate composition analysis, such as protein, ash, carbohydrates, fat, and moisture content, was determined following the AOAC guidelines and standard methods. The sensory assessment was conducted based on a 9-point hedonic scale. The highest protein content (4.83%) and ash content (1.04%) were observed in T4, while the highest carbohydrate content (21.33%) was found in T3. The highest fat content (3.91%) and moisture content (76.72%) were recorded in T1. Statistically significant variations were observed in proximate compositions among treatments, and the majority of the above parameters are aligned with the standard range established by SLS. The sensory characteristics of yogurts, such as aroma, taste, and overall acceptability, were significantly different ($p < 0.05$) among the four treatments. No significant difference ($p > 0.05$) was observed either in color or texture. The addition of 0.5% bee pollen in yogurt significantly shows the highest value for all sensory attributes. The study highlights the benefits of incorporating bee products to improve quality, suitability for consumption, and sensory attributes. Future work is recommended to analyze the composition and functional properties of bee products and explore their impact at varying concentrations on yogurt formulation.

Keywords: Bee products, Bio yogurt, Proximate composition, Sensory attributes

Antibacterial Effect of Probiotic Bacterial Strains Isolated from Locally Fermented and Commercial Products

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Probiotic bacteria boost health by fighting pathogens and regulating immunity. Many strains are derived from various sources like fermented foods and dietary supplements. To combat antimicrobial resistance in disease prevention, probiotic-based approaches are vital. This study aimed to investigate the antagonistic effect of locally and commercially available probiotic bacteria against bovine pathogens. Fermented coconut water and rice water prepared in the laboratory, curd, and five probiotic products from the market were cultured on De Man Rogosa Sharpe (MRS) agar to obtain lactic acid bacteria (LAB). The resulting colonies were morphologically examined, Gram stained and evaluated for inhibition of bovine mastitis pathogens including *Escherichia coli* ($n = 3$) *Staphylococci spp* ($n = 2$), and two reference cultures of *E. coli* and *S. aureus*, using modified disk diffusion method. All obtained colonies were Gram-positive yielding both Gram-positive cocci and bacilli. Bacilli were isolated from rice water whereas both bacilli and cocci were detected from curd. Fermented coconut water comprised of cocci bacteria as similar to the commercial probiotic products. One LAB strain from fermented coconut water and two bacterial strains, one coccus and one bacillus from a curd sample showed inhibition zones of 17mm-23mm, 14mm, and 15mm respectively against the tested bovine pathogens. However, bacteria isolated from the probiotic tablets did not show inhibition zones against the pathogens. This is the first report on fermented coconut water LAB inhibiting bovine mastitis pathogens. In conclusion, the local LAB from environmental sources is more effective against indigenous bovine pathogens compared to market products. These can be used to reduce disease incidence. Additional testing is in progress to identify the species of LAB. Further studies are recommended to produce effective probiotic formulations for use in livestock farming.

Keywords: Antibacterial, Bovine, Fermented, Lactic Acid Bacteria, Probiotic bacteria

Assessing Water Quality and Plankton Abundance in Jaffna Lagoon

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Jaffna Lagoon, located on the Northern coast of Sri Lanka, is a significant habitat for marine life, yet its water quality and the role of environmental parameters on plankton distribution and abundance remain unknown. The present study aims to investigate the water quality of Jaffna Lagoon, plankton diversity, abundance, and their relationship with water quality parameters. Water samples were collected from 20 different locations between September 2021 and March 2022, and water quality parameters and plankton samples were analyzed. The results revealed that the water quality of Jaffna Lagoon was highly variable, with pH ranging from 7.67 to 8.52, dissolved oxygen ranging from 5.34 to 8.76 mg/L, salinity ranging from 20.5 to 29.5 PSU, temperature ranging from 26.06°C to 29.98°C, total nitrate ranging from 10×10^3 mg/L to 21.9×10^6 mg/L, and total phosphate ranging from 0.01 mg/L to 0.32 mg/L. A total of 13 species belong to 12 families of planktons were identified, viz., *Coscinodiscus granii*, *Leptocylindrus minimus*, *Gyrosigma balticum*, *Woronichinia elenkin*, *Acartia* sp., Gastropod larvae with ciliated foot, *Chaetoceros vanheurckii*, *Melosira* sp., *Cymbella cuspidata*, *Cymbella lanceolata*, *Chaetoceros costatus*, *Closterium limneticum* and *Protoperidinium pellucidum*. *Gyrosigma balticum* was the most abundant plankton species (13%) in the lagoon, followed by *C. granii* (10%) and *C. vanheurckii* (10%). The total phytoplankton abundance fluctuated from values of $<10^4$ cells L⁻¹ to values $>2 \times 10^6$ cells L⁻¹. The regression analysis was performed to examine the relationship between plankton abundance, temperature, and nitrate content. These findings contribute to the understanding of the ecological status of Jaffna Lagoon and can inform the development of sustainable management strategies for the lagoon ecosystem.

Keywords: Aquatic ecology, Lagoon environment, Plankton diversity, Water quality

A preliminary study on the preparation method of soya milk feed and its effect on the survival rate of common carp (*Cyprinus carpio*) post-larvae

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Common carp plays a major role in inland fish production. However, seed supply for culture-based fisheries remains inadequate due to the low survival rate during their nursery stages. During their first week of nursery stage, they were fed with soya milk. Normally, soya comprises over 30% crude protein, but unfortunately, soya contains few anti-nutritive factors such as trypsin and amylase inhibitors. There are many practices developed for deactivating those inhibitors, including applying and overnight soaking in hot water, frying seed powder, and overnight soaking in water. The study was conducted using a completely randomized block design with in four cement tanks each measuring 18m² and 1.2 m deep over a period of 15 days. The post- larvae stocking density was 2777 post larvae/m² (50000/18m²). Soya milk was administered as feed at a total volume of 0.5 liters, distributed over three times per day. The post larvae were fed with soya milk prepared according to the above three methods, while soya milk prepared using normal powdered soya was taken as a control treatment. Body weight and total length of post-larvae were recorded at stocking (Initial mean length (5.68 mm), Initial mean weight (4.25 mg)) and water quality parameters were also recorded twice a day in each treatment. The survival rate, body weight and total lengths of the post-larvae were recorded at the end of the 15 days of rearing period. The data were analyzed using a one-way ANOVA followed by Turkey's test at the 5% significance level. Soya milk prepared by using hot water (P = 0.001) showed a significant difference, while other methods showed no significant difference between each other. A significantly high survival rate of 87% was observed with the hot water soaking method compared to the control. In contrast, frying seed powder and the overnight water soaking method demonstrated lower survival rates of 43% and 35%, respectively, when compared to the control. Soya beans contain anti nutritional factors such as inhibitors and lectins, which can interfere with digestion and nutrient absorption. Therefore, the present study revealed that soaking in hot water helps to deactivate these compounds, making the soya milk more suitable and safe for the post larvae.

Keywords: Anti-nutritive factors, Common carp, Soya milk, Survival rate

Initial Crossbreeding to Develop Fancy Hybrids Using Threatened Endemic “Cyprinid” Species

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There are two economically important ornamental freshwater fish species found in Sri Lanka; *Dawkinsia filamentosa* and *Dawkinsia srilankensis*. Combination of several factors directly caused those freshwater fish species to threatened levels. Due to that, their export was currently regulated, highlighting immediate need of conservation. The objective of this study was to develop a new fancy hybrid variety for ornamental fish industry. Wild caught brooders of those species were separated into male and female and reared in cement tanks until they attained sexual maturity. Afterwards 2:1 ratio male and female brooders were introduced into the breeding tank, provided with submerged aquatic plants. The water quality parameters were recorded every week during the culture period. During this culture period offspring exhibited average length, average weight and average width of 17.29 mm, 0.047 mg and 2.55 mm, respectively. During this period, the water temperature, water pH, dissolved oxygen, alkalinity, hardness, nitrate, nitrite, ammonia, phosphate, turbidity and total suspended solids (TSS) in experiment tank was 27-29 °C, 7-9, 5-7 mg/L, 110-142 mg/L, 100-123 mg/L, 0.0099-0.0016 mg/L, 0.0015-0.0094 mg/L, 0.022-0.076 mg/L, 0.0123-0.0854 mg/L, 0.45-1.72 NTU, and 4-9 mg/L, respectively. Fulton condition factor (K) values ranged from 0.85 to 1.43, indicating varied fish health and body condition. Length frequency distribution displayed a right skew of 1.77, suggesting growth pattern variations. Therefore, we can conclude that, cross-breeding these *D. filamentosa* and *D. srilankensis* can create a successful hybrid variety. Often, produced new hybrids variety, showed the color preference of the *D. filamentosa* cultivar. Therefore, the newly found hybrid variety can be exported instead of pure *D. filamentosa* and this will also prevent the bio-piracy of *D. filamentosa* and conserve their stocks.

Keywords: *Dawkinsia filamentosa*, *Dawkinsia srilankensis*, Ornamental, Hybrid, Conservation

Comparative Study of Egg Characteristics of White Leghorn and Naked Neck Chicken for Table Eggs

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The quality of hens' eggs is central in purchasing for consumption. The present study investigated the egg weight and the shell characteristics of White Leghorn and Naked neck chickens for table eggs from the coastal areas of Ampara district of Sri Lanka. The egg weight, shell thickness, and shell weight were recorded from White Leghorn (n=60) fed with commercial feed and Naked neck chicken fed on free range (n=60) using recommended methods. The data were analyzed statistically using SPSS (version 25) software. The mean egg weight was significantly higher ($p < 0.05$) in White Leghorn ($60.23 \pm 3.57\text{g}$) compared to Naked neck chickens ($42.70 \pm 5.17\text{g}$) while shell thickness was significantly higher ($p < 0.05$) in Naked neck chickens ($0.75 \pm 0.14\text{mm}$) compared to White Leghorn ($0.24 \pm 0.10\text{mm}$). No significant difference ($p < 0.05$) was observed in shell weight between the two breeds. The correlation of egg weight with shell weight (-0.068) and shell thickness (0.020) as well as the correlation of shell thickness with shell weight (-0.061) was negligible in White Leghorn. However, in Naked neck chickens, the correlation of the egg weight with shell thickness (0.266) and shell weight (0.28) was significant ($p < 0.05$) and weak positive. Likewise, the correlation of the shell thickness with shell weight was significant and weak positive (0.281, < 0.05). The study concludes that the egg weight was higher in White Leghorn and falls under the category of extra-large (60 g and above) and in Naked neck chickens small (38 g – 44 g) according to the Sri Lankan Standards. In White Leghorn, the shell thickness and shell weight were independent of egg weight, while in naked neck chickens, with the increase of egg weight, the shell thickness and shell weight tend to increase. It is recommended that for larger sizes, consumers can select White Leghorn's eggs while naked neck chicken eggs can be chosen for their thicker shell.

Keywords: Egg weight, Shell thickness, Shell weight, Egg preference

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