



PROCEEDINGS

Precision Agriculture
Towards Resilient Food Systems



22nd November 2024
36th PGIA ANNUAL CONGRESS - 2024
Postgraduate Institute of Agriculture
University of Peradeniya
Sri Lanka

THIRTY-SIXTH ANNUAL CONGRESS

22nd November, 2024

Postgraduate Institute of Agriculture

PROGRAMME

Inaugural Session

Chairperson: Prof. D.K.N.G. Pushpakumara, Director, PGIA

8.15 a.m.	Registration
8.45 a.m.	National Anthem & Lighting of Traditional Oil Lamp
9.00 a.m.	Welcome Address by Dr. D.N. Vidana Gamage The Coordinator, PGIA Annual Congress 2024
9.10 a.m.	Address by Mr. H.M.M.C. Herath President, Postgraduate Agriculture Students' Association
9.20 a.m.	Address by Prof. B.C. Jayawardena Dean, Faculty of Agriculture, University of Peradeniya
9.30 a.m.	Address by Prof. D.K.N.G. Pushpakumara Director, Postgraduate Institute of Agriculture, University of Peradeniya
9.40 a.m.	Address by Prof. Terrence Madhujith Vice-Chancellor, University of Peradeniya
9.50 a.m.	Address by the Chief Guest, H.E Mr. Eric Walsh The High Commissioner for Canada in Sri Lanka and the Maldives
10.00 a.m.	Launching of the 36 th Volume of Tropical Agriculture Research (TAR) Journal
10.05 a.m.	Keynote Address by Prof. Viacheslav Adamchuk Professor and Chair, Department of Bioresource Engineering, McGill University, Canada
10.35 a.m.	Highlights of PGIA Annual Congress 2024
10.45 a.m.	Closure of the Inaugural Session
11.00 a.m.	Technical Session: Oral and Poster presentations
12.30 p.m.	Lunch Break
1.30 p.m.	Panel Discussion with Development partners

Closing Session

- 3.00 p.m. Address by **Dr. Shamen Vidanage**
Distinguished Alumnus of PGIA
Country Representative of IUCN, Sri Lanka
- 3.15 p.m. Presentation of Awards
- 3.30 p.m. Closing Remarks by **Dr. D.N. Vidana Gamage**
Coordinator PGIA Annual Congress 2024
- 3.45 p.m. Vote of Thanks by **Ms. H.A.S.V. Attanayake**
Secretary, Postgraduate Agriculture Students' Association
- 3.50 p.m. Closure of the Programme

Technical Session 1

Agronomic Interventions for Sustainable Agriculture

Chairperson: Emeritus Prof. D.C. Bandara

Venue: Auditorium/ PGIÁ Old Building

- 11.00 am Impact of Soil Suitability Class, Variety, Milling Method and Ageing Status on Some Chemical Properties of Coco Pith

R.K.R.M.A. Gunasena, K.W.L.K. Weerasinghe, W.A.P. Weerakkody, S. Samita and L. Perera
- 11.15 am Effect of Growing Environment on the Quality and Quantity of *Kappaphycus alvarezii* (Doty) Doty Yield

G.D.S.P. Rajapaksha, P.M.P.C. Gunathilake, J.K. Vidanarachchi, B.C. Jayawardana, B. Nirooparaj, M.D.S.T. De Croos. Wijesekara and P.C.G. Bandaranayake
- 11.30 am Environmental Factors Influencing Seed Germination and Seedling Emergence of *Cyperus iria*

K. Nishanthan, S. Dissanayaka, L. Pradheeban, T. Sivananthawerl and B. Marambe
- 11.45 am Effect of Growing Environment on Leaf, Stem, and Root Anatomy of Tomato (*Solanum lycopersicum* L.) in Vegetative and Reproductive Stage

I.N.S. Dewapriya, W.A.P. Weerakkody and P.C.G. Bandaranayake
- 12.00 am Effect of Combined Application of Compost and Biochar on Availability of some Selected Nutrients in Alfisol and Ultisol

R.M.A.U. Rathnayake, H.M.R.T. Wijerathne and R.S. Dharmakeerthi
- 12.15 am Effect of Fish Tonic on Growth and Yield of Organically Grown Capsicum chinense Jacquin var. Scotch Bonnet under Protected Cultivation

H.F.L. Upendri, D.A.U.D. Devasinghe and W.A.P. Weerakkody

Technical Session II
Advancements in Pest Management and Crop Resilience

Chairperson: Emeritus Prof. V.A. Sumanasinghe

Venue: Room 02/ PGIA New Building

- 11.00 am Screening of Wild Sugarcane (*Erianthus* Spp.) against Internode Borer *Chilo sacchariphagus indicus* (Lepidoptera: Crambidae) in Sri Lanka

V.K.A.S.M. Wanasinghe, K.M.G. Chanchala, K.S. Hemachandra, L. Nugaliyadde and A.D.N.T. Kumar

- 11.15 am Morphological and Molecular Characterization of Leaves from Selected Accessions of Jackfruit (*Artocarpus heterophyllus* Lam) available in Sri Lanka

N. Dayarathna, N.U. Jayawardana and V.N.S. Sirimalwatta

- 11.30 am Influence of Morphology of Leaf Sheath of Sugarcane and *Erianthus* for Infestations of Internode Borer (*Chilo sacchariphagus indicus*, Lepidoptera: Crambidae) in Sri Lanka

V.K.A.S.M. Wanasinghe, K.M.G. Chanchala, K.S. Hemachandra, L. Nugaliyadde and A.D.N.T. Kumara

- 11.45 am Optimization of Embryo Rescue Technique for Wide Hybridization of Cross between *Oryza sativa* with *Oryza rhizomatis*

A.V.C. Abhayagunasekara, P.G.L.T. Dilhani, D.K.N.G. Pushpakumara, W.L.G. Samarasinghe and P.C.G. Bandaranayake

- 12.00 am Allele Mining of Major Gall Midge Resistance Genes in Selected Sri Lankan Rice Germplasm

R.M.S.D.L. Abeyrathne, N.H.L.D.L.D. Nanayakkara and D.V Jayatilake

Technical Session III
Community and Environmental Stewardship

Chairperson: Emeritus Prof. C. Sivayoganathan
Venue: Room 102/ PGIA New Building

- 11.00 am Fostering Stewardship Approach to Promote Technology Transfer among Sugarcane Extension Staff in the Monaragala District Sri Lanka

A.P. Karunathilaka, U. Dissanayeke, C.K. Jayathilake, G.A. Gow, D.P.W. Pottawela and K.G.M.J.W. Gunapala

- 11.15 am Assessment of Pollution Using Water Quality Indices: A Case Study in Sainthamaruthu Coastal Lagoon

S.L.R. Begum, S.K. Weragoda and M.I.M. Mowjood

- 11.30 am Current Status of Maize Cultivation and Adoption of Weed Management Technologies by Farmers in the North Central Province of Sri Lanka

T.A.B.D. Sanjeewa, L.D.B. Suriyagoda and B. Marambe

- 11.45 am Gender Dynamics in Collective Efficacy Beliefs for Conservation Practices in Rural Tank Cascade Systems in Sri Lanka

R.M.M.P. Rathnayaka and A. Jayaweera

- 12.00 am Relationship of Perceived Extension Worker Characteristics with the Adoption of Value-Added Technologies by the Beneficiaries

C.A.K. Dissanayake, W. Jayathilake, H.V.A. Wickramasuriya, U. Dissanayake and W.M.C.B. Wasala

- 12.15 am Developing Household Wealth Index to Measure the Rubber Smallholders' Household Wealth Status as an Effect of Rubber Farming in Newly Introduced Rubber Areas in Sri Lanka

P.K.K.S. Gunarathne, T.M.S.P.K. Tennakoon and J.C. Edirisinghe

Technical Session IV
Technological Innovations in Agriculture

Chairperson: Emeritus Prof. E.R.N. Gunawardena
Venue: Room 106/ PGIA New Building

- 11.00 pm Classification of Milking Animals Based on Production and Reproductive Performance for Effective Management Decisions: An Approach Using K-Means Clustering

K.G.C.B. Wijebandara, K.S. Madusanka, K.G.J.S. Disnaka, B.M.L.D.B. Suriyagoda, C.M.B. Dematawewa and G.L.L.P. Silva

- 11.15 pm Comparison of Performance of Rice Crop Parameters in Controlled and Commercial Field Estimated from UAV Multispectral Imagery

P.P. Dharmaratne, A.S.A. Salgadoe, W.M.U.K. Rathnayake, and A.A.J.K Weerasinghe

- 11.30 pm Two - Stage Catalytic Activation of Coconut Shell Biochar for Effective Malachite Green Removal from Water

T. Bavithira, N. Kannan and A.K. Karunarathna

- 11.45 pm Carbon Footprint of Orthodox Black Tea through Life Cycle Assessment: A Case Study of a Medium Scale Tea Factory in Sri Lanka

M.M.K.D. Manathunga and A.K. Karunarathna

- 12.00 pm Vector Autoregressive Modeling between Crop Production Index and Permanent Cropland in Sri Lanka

M.M.R.S.S. Manthilake and N.R. Abeynayake

- 12.15 pm Functional Properties of Insoluble Dietary Fiber Obtained from Ceylon Cinnamon (*Cinnamomum zeylanicum* or *Cinnamomum verum*) Spent Bark Waste

L.H.M.P.R. Lansakara, S.P. Kodithuwakku, S.M.C. Himali and J.K. Vidanarachchi

- 12.30 pm Effect of Polyphenol-Rich Antioxidants Supplementation on Growth Performance and Meat Quality of Broiler Chicken Fed Rice Bran Stored for Extended Time Periods

S.M.R. Samarakoon, K.K.S.M Kulawardhana, N.D. Karunaratne, B.C Jayawardana, M. Flavel, and P. Weththasinghe

Posters Session
11.00 a.m. – 12.50 p.m.

Poster Session

Session: Agricultural Production and Productivity Improvement

Venue: Room No.206/ PGIA Old Building

- 11.00 pm Association of Dietary Patterns and Sarcopenia in the Ageing Population in Polonnaruwa District, Sri Lanka: A Cross-Sectional Study
F. Rafeek, S.D. Maithreepala, S. Padmalatha, and G. Somaratne
- 11.05 pm Quality and Shelf Life of Boiled and Unboiled Palmyrah (*Borassus flabellifer*) Shoot Flour Incorporated Chicken Meatballs During Refrigerated Storage
V. Susruthan and S.M.C. Himali
- 11.10 pm Nutritional Status of the Lip, Oral Cavity and Pharynx Cancer Patients in Different Stages of the Disease in Sri Lanka
M.K.C.P. Jayasekara, R. Silva, A. Chandrasekara and N. Jeyakumaran
- 11.15 pm A Comparative Study of Total Phenolic Content and Antioxidant Activity of Cultivated and Wild Cinnamomum Species in Sri Lanka
B.S. Bandusekara, D.K.N.G. Pushpakumara, K.M.S. Wimalasiri and P.C.G. Bandaranayake
- 11.20 pm Effect of Storage Time of Dietary Rice Bran on Growth Performance and Meat Quality of Broiler Chicken
S.M.R. Samarakoon, B.A.D.A. Samarasinghe, P. Weththasinghe and B.C Jayawardana
- 11.25 pm A Conceptual framework to evaluate Performance of Multipurpose Cooperative Societies in Sri Lanka
R.M.D.H Rathnayake, U. Dissanayeke, C.J Jayawardhana and H.M.W.H.A Herath
- 11.30 pm Optimization of some Agronomic Practises for Yield Enhancing of Scotch Bonnet Pepper (*Capsicum chinense* Jacq.) under Controlled Cultivation
H.G.A.M. Wickramarahne, R.M. Fonseka and K.P. Somachandra
- 11.35 pm Developing and Validating a Localized SDG Indicator Framework for Uva Province, Sri Lanka
J.P.N. Mallawaarachchi and U.I. Dissanayake

- 12.50 pm The Influence of Social Capital on Adoption of Conservation Agriculture-based Sustainable Intensification (CASI) Technology by Farmers in Nepal,

R.M.M.P. Rathnayaka, M.F Rola-Rubzen and A. Hailu

- 12.50 pm Effect of Different Cutting Styles on the Quality of Fresh-Cut Carrots (*Daucus carota* L.)

J.P.C.V.T. Jayasinghe, J.N. Jansz, D.M.S.S. Daundasekara, U.S.S. Dharmapriya, H.D.P. Premarathne and A.K. Kulatunga

- 12.50 pm Quality Changes of Fresh Diced Carrots (*Daucus carota* L.) Treated with Organic Acids during Refrigerated Storage

J.N. Jansz, J.P.C.V.T. Jayasinghe, D.M.S.S. Daundasekara, U.S.S. Dharmapriya, H.D.P. Premarathne and A.K. Kulatunga

Lunch Break 12.30 p.m – 1.30 p.m

Panel discussion with development partners

Precision Agriculture Towards Resilient Food Systems

Moderator: Prof. Buddhi Marambe

Venue: Diamond Jubilee Auditorium, Faculty of Agriculture

Time: 01.30 p.m. – 03.00 p.m.

Closing Session

Chairperson: Dr. D.N. Vidana Gamage, Coordinator PGIA Annual Congress 2024

Venue: Diamond Jubilee Auditorium, Faculty of Agriculture

Time: 03.00 p.m. – 03.30 p.m.

Message from the Chief Guest

It is an honour for me to join the Annual Congress 2024 at the Postgraduate Institute of Agriculture (PGIA) of the University of Peradeniya.

As the first institution of postgraduate education of its kind in Sri Lanka, PGIA plays a pivotal role in shaping the future of agriculture, the backbone of any society. As such, this is an excellent platform for exchanging ideas, fostering collaboration and presenting the latest advancements in the field.



This year's theme "Precision Agriculture Towards Resilient Food Systems" is not only timely, but essential in today's global agricultural landscape. It complements the discussions and narratives on environment, sustainability and effective land-use planning in a rapidly changing world. Within this context, precision agriculture emerges as a beacon of hope, offering innovative solutions to ensure food system resiliency.

This journey requires the collective effort of governments, academia, industry, and farmers. I am pleased to note the various partnerships with Canada, including with the prestigious McGill University. Those attending this event will have the opportunity to gain insights into the latest trends and best practices pertaining to precision agriculture and how it will encourage resilient food systems. Each of us has a role to play in this transformative process. By embracing precision agriculture, we can create a future where food security is not just a goal, but a reality for all.

My sincere appreciation goes to the PGIA team, and everyone involved in this event. Your commitment to advancing agricultural education and research is pivotal in shaping the future of agriculture. I am confident that the knowledge and innovations developed here will have a lasting impact on society in Sri Lanka.

H.E. Eric Walsh
High Commissioner of Canada

Message from the Director

It is my pleasure to warmly welcome all participants, contributors, and distinguished guests to this year's Congress organized by the Postgraduate Institute of Agriculture (PGIA). Since its founding in 1976 as Sri Lanka's first postgraduate institute, PGIA has proudly led the way in advancing human resource development through postgraduate education in agriculture. Supported by a highly qualified teaching panel of internationally trained academics and professionals, PGIA stands as the leading provider of advanced agricultural education in the country, producing Master's, MPhil and PhD graduates equipped to serve across diverse agricultural and allied sciences disciplines.



The PGIA Annual Congress offers a unique platform for postgraduate students, academics, researchers, and industry stakeholders to engage in multidisciplinary discussions, fostering collaboration that bridges theory and practice. This year's theme, "Precision Agriculture Towards Resilient Food Systems," reflects our commitment to driving agricultural research that not only meets academic standards but also addresses the urgent needs of society and the nation.

I extend my heartfelt thanks to the congress coordinator, organizers, boards of study, reviewers, editors, judges, PGIA staff, Board of Management, sponsors, and well-wishers for their dedication and hard work in making this event possible. Their commitment ensures that this congress remains a cornerstone for knowledge-sharing and professional growth within our postgraduate community. I am confident that the ideas shared and networking made here will significantly contribute to the future of agriculture, inspiring the innovations and insights essential to our shared mission.

On behalf of PGIA, I wish you all a successful and inspiring congress.

Prof. D.K.N.G. Pushpakumara
Director/ Postgraduate Institute of Agriculture
University of Peradeniya

Message from the Vice-Chancellor

It is with immense pleasure, I place this message on the occasion of the 36th Annual Congress of the Postgraduate Institute of Agriculture (PGIA) of the University of Peradeniya. Since its inception in 1989, the PGIA congress has been an annual event in the calendar of the PGIA that attracts present and future professionals in all disciplines of agriculture and allied sciences.



At a time when the agriculture sector faces unprecedented challenges due to climate change, resource scarcity, and a rapidly growing global population, the need to develop resilient food systems has become more critical than ever. By harnessing data-driven insights, advanced technology, and sustainable practices, precision agriculture offers a pathway to optimize resource use and minimize environmental impacts. This congress, on the theme ‘Precision Agriculture Towards Resilient Food Systems’, therefore, serves as a crucial platform to explore innovative approaches that combine the power of science, technology, and practical expertise to ensure food security and sustainability. It is encouraging to see such a diverse array of research and discussions aimed at fostering resilience, adaptability, and sustainability within food systems.

On behalf of the University of Peradeniya, I hereby wish to record my gratitude to the distinguished chief guest, keynote speaker, and members of the panel discussion for dedicating their valuable time to this event. I would also like to acknowledge the Coordinator and the Organizing Committee of the 36th Annual congress of the PGIA for their untiring effort to bring the Annual Congress- 2024 on stage.

I wish PGIA Congress 2024 all the very best!

Prof. Terrance Madhujith
Vice Chancellor
University of Peradeniya

Message from the Dean

As the Dean of the Faculty of Agriculture at the University of Peradeniya, it is both an honor and a pleasure to send this message for the 36th Annual Congress of the Postgraduate Institute of Agriculture (PGIA). Over recent years, I have seen its growth and its role as a rich platform where ideas flourish, providing postgraduates with essential exposure and experience.

The Annual Congress has successfully gathered academics, scientists, policymakers, the private sector, NGOs, and postgraduate researchers onto a common platform to discuss, debate, and address key issues with integrated and holistic approaches. This collaborative effort has been instrumental in building essential research capacity, human resources, and fostering a strong research culture within postgraduate education. By providing a wealth of ideas and knowledge, the congress has made a substantial impact on agricultural advancement both nationally and regionally. The term “Annual Congress of the PGIA” evokes a space of learning, experience, innovation, and service to the University and the nation. I would like to take this opportunity to commend the vision and commitment of those who initiated this congress and those who have sustained it over the years. It is with pride that I acknowledge the substantial contributions made by members of the Faculty of Agriculture, University of Peradeniya, in elevating this event to its current stature.



This year too, I am confident that the Annual Congress will provide a forum for discussing cutting-edge science in a multi-disciplinary audience. I take this opportunity to congratulate this year's congress coordinator, organizing committee, and the Director of the PGIA for their untiring effort in organizing the event. On behalf of the Faculty of Agriculture, University of Peradeniya, the major partner of the PGIA in its academic and research activities, I wish the 36th Annual Congress every success and sincerely hope that this event delivers all its responsibilities to its stakeholders.

Prof. B.C. Jayawardena
Dean/ Faculty of Agriculture
University of Peradeniya

Message from the the President, Postgraduate Agriculture Students' Association

I am pleased and privileged to convey this message on behalf of the Postgraduate Agriculture Students' Association (PASA) on the occasion of the 36th Annual Congress of the Postgraduate Institute of Agriculture (PGIA) of the University of Peradeniya, scheduled to be held in 22nd November 2024.



The annual congress is a significant academic event for students in PGIA, as it offers an outstanding opportunity for postgraduates to become a partner in the platform with academics, scientists and policymakers share, discuss, and explore the unique scientific findings across all fields of agricultural and allied sciences.

We, as the student body of PGIA, are truly grateful for the effort taken by the PGIA in providing young scientists not only attached to PGIA but worldwide, the chance to present their postgraduate research and also for ensuring the continuity of this annual event upto 36th time. I believe that every PGIA student recognizes the importance and value of this scientific event, which is organized primarily for the benefit of the student body. We applaud the PGIA for its devotion and arduous effort.

On behalf of PASA, I would like to express our sincere gratitude to the congress coordinator and organizing committee for their dedication and remarkable efforts in successfully organizing this event under such challenging conditions.

I extend my best wishes for a successful and inspiring congress.

Mr. H.M.M.C. Herath

*President, Postgraduate Agriculture Students' Association (PASA) Postgraduate Institute of Agriculture
University of Peradeniya*

Message from the Congress Coordinator

36th Annual Congress, Postgraduate Institute of Agriculture

On behalf of the organizing committee, it is with great honor and privilege that I extend this message to the 36th Annual Congress of the Postgraduate Institute of Agriculture (PGIA), University of Peradeniya, Sri Lanka.

Over the years, the Annual Congress has evolved into the premier event of the PGIA, serving as a cornerstone of its academic calendar. It offers an exceptional platform for postgraduate students to engage with local and international professionals and peers, showcase their talents, expand their knowledge, build networks, and collaboratively explore current and future research directions in agriculture and allied fields.



The Annual Congress also provides a valuable opportunity for researchers to publish the findings of their postgraduate studies. Abstracts are featured in the Proceedings, while selected papers undergo rigorous review and are published in Tropical Agricultural Research (TAR), a leading indexed journal in Sri Lanka. This year, 39 manuscripts were submitted, and following a meticulous double-blind review process, 35 were accepted for presentation at the Congress.

As the pioneer in postgraduate education and agricultural research in Sri Lanka, the PGIA remains steadfastly committed to bridging the gap between tertiary agricultural education and the nation's developmental needs. This year's Congress featured five pre-congress workshops on diverse topics, including conducting systematic literature reviews, applying machine learning to advance research and industry applications, statistical methods for data analysis, basic statistics for field experiments, and effective research presentation skills. These workshops aim to support postgraduate students while enhancing the prominence of postgraduate education in agriculture within the country. A notable highlight of this year's Congress is the Industry-Academia-Student Collaboration Forum (IASC Forum - PGIA), which aims to establish a dynamic platform for collaboration between academia and industry. This forum focuses on addressing current challenges and fostering innovative solutions for the agricultural sector.

As the Coordinator of this prestigious event, I wish to express my heartfelt gratitude to His Excellency Mr. Eric Walsh, High Commissioner for Canada in Sri Lanka, and the Maldives, for gracing the inaugural session as the Chief Guest. I am deeply thankful to our Keynote Speaker, Prof. Viacheslav Adamchuk, for his invaluable contribution. My sincere appreciation goes to the Chief Editor and Editorial Board members of the TAR journal, the authors, and the reviewers for their efforts in upholding the high standards of the Congress publications.

I also extend my gratitude to the resource persons of the pre-congress workshops for their contributions and to the Director of PGIA, along with his dedicated staff, for their unwavering support. Lastly, I commend the organizing committee, led by the Chairpersons of the four sub-committees, for their commitment to making the 36th Annual Congress a resounding success.

Dr. Duminda N. Vidana Gamage

Congress Coordinator, 2024

Past Directors of the Postgraduate Institute of Agriculture University of Peradeniya

<i>Prof C.M.B Dematawewa</i>	<i>November 2017- January 2024</i>
<i>Prof. S. Samita</i>	<i>July 2014 – September 2017</i>
<i>Prof. B.C.N. Peiris</i>	<i>October 2011 – June 2014</i>
<i>Prof. A.L.T. Perera</i>	<i>August 2006 - September 2011</i>
<i>Prof. R.O. Thattil</i>	<i>January 2002 – August 2006</i>
<i>Prof. H.P.M. Gunasena</i>	<i>March 1997 – January 2002</i>
<i>Prof. Y.D.A. Senanayake</i>	<i>January 1987 – March 1997</i>
<i>Prof. T. Jogaratnam</i>	<i>February 1978 – December 1986</i>
<i>Prof. R.R. Appadurai</i>	<i>June 1975 – February 1978</i>

Past Congress Coordinators

<i>Prof. W.S. Dandeniya</i>	<i>2023</i>	<i>Dr. (Ms.) A. Ariyawardena</i>	<i>2005</i>
<i>Prof. K.W.L.K. Weerasinghe</i>	<i>2022</i>	<i>Prof. C.M.B. Dematawewa</i>	<i>2004</i>
<i>Prof. P.C.G. Bandaranayake</i>	<i>2021</i>	<i>Prof. (Ms.) S.P. Indraratne</i>	<i>2003</i>
<i>Prof. R.S. Dharmakeerthi</i>	<i>2020</i>	<i>Prof. D.K.N.G. Pushpakumara</i>	<i>2002</i>
<i>Prof. (Ms.) A.J. Mohotti</i>	<i>2019</i>	<i>Prof. (Ms.) G.L.L.P. Silva</i>	<i>2001</i>
<i>Prof. W.A.U. Vitharana</i>	<i>2018</i>	<i>Prof. N.A.A.S.P. Nissanka</i>	<i>2000</i>
<i>Dr. (Ms.) S.M.C. Himali</i>	<i>2017</i>	<i>Prof. (Ms.) S.E. Peiris</i>	<i>1999</i>
<i>Dr. M. Ariyaratne</i>	<i>2016</i>	<i>Prof. B. Marambe</i>	<i>1998</i>
<i>Prof. (Ms.) K.M.S. Wimalasiri</i>	<i>2015</i>	<i>Prof. (Ms.) D. Kumaragamage</i>	<i>1997</i>
<i>Dr. S. Pathmarajah</i>	<i>2014</i>	<i>Prof. B.C.N. Peiris</i>	<i>1996</i>
<i>Prof. (Ms.) R.M. Fonseka</i>	<i>2013</i>	<i>Prof. (Ms.) E.R.K. Perera</i>	<i>1995</i>
<i>Prof. T. Sivanathawerl</i>	<i>2012</i>	<i>Prof. A.R. Ariyaratne</i>	<i>1994</i>
<i>Prof. (Ms.) R.P. Karunagoda</i>	<i>2011</i>	<i>Dr. (Ms.) A.A. Jayasekara</i>	<i>1993</i>
<i>Prof. W.M.T. Madhujith</i>	<i>2010</i>	<i>Dr. M.W.A.P. Jayatilaka</i>	<i>1992</i>
<i>Prof. (Ms.) J.P. Eeswara</i>	<i>2009</i>	<i>Prof. (Ms.) D.C. Bandara</i>	<i>1991</i>
<i>Prof. K.S. Hemachandra</i>	<i>2008</i>	<i>Prof. R.O. Thattil</i>	<i>1990</i>
<i>Dr. (Ms.) M. Wickramasinghe</i>	<i>2007</i>	<i>Prof. J.M.R.S. Bandara</i>	<i>1989</i>
<i>Dr. L.W. Galagedara</i>	<i>2006</i>		

Staff of the PGIA

Prof. D.K.N.G. Pushpakumara, Director
Mr. K.A.B. Damunupola, Deputy Registrar
Ms. K.A.I.S. Ranasinghe, Senior Assistant Bursar
Mr. A.G.I. Hemajith, Systems Analyst

Organizing Committee - PGIA Congress 2024

The Organizing Committee consisted of four Subcommittees;

Subcommittee I – Registration

Dr. Rasanjali Samarakoon - Chairperson

Prof. C.K. Beneragama

Prof. R.H.G. Ranil

Dr. W.E.M.L.J Ekanayake

Dr. U Dissanayeke

Dr. G. M. Somaratne

Dr. D.M.S.S.Daundasekara

Dr. I.D.L.S.D. Ariyawanse

Dr. D. N Balagalla

Ms. P.G.N.N Dayarathna

Ms. K.A.I.S. Ranasinghe

Subcommittee II – Publicity and Finance

Dr. Anuradha Jayaweera - Chairperson

Dr. Lakmal Ranathunga

Dr. D.N Balagalla

Ms. P.G.N.N Dayarathna

Ms. K.A.I.S. Ranasinghe

Subcommittee III – Sessions

Dr. Samantha Dissanayaka – Chairperson

Prof. Dhammika Dayawansa

Prof. Pradeepa Silva

Prof. R.S. Dharmakeerthi

Prof. J.K. Vidanarachchi

Prof. Ranjith Mapa

Prof. S.M.C. Himali

Prof. C.K Beneragama

Prof. P.C.G Bandaranayake

Prof. B.D.R Prasantha

Prof. R.H.G. Ranil

Prof. Ananda Chandrasekara

Dr. Sewwandhi Chandrasekara

Dr. V.N.S Sirimalwatta

Dr. Senal Weerasooriya

Dr. I.U. Hemachandra

Mr. Ryan Rienzie

Mr. T.M. Jayasekera

Ms. T.I.G. Prabasshwari

Dr. D.N. Balagalla

Ms. P.G.N.N. Dayarathna

Ms. K.A.I.S. Ranasinghe

Subcommittee IV– (Logistics)

Dr. Nuwan De Silva - Chairperson

Prof. W.A.U. Vitharana

Prof. R.H.G. Ranil

Prof. T.Sivananthawerl

Prof. L.K. Weerasinghe

Dr. W.M.T.P Ariyaratne

Dr. W.H. Jayasinghe

Dr. L.M. Rankoth

Mr. W.A.M. Lowe

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The 35th Annual Congress of the PGIA - 2023

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G. D. S. P. Rajapaksha, P. M. P. C. Gunathilake, B. Nirooparaj, J. K. Vidanarachchi, B. C. Jayawardana, M. D. S. T. De Croose, I. Wijesekara, P. C. G. Bandaranayake

Comparative Analysis of Green and Brown Morphotypes of *Kappaphycus alvarezii* doty (Doty): Morphology, Total Phenol Content, Antioxidant Activity and Antimicrobial Activity Against Selected Bacterial Strains.

Oral Presentations:

- ***G. D. S. P. Rajapaksha, P. M. P. C. Gunathilake, B. Nirooparaj, J. K. Vidanarachchi, B. C. Jayawardana, M. D. S. T. De Croose, I. Wijesekara, P. C. G. Bandaranayake***

Comparative Analysis of Green and Brown Morphotypes of *Kappaphycus alvarezii* doty (Doty): Morphology, Total Phenol Content, Antioxidant Activity and Antimicrobial Activity Against Selected Bacterial Strains.

- ***M.K.N.W. Jayarathna, R.S. Dharmakeerthi and A.D. Igalavithan***

Effects of biochar based slow-release fertilizer application on ammonia volatilization in lowland rice soil under two water regimes

- ***R. A. A. S. Rathnayaka, B. Jananey, H. P. N. Maduranga, T. Sivananthawerl, P. G. D. S. Amarasena, E. Frossard, A. J. Mohotti, K. M. Mohotti, L. D. B. Suriyagoda***

Allometric models for estimating above- ground, below-ground and total biomass of tea (*Camellia sinensis* (L.) O. Kuntze) plant individuals grown under tea cultivation systems of Sri Lanka

- ***K.I.S. Thamali, W.G.A.S. Sumanarathne, L.D.B. Suriyagoda, and D.V. Jayatilake***

Predicting salinity tolerance of popular Sri Lankan rice varieties based on root morphology at the seedling stage

- ***U. W. L. M. Kumarasiri, U. W. A. Vitharana, T. Ariyawansa, B. R. Kulasekara***

Use of drone imagery to predict leaf nitrogen content of sugarcane

Poster Presentations:

- ***N. Tissera, G. Somaratne, C. Sandaruwan and W. Lankathilaka***

Anti-fungal phytochemical analysis of selected Sri Lankan medicinal plants

PGIA Alumni Awards:

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2nd Runner up: U.W.L.M. Kumarasiri

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Winner: *K.A.T.K. Jayalath*

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1st Runner up: *G.D.S.P. Rajapaksha*

The hidden wonder of the seaweed colour

2nd Runner up: *P.G.N.H. Dharmasiri*

Antioxidant, anti-diabetic, and anti-inflammatory activities of *Passiflora foetida* grown in Sri Lanka

Boards of Study Poster Competition:

Boards of Study in Animal Science

Joachim Memorial Award:

Ms. C.P. Aluwihare from the Board of Study Crop Science

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Chairpersons and Judges of Technical Sessions - 2024

Oral Sessions

SESSION I: Agronomic Interventions for Sustainable Agriculture

Venue: Auditorium/ PGIA Old Building

Chairperson	Emeritus Prof. D.C. Bandara
Judges	Dr. Dushan Kumarathunge Dr. D. M. J. B. Senanayake Dr. N. Suranjith Gama-Arachchige
Session Coordinator	Dr. Ishanka Hemachandra
Assistant Coordinator	Mr. Ryan Rienzie

SESSION II: Advancements in Pest Management and Molecular Crop Resilience

Venue: Room 02/ PGIA New Building

Chairperson	Emeritus Prof. V.A. Sumanasinghe
Judges	Dr. A.N.R. Weerawansha Dr. Sachinthanie Karaunarathna Dr. Wajira Balasooriya
Session Coordinator	Dr. Lakmal Ranathunga
Assistant Coordinator	Mr. Ayesh Lowe

SESSION III: Community and Environmental Stewardship

Venue: Room 102/ PGIA New Building

Chairperson	Emeritus Prof. C. Sivayoganathan
Judges	Dr. P. K. Seelagama Dr. Manoj Thibbotuwawa Dr. WMSMK Thoradeniya
Session Coordinator	Dr. Kumudu Kopiyawattage
Assistant Coordinator	Dr. Kumudu Ariyawansa

SESSION IV: Technological Innovations in Agriculture

Venue: Room 106/ PGIA New Building

Chairperson	Emeritus Prof. E.R.N. Gunawardena
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Session Coordinator	Dr. Yamuna Somarathna
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Poster Session

SESSION: Agricultural Production and Productivity Improvement

Venue: Room No.206/ PGIA Old Building

Judges

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Dr. H.K.J.P. Wickramasinghe
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Dr. Thushanthi Perera

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Impact of Soil Suitability Class, Variety, Milling Method, and Ageing Status on Some Chemical Properties of Coco Pith

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Given the coco pith is a versatile grow medium, it is important to understand the factors that influence its physicochemical properties. This study investigated the impact of soil suitability class, coconut variety, milling method, and ageing status on electrical conductivity, pH, and Na⁺ and K⁺ of coco pith. The research included 43 blocks covering soil suitability classes, where husks from Tall×Tall (TT) and Dwarf×Tall (DT) varieties were processed using dry and wet milling, with and without ageing. The milling method significantly affects the electrical conductivity of coco pith, with dry milling producing higher electrical conductivity (1017.5 $\mu\text{S cm}^{-2}$) compared to wet milling (14.3 $\mu\text{S cm}^{-2}$) ($P<0.0001$). Ageing significantly reduces electrical conductivity ($P<0.0001$), with an observed interaction between the milling method and ageing. No significant differences in electrical conductivity were found between dry and wet milling methods for aged coco pith. For pH, a three-way interaction among variety, milling method, and ageing status was detected ($P=0.0007$). DT variety had higher pH values with dry milling, and wet milling consistently showed lower pH levels. The average pH of aged coco pith was 6.4, compared to 6.7 for non-aged coco pith. Soil suitability class also influenced pH, with the S2 class showing the lowest pH (6.4) and the S4 class showing the highest (6.7) ($P<0.05$) due to their differences in soil properties. Na⁺ in coco pith showed significant interactions among variety, milling method, and ageing status ($P=0.0488$), with aged coco pith exhibiting significantly lower Na⁺ levels across all combinations due to enhanced particle breakdown. Both the milling method and ageing status had significant effects on K⁺ content ($P<0.0001$), with aged coco pith showing lower concentrations. The transition from non-aged to aged coco pith significantly reduced K⁺, highlighting the importance of ageing in achieving optimal chemical properties. These findings highlighted the critical role of ageing and milling methods in enhancing the quality of CP by reducing cation levels.

Keywords: milling method, ageing, electrical conductivity, pH, sodium ions, potassium ions

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Effect of Growing Environment on the Quality and Quantity of *Kappaphycus alvarezii* (Doty) Doty Yield

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Kappaphycus alvarezii Doty (Doty) is a commercially important red algae known for carrageenan, a cell wall polysaccharide, and thickening agent. It is also a source of major and minor nutrients and secondary metabolites with antioxidant, antibacterial, anti-diabetic, and anticancer properties. However, comprehensive studies are limited to answering the scientific questions concerning morphotypes and their influence on the quantity and quality of carrageenan. This study aimed to analyze the growth rate, carrageenan yield, water-holding capacity of carrageenan, antimicrobial properties, antioxidant properties, and total phenols of green and brown morphotypes of *K. alvarezii* cultivated in Pesalai and Valaippadu of Sri Lanka. The seaweed was harvested after 45 days of cultivation (n=12) and analyzed using standard methods. The antibacterial properties of ethanol extracts were evaluated by disc diffusion assay against *Staphylococcus aureus*, *Escherichia coli*, and *Pseudomonas aeruginosa*. Antioxidant properties and total phenolic contents (TPC) were determined using the DPPH radical scavenging assay and the Folin-Ciocalteu method, respectively. There were no significant (P>0.05) location effects and morphotype effects in terms of growth rate, carrageenan yield, and water holding capacity. Irrespective of the cultivation location, the green morphotype showed significantly high (P<0.05) antibacterial and antioxidant properties and significantly high (P<0.05) TPC. This study suggests that the green morphotype of *K. alvarezii* performs better as a natural source of antibacterial and antioxidant compounds, while both morphotypes of *K. alvarezii* are suitable for carrageenan production. The Mannar Sea area of Sri Lanka has suitable environmental conditions for commercial farming of *K. alvarezii* with an average 4.21±0.03 % growth rate.

Keywords: Carrageenan, Food hydrocolloids, Morphotypes, Phycocolloids, Sri Lanka

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Environmental Factors Influencing Seed Germination and Seedling Emergence of *Cyperus iria*

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Mature, viable seeds of *Cyperus iria*, randomly collected from paddy fields in the five districts of the Northern Province of Sri Lanka, were used to assess the impact of selected environmental parameters and agronomic practices on their germination and seedling emergence. The weed seeds from different districts were subjected to four combinations of day/night temperatures coupled with three light durations in a Completely Randomized Design as a two-factor factorial experiment. The temperature x light duration with the highest seed germination was combined with different flooding heights and durations, followed by soil-burial depths. The frequencies of seed germination and seedling emergence were analyzed using the Chi-square test in SAS 9.1 software ($P=0.05$). *Cyperus iria* seeds from Vavuniya recorded the highest seed germination at all combinations of day/night temperature and light durations, while the lowest was recorded from Jaffna. Seed germination was the highest at day/night temperatures of 35/30 °C and the lowest at 25/20 °C ($P<0.05$). The highest frequency of seed germination was in 24-hour light, and the lowest was in 24-hour dark under all-day/night temperatures. Imposing flooding at 5 days after sowing (DAS) at a height of 5 cm showed the lowest seedling survival % measured at 28 DAS ($P<0.05$). Seedling emergence of *C. iria* was restricted ($P<0.05$) at soil-burial depths 2.5 cm and 5 cm. The results revealed that 25/20 °C day/night temperatures in 24 hours of darkness, seed burial >1 cm soil depth, and flooding at 5 cm height from 5 DAS suppressed the seedling emergence and growth of *C. iria*.

Key words: *Cyperus iria*, environmental factors, paddy fields, seed germination, seedling survival

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Effect of Growing Environment on Leaf, Stem, and Root Anatomy of Tomato (*Solanum lycopersicum* L.) in Vegetative and Reproductive Stage

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Changing environments cause significant changes in plant anatomy, photosynthesis, and stress responses which can influence plant development, with substantial implications for agriculture and food security. Understanding how current crops adapt to changing environments is important, especially as climate change becomes a global challenge. This study aimed to investigate the effect of the microenvironment in partially controlled greenhouses on anatomical changes of a selected hybrid tomato variety, “Sylviana” maintained under the same crop management practices. The study was conducted in the mid-country wet zone of Sri Lanka under three different greenhouse environments: intensive controlled greenhouse (T1), semi-intensive greenhouse (T2), and less intensive greenhouse (T3), with the highest daily average temperatures around 35°C, 37°C, and 39°C and average light intensities around 5500lx, 11800lx, and 8000lx respectively. The daily average relative humidity varied from 60-80%. The leaf, stem, and root anatomy at vegetative and reproductive growth stages were studied using a light microscope. Stomatal numbers per unit leaf area varied from 100-110 on the adaxial (upper) side and 212- 232 on the abaxial (lower) side, with T2 and T3 having significantly more stomata. Stem thickness and xylem vessel thickness increased during plant development, with T3 showing the highest value in the reproductive stage. Root diameter was increased (2.6-3.63 µm) with increasing diameters of vascular area (1.4-2.1 µm) with the plant growth. Plants grown in three microenvironment conditions displayed some changes in plant anatomy as phenotypic plasticity, which could be due to the combined effects of changes in temperature, light intensity, and relative humidity inside greenhouse microenvironments and which help improve water transport and cooling in the plant.

Keywords: Climate change, Microenvironments, Environmental control, Plant adaptation, Microscopic analysis.

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Effect of combined application of Compost and Biochar on availability of some selected nutrients in Alfisol and Ultisol

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Crop productivity is often limited by low nutrient availability and poor soil fertility in Alfisols and Ultisols of Sri Lanka. The combined application of biochar and compost has offered a potential solution to poor soil fertility and micronutrient availability. However, concerns have also arisen about possible reductions in micronutrient availability, such as copper (Cu) and zinc (Zn), due to complex soil and organic matter reactions. This study investigated the effects of biochar and compost application at different ratios on the plant availability of Cu, Zn, P, and K in an Alfisol and an Ultisol of Sri Lanka. All nine combinations of 0, 0.5, and 2% (w/w) rubber wood biochar and poultry litter compost were applied to the soils. Both amended and unamended soils were incubated at 60% water-holding capacity under room temperature. Mehlich 3 extractable (M3) Cu, Zn, P, and K contents were measured at 7 and 42 days after incubation (DAI). The M3-Cu in the Ultisol was increased after compost and/or biochar application at both times but only after 42 DAI in the Alfisol. Increasing the rate of compost application increased the M3-Zn in both soils at 7 DAI, and the application of biochar further increased it. However, a significant increase in M3-Zn after 42 DAI was observed only at the highest combined rate of biochar and compost. The M3-P content in 2% compost treated soils was significantly high in both soils and was not further affected due to biochar application. The M3-K contents in both soils were significantly increased by increasing the rates of biochar but not with compost application. Results indicate that the combined application of compost with biochar enhances the plant availability of Cu, Zn, P, and K in the soils used, especially when they were applied at 2% rate.

Keywords: Alfisol, Biochar, Compost, Ultisol, Nutrient availability

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Effect of Fish Tonic on Growth and Yield of Organically Grown *Capsicum chinense* Jacquin var. Scotch Bonnet under Protected Cultivation

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Genus *Capsicum* belongs to the Solanaceae family and is a major spice crop worldwide. The Scotch Bonnet (*Capsicum chinensis* Jacquin) is a popular *Capsicum* variety. This study investigated the efficacy of fish tonic as a supplementary source of plant nutrients to synthetic fertilizers in enhancing the growth and yield of Scotch Bonnet in grow bag culture under tropical conditions in the dry region of Sri Lanka. Two fish tonic concentrations (2 and 5 mL/L, as a foliar spray or soil drench) and two application rates (weekly and biweekly) were compared with a control treatment for the supplementary effect of the main source of plant nutrients (200 g of quality certified solid compost as split application per plant). The study followed a Complete Randomized Design (CRD) with seedlings transplanted into grow bags containing a substrate of sterilized topsoil and partially burnt paddy husk (3:1). Results showed no significant impact of treatments on plant height and leaf count. However, the fish tonic treatment significantly improved the leaf chlorophyll content and leaf area of Scotch Bonnet plants. Soil drenching of 2 mL/L fish tonic at weekly intervals (T5) contributed to the highest leaf area (at 16 weeks after planting) (56.7 cm²), yield (17.1 g/plant), number of fruits (18) and the fruit length (6.1 cm). However, the total soluble solids (TSS) of fruits were unaffected. There was a significant change in fruit colour in most fish tonic treatments compared to the control. Further, the most desirable pH range in the grow media was observed with soil drenching of fish tonic at both concentrations. The study concludes that soil drenching of 100 mL of fish tonic per plant at 2 mL/L concentration in weekly intervals, in addition to the standard rate of solid organic fertilizer, can positively influence the growth and yield of Scotch Bonnet sustainably in protected culture.

Keywords: Capsicum, fish tonic, organic media, yield, soil drenching

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Screening of Wild Sugarcane (*Erianthus* spp.) against Internode Borer *Chilo sacchariphagus indicus* (Lepidoptera: Crambidae) in Sri Lanka

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Erianthus spp. were screened to identify resistant parents and their potential as trap crops against sugarcane internode borer (INB) in Sri Lanka. Twenty-one accessions of *Erianthus* spp. and five sugarcane varieties were assessed by considering leaf infestations, formation of dead hearts, stalk infestations, oviposition preference, and larval survival. The nature of infestations by INB on *Erianthus* is similar to that on sugarcane. More leaf infestations were observed on *Erianthus* spp. than sugarcane. However, more stalk infestations were observed on sugarcane than *Erianthus* spp. The highest leaf infestations were observed in IND 81 80 while zero infestations were observed in MOL 45 03. Also, IND 81 80 had the highest incidences of dead hearts up to 150 DAPs. SL 96 128 and Co 775 had the highest stalk infestations while SL 83 06 had the lowest. MOL 45 03 recorded zero stalk infestations at the time of harvesting. Oviposition and larval performance tests recorded, the highest and lowest number of eggs per plant in IND 81 80 and MOL 45 03, respectively. According to the larval survival percentages, the highest value was recorded in SL 96 128 while the lowest values were observed in MOL 45 03 and SL 83 06. Among the tested varieties, IND 81 80 was found to be the highly susceptible while MOL 45 03 was the highly resistant for INB. Therefore, MOL 45 03 exhibits promise as a resistant parent for breeding sugarcane cultivars with increased resistance, and IND 81 80 is a viable candidate for further research as a possible trap crop.

Keywords: Push-pull technology, trap crop

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Morphological and Molecular Characterization of Leaves from Selected Accessions of Jackfruit (*Artocarpus heterophyllus* Lam.) available in Sri Lanka

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Jackfruit (*Artocarpus heterophyllus* Lam.) belongs to the family Moraceae. Selected jackfruit accessions in Fruit Crop Research and Development Station, Gannoruwa were studied based on molecular markers and leaf morphology. The main objective of the study was to evaluate the morphological and molecular diversity of specific jackfruit accessions that were collected from an orchard located in Udayakattikulam Mullaitivu, Sri Lanka. Two recommended accessions (*Maharagama* and *Mandoor*) and 11 accessions were studied morphologically and 4 accessions were selected for the molecular analysis. Leaf morphology was assessed in accordance with the descriptor developed by the International Plant Genetic Resources Institute (IPGRI). Molecular characterization focused on the ITS (Internal Transcribe Spacer) region. Morphological data were analyzed using PAST 4.03. Scatter plot was obtained from the Principal Component Analysis (PCoA). ITS sequence data was analyzed by MEGA 11 and DnaSP 5.10. Based on the leaf morphology, ACC-17-267 morphologically different from other accessions while *Maharagama* and ACC-15-27 were closely related to each other. The selected 4 accessions (ACC-1-275, ACC-3-265, ACC-7-249, ACC-8-271) for molecular analysis were closely related to *Mandoor* accession with respect to their leaf morphology. Molecular analysis revealed that no genetic distance between *Maharagama*-*Mandoor* and ACC-7-249. According to the dendrogram resulted from MEGA 11, *Maharagama*, *Mandoor* and ACC-7-249 form a separate clade. Diversity analysis results revealed that, selected Jackfruit accessions has a higher haplotype diversity and moderate level of nucleotide diversity (Pi: 0.115).

Key words: Artocarpus, Genetic diversity, ITS, Leaf morphology, Moraceae

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Influence of Morphology of Leaf Sheath of Sugarcane and *Erianthus* for Infestations of Internode Borer (*Chilo sacchariphagus indicus*, Lepidoptera: Crambidae) in Sri Lanka

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Internode Borer (INB) (*Chilo sacchariphagus indicus*, Lepidoptera: Crambidae) is an economically important moth borer species in sugarcane in Sri Lanka. Plant resistance plays an important role in managing this pest. This study evaluated the association between INB infestation and two morphological characters of leaf sheath (sheath thickness and leaf insertion (throat) hairs; LI hairs) in 21 *Erianthus* accessions and five sugarcane varieties. Leaf sheath infestations by INB recorded in the field trial at three months age. The leaf sheath thickness using cross sections and length of LI hairs were measured under microscope. The weight of LI hairs was also measured to determine the density. The findings showed that IND 81 80 (13.5±0.4a) had the highest infestation, whereas MOL 45 03, Co 775, and SL 83 06 had no infestations. Leaf sheath thickness and INB infestations were shown to be strongly negatively correlated ($r = -0.6$). Only *Erianthus* accessions had LI hairs; the longest ones were found in IK 76 62 and IK 76 73 (3.5±0.2^a, 3.5±0.3^a). The hair length and infestation showed a mild negative correlation ($r = -0.2$), whereas hair weight and infestation showed a higher negative correlation ($r = -0.5$). On the *Erianthus* accessions, the highest time has been taken by larvae to pass through MOL 45 03 (28±0.3) followed by SES 75(26±0.2) and SES 356 (26±0.2). The lowest time has been taken by three sugarcane varieties; SL 90 6237(0.2±0.05), SL 92 5588 (0.3±0.05) and SL 96 128 (0.2±0.03). These results emphasize the significance of leaf sheath thickness and density of LI hairs in the breeding of pest-resistant cultivars.

Key words: Leaf insertion hairs, Leaf sheath hardness, resistant sugarcane cultivars, Sri Lanka

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Optimization of Embryo Rescue Technique for Wide Hybridization of Cross between *Oryza sativa* with *Oryza rhizomatis*

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Cultivating resistant rice varieties is considered the most economical and environmentally friendly method to sustain the cultivation. Therefore, it is urgent to incorporate resistant genes for cultivated species. *Oryza rhizomatis*, an endemic wild rice species in Sri Lanka, is tolerant to drought and consists of many other valuable traits including Brown plant hopper (BPH) resistance. However, when hybridizing genetically distant species such as *O. rhizomatis*, incompatibility is a barrier, and the embryos may not grow normally and naturally. Embryo rescue is a technique used to protect weak, immature, and hybrid embryo and promote to develop into a complete plant. This research aimed at developing an embryo rescue protocol for *O. rhizomatis* crossed with popular cultivated *O. sativa* cultivars. Crosses were made using Bg 94-1 and Bg 380 as female parents while *O. rhizomatis* as male to initiate drought and BPH-resistant rice breeding respectively. F₁ hybrid embryos excised at 6, 8, and 10 days after crossing were grown in MS medium fortified with different combinations of BAP, 2,4 – D, and with no hormone. The explants that were excised at eight days (08) old; sterilized with 10 % Clorox® for 15 minutes and cultured in MS medium with no hormone were selected as the protocol for plant regeneration of wide hybridization. The interspecific hybrids can be produced successfully by distant hybridization of *O. sativa* vs *O. rhizomatis*. About 30% of the regenerated plants consisted of rhizome-like structures and the hybridization was further confirmed by molecular analysis using a polymorphic Inter Simple Sequence Region.

Keywords: Crop wild relatives, Hybridity testing, In vitro culture, ISSR.

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Allele Mining of Major Gall Midge Resistance Genes in Selected Sri Lankan Rice Germplasm

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Breeding rice varieties carrying resistance to rice gall midge (RGM), *Orseolia oryzae* is a key strategy to reduce yield losses incurred as a result of RGM infestations, globally. Using associated DNA-markers, the study evaluated 56 Sri Lankan rice accessions based on their breeding potential (including 23 traditional (TAs) and 33 newly improved varieties (NIVs)) to identify rice accessions carrying resistance alleles at four major RGM resistance genes: *gm3*, *Gm4*, *Gm8*, and *Gm11*. The allele profiling revealed that none of the accessions carried resistance alleles for all four genes and five accessions carried only susceptible alleles at the target loci. Eleven accessions carried resistance alleles at gene combinations *Gm4*, *Gm8* and *Gm11* (7), *gm3*, *Gm8* and *Gm11* (3), and *gm3*, *Gm4* and *Gm11* (1). Twenty-four accessions reported combinations of any two resistance alleles from the four target genes and 16 rice accessions carried only one resistance allele in all target genes except in *Gm4*. The resistance alleles of *Gm11* (55%) and *gm3* (52%) were the most common in the study panel, and the resistance allele of *Gm4* was the least prevalent (32%). At any given resistance gene, mostly the TAs carried the resistance allele compared to the NIVs. The RGM resistance allele profiling conducted in the present study will facilitate taking informative decisions at donor selection for gene pyramiding in rice breeding programs. The study must be further expanded with field evaluation for RGM resistance, and discover novel resistance genes in the local germplasm to broaden the understanding of RGM resistance in rice.

Key words: Gene pyramiding, *gm3*, *Gm4*, *Gm8*, *Gm11*

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Fostering Stewardship Approach to Promote Technology Transfer among Sugarcane Extension Staff in Monaragala District Sri Lanka

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Correct integration of ICTs in agricultural innovation systems can enhance the efficiency, effectiveness, and reach of extension services. This study aimed to develop a mechanism for knowledge dissemination and capacity-building among sugarcane extension officers in Monaragala District using a technology stewardship approach. A participatory action research approach was adopted to ensure active participation. The research cycle had four phases namely i) *information need assessment*, ii) *campaign planning*, iii) *rapid-prototyping*, and iv) *evaluation*. Data were collected using four focused group discussions (n=28), a questionnaire survey (n=28), and logged data in the ICT platform. Data were analyzed using SPSS. During the first and second phases, three communities of practices were designed on WhatsApp messaging service and the campaign was implemented for three weeks. The effectiveness of the campaign was evaluated using a survey (n=40). The most important information needs of the community were related to cane quality improvement (93%), weed management (82%), water management (82%), soil nutrition management (75%), mechanization technologies (75%), and ratoon management (71%) and campaign messages were tailored accordingly. The majority (85%) of the members agreed that the ICT platform effectively delivered advisory support. Only 53% of the members have actively participated in the campaign. Challenges included technological limitations, access barriers and the inability to read any messages. The study highlights potential of messaging services to revolutionize agricultural extension services by enhancing communication, knowledge sharing, and problem solving among extension officers. The findings provide insights for designing effective capacity-building initiatives tailored to Sri Lankan sugarcane industry, emphasizing the importance of applying digital tools to enhance productivity and sustainability.

Keywords: Technology stewardship, Sugarcane industry, Capacity-building, Low-cost ICT platform

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Assessment of Pollution Using Water Quality Indices: A Case Study in Sainthamaruthu Coastal Lagoon

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An understanding of pollution status is vital for remediating water resources, which is lacking in the context of Sri Lanka's lagoon system. The aim of this study was to assess the pollution in a lagoon in terms of degree, dynamics and sources of pollution using water quality indices. The water samples collected from up, mid and down streams of Sainthamaruthu lagoon across different rainfall seasons were analyzed for pH, temperature, Electrical Conductivity (EC), Total Dissolved Solids (TDS), Dissolved Oxygen (DO), ammonium nitrogen (NH_4^+), nitrate nitrogen (NO_3^-) and Total Phosphorus (TP). The measurements were used to compute Water Quality Index (WQI) and Comprehensive Pollution Index (CPI) and to perform a Principal Component Analyses. It was found that upstream region of the lagoon was severely polluted during North East Monsoon (NEM) and First Inter Monsoon (FIM), whereas significantly higher concentrations of nutrient pollutants ($\text{NH}_4^+= 4.5 \text{ mg/L}$, $\text{TP}=3 \text{ mg/L}$) and physiochemical attributes ($\text{EC}=3007\mu\text{S/cm}$, $\text{TDS}=801.7 \text{ mg/L}$) were associated with the higher pollution in NEM and FIM respectively. Meanwhile, the other regions were moderately polluted throughout the year. The greater WQI (>100) observed in regions across the different rainfall seasons implied that Sainthamaruthu lagoon was not suitable for drinking and fish culture. Furthermore, the results of Principal Component Analysis revealed that the pollution in Sainthamaruthu lagoon is caused by mixed sources of natural and anthropogenic factors including mineralization, sea water intrusion, effluent discharge and wastewater release. This study proved the occurrence of pollution in Sainthamaruthu lagoon and the facts identified could be used during remediation of the lagoon in near future.

Keywords: Ammonium nitrogen, Comprehensive pollution index, Physiochemical parameters, Total phosphorus, Water quality index

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Current Status of Maize Cultivation and Adoption of Weed Management Technologies by Farmers in the North Central Province of Sri Lanka

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Maize is the second most widely cultivated cereal in Sri Lanka. A field survey done from 2021 to 2022 assessed the status and explored possibilities of uplifting maize production in the North Central Province (NCP) in Sri Lanka. A pre-tested structured questionnaire was administered (n=56) together with farmer field observations (n=28), key informant interviews (KII; n=10), focus group discussions (FGD; n=5), and monitoring of selected farmer fields and their practices at bi-weekly intervals (n=3). Data were analyzed using chi-square test (P=0.05) and correlation analysis using SAS statistical software. Two main maize-based cropping systems were identified in NCP, namely, rainfed upland maize monoculture (RUMM) and lowland paddy-based maize monoculture (LPMM). Crop-animal integration by 21% respondents has brought in mutual benefits for both components. About 61% of respondents were large-scale maize growers (2 to 10 ha) with mechanization. About 68% were full-time maize farmers, mostly using family labour. The net return from maize farming ranged from US\$ 383 to 1,000 per ha. Younger maize farmers were more educated than the elderly. However, there was a lower tendency of younger generation moving into maize farming. Weeds were the main biological constraint for maize production. The most competitive weed species were *Megathyrus maximus*, *Cyperus rotundus*, *Lantana camara*, *Ocimum sanctum* and *Euphorbia heterophylla*. Large-scale maize farmers used four-wheel tractors fitted with land preparation implements, which also helped in pre-plant weed control. Herbicides, Topramezone and Nicosulfuron were mostly used for post-plant weed control. Small-scale farmers used manual methods and the same herbicides for weed control. Of the respondents, 23% tank-mixed herbicides (cocktail mixtures), however, successful weed control was achieved without tank-mixing herbicides. Moreover, 40% of respondents had access to herbicides not registered in Sri Lanka. Results indicated that the import-ban imposed on agrochemicals for seven months in 2021 has led to use of smuggled products.

Key Words: Herbicides, Maize-based cropping systems, Post-plant weed control, Questionnaire survey, Tank mixing

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Gender Dynamics in Collective Efficacy Beliefs for Conservation Practices in Rural Tank Cascade Systems in Sri Lanka

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Understanding how gender dynamics influence collective efficacy beliefs is crucial for crafting effective and enduring conservation strategies to ensure the sustainability of common natural resource pools in agrarian regions of the developing world. This study explores the influence of gender on perceptions of collective action in the *Mahakanumulla* Tank Cascade System, offering unique insights into the socio-cultural aspects that shape conservation behavior in human-curated natural landscapes. A cross-sectional survey was conducted to collect data from 463 households dispersed across six village divisions. The survey focused on three dimensions of collective efficacy: individual self-efficacy, group efficacy in executing collective action, and the efficacy of collaboration in accomplishing shared goals. The study could reveal significant disparities between men and women in their perceptions of a community's potential to sustain collective action. Female respondents assessed their community's capacity to coordinate collective action as comparatively less adequate than their male counterparts. Moreover, there was a strong correlation ($p < 0.01$) between land ownership and collective efficacy, as those who owned land demonstrated higher levels of confidence in their collective endeavors. These findings highlight the importance of adopting more gender-responsive solutions to effectively manage natural resource pools in traditional societies.

Keywords: Collective action, Collective efficacy, Gender-responsive, Natural resource

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Relationship of Perceived Extension Worker Characteristics with the Adoption of Value-Added Technologies by the Beneficiaries

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Adopting novel technologies is essential for developing the agriculture sector. The extension worker plays a major role in this scenario. The association of the perceived characteristics of the extension worker with the adoption of value-added technologies was studied using a questionnaire survey conducted with 200 respondents who participated to value-added technology training programs conducted during 2015 to 2020 by the Anuradhapura and Kurunegala District Centers of the National Institute of Post Harvest Management. The 200 respondents were randomly selected based on strata in attendance lists of the programs and adopter lists present at the institute. Data were analyzed using descriptive and non-parametric statistics. The results revealed that 94.7% of respondents had participated in the training programs because an officer from an organization had requested them to do so. The binary logistic regression showed that when considered alone, all characters, credibility, relationship with extension worker, intelligence, sincerity, resourcefulness, ability to communicate, persuasiveness and development orientedness were significantly associated with the adoption of value-added technologies. When all factors were considered together, only persuasiveness and development-orientedness were significantly associated with adoption. The adopters and non-adopters had perceived the association of each characteristic significantly different, and more than the non-adopters, the adopters significantly felt the extension workers showed persuasiveness and were development-oriented. In conclusion, extension workers' characteristics were associated with the adoption decision related to the value-added technologies of the respondents. Thus, the development of the extension worker characteristics would favour in adoption of value-added technologies by beneficiaries.

Keywords: Adopters, Development orientedness, Non-adopters, Persuasiveness

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Developing Household Wealth Index to Measure the Rubber Smallholders' Household Wealth Status as an Effect of Rubber Farming in Newly Introduced Rubber Areas in Sri Lanka

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This study develops a Household Wealth Index (HWI) to assess the wealth impact of rubber (*Hevea brasiliensis* L.) farming in newly introduced areas in Sri Lanka. Rubber (n=513) and non-rubber (n=600) smallholders in Moneragala and Ampara Districts were selected for this study based on a stratified random sampling technique. Forty two household wealth assets were selected based on literature and discussion with experts and smallholders. Completeness, consistency, and outliers were checked. Assets with frequencies of < 5% and > 95% were excluded. Kaiser-Meyer-Olkin value and Variance-Inflation Factor were 0.9014, 0.3000 respectively, and, Bartlett's Test of Sphericity was at a significance level of 0.000 (<0.05) ($X^2=17087.349$, DF=35). Principal Component Analysis was applied to weigh the HWI with 36 assets. A weighted sum of predicted factor scores coefficients was used to generate a standardized HWI for each smallholder to assess the impact of rubber farming and estimated using the built-in regression method in STATA. Propensity Score Matching (with nearest neighbour matching 1:1) was applied to examine the impact of rubber farming on the outcome of the wealth status of smallholders. The adoption of rubber farming has a positive and statistically significant effect on household wealth by 16.3%. Government policy should focus on the expansion and promotion of rubber farming in the Intermediate zone in Sri Lanka to enhance the wealth status of smallholder households. HWI can be applied to assess the impact of rubber farming in newly rubber-introduced areas in Sri Lanka.

Key words: Non-traditional areas, Socioeconomic status, Well-being

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Classification of Milking Animals Based on Production and Reproductive Performance for Effective Management Decisions: An Approach Using K-Means Clustering

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This study was conducted to determine the feasibility of implementing principal component analysis (PCA) and K-means clustering method for grouping cows in a dairy herd based on their performance on multiple traits related to milk production and reproduction, for implementing need based, group specific management practices. The proposed method was tested on two different management systems, namely System A (Friesian x Jersey crossbreds managed intensively under Low Country Dry Zone) and System B (Sahiwal crossbreds managed semi intensively under Low Country Intermediate Zone). Six large scale state dairy farms were grouped into the two systems with 1507 lactation records of 643 cows belonging to System A and 552 lactation records of 185 cows in System B. Means of calf birth weight, age at first conception, age at first calving, lactation length (LL), total milk production (MP), average daily yield, and calving interval (CI) of System A were significantly superior to the respective means of System B ($p < 0.05$). The PCA used MP, LL and CI traits where all three traits exhibited significant positive pairwise correlations ($p < 0.05$). For both systems, the first two PCs explained over 85% of the total variation of traits. Traits MP and LL played a major component in PC1 (production component) and CI was loaded heavily for PC2 (reproduction component). For both systems, the K-means clustering approach was effective with the three clusters of cows formed within a system showing significant differences for MP, LL and CI ($p < 0.05$), hence can be recommended for commercial dairies in Sri Lanka.

Keywords: Cluster analysis, Crossbred cattle, Management groups, PCA, Selection

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Comparison of Performance of Rice Crop Parameters in Controlled and Commercial Field Estimated from UAV Multispectral Imagery

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Remote measurement of rice crop parameters; leaf-Chlorophyll, above-ground biomass, plant height, leaf moisture and rice yield before the actual harvest are vital for the early management of rice crops. This study was conducted in controlled rice fields and extended to farmer rice fields in the *Maha* season in Sri Lanka. The multispectral aerial images of the field were acquired by an Unmanned Ariel Vehicle (UAV) and processed. Vegetation indices (VIs) were then derived and selected the best combination of VIs explaining the respective ground-measured parameters. The combination of selected VIs showed significant association ($R^2=0.84$, $R^2=0.81$, $R^2=0.63$, $R^2=0.57$, and $R^2=0.98$, Leaf-Chlorophyll, Above-ground biomass, Plant Height, Leaf Moisture, and Rice Yield respectively) with the ground data in the controlled rice field experiment conducted at the Rice Research and Development Institute (RRDI), Bathalagoda, Sri Lanka. When these selected vegetation indices were transferred to a farmer rice field they showed a relationship as $R^2=0.57$, 0.60, 0.41, 0.36, and 0.53 respectively. The vegetation indices derived from UAV-multispectral images were able to associate and estimate the rice crop parameters like Leaf-Chlorophyll, Above-ground biomass and Rice Yield at booting stage and 25 m flying height. Therefore, VIs developed using UAV multispectral imagery to measure Leaf-Chl, AGB, PHt, and RY can perform similar manner across rice fields in different soils, rice varieties, weedy conditions and agronomic practices while LM estimation may affect with those conditions.

Keywords: Farmer field, Multispectral, Pix4D mapper, UAV, Vegetation indices

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Two-Stage Catalytic Activation of Coconut Shell Biochar for Effective Malachite Green Removal from Water

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This study provides scientific insights into the adsorption mechanisms of novel biochar engineered from coconut shells via catalytic conversion with FeCl_3 for the removal of Malachite Green, a cationic dye. It uniquely explores the use of waste-derived engineered biochar as a sustainable adsorbent while revealing the adsorptive removal mechanism. The engineered biochar was prepared with different concentrations (5%, 7%, and 9%) of iron catalyst (FeCl_3) and at different pyrolysis temperatures: 200 °C, 300 °C, and 400 °C with residence time of 4 hours. An adsorption analysis was planned under the set of experimental conditions: dosage 1g/L; pH 6; rpm 150; holding time 72 hours to identify the best-engineered biochar. The adsorptive performance was evaluated using artificially polluted water. The engineered biochar with the high q_e value (amount of adsorbate removed by unit weight of engineered biochar) was selected for detailed analysis. Detailed isotherm analysis, Kinetics study, thermodynamics analysis, and rate-limiting factor analysis were carried out for engineered biochar with higher adsorptive capacity. The biochar treated with 9% FeCl_3 and pyrolysed at 400 °C demonstrated the highest adsorption capacity of 50.20 mg/g for Malachite Green due to increased mineral components and a denser carbon network. Isotherm analysis revealed that the Freundlich model best describe the adsorption behaviour indicating multilayer adsorption. The results of the adsorption kinetic study revealed that the pseudo-second order Accurately fits data, indicating that the chemisorption process plays a significant role in the removal of Malachite Green by 9% coconut shell biochar 400. The adsorption process found to be spontaneous and endothermic. These findings establish that iron-catalyzed engineered biochar is a highly effective adsorbent for dye removal. This innovative approach highlights the value of utilizing coconut shell for the removal of malachite green opens the door to the development of novel strategies for the effective removal of dye at the commercial level.

Keywords: Adsorption, Engineered biochar, Isotherm, Kinetics, Thermodynamics

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Carbon Footprint of Orthodox Black Tea through Life Cycle Assessment: A Case Study of a Medium Scale Tea Factory in Sri Lanka

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Sri Lanka, the third-largest tea exporter, plays a pivotal role in the global tea industry, significantly contributing to the country's economy. This study emphasizes the importance of measuring the carbon footprint of black tea production to meet rising consumer demand for sustainable products. A cradle-to-gate Life Cycle Assessment was conducted for a medium-scale tea factory in Pilimathalawa, which produces black tea using the Orthodox method and sources raw leaves from smallholder farmers. The functional unit was defined as one kilogram of processed tea. Results indicate that the cultivation, processing, and transportation phases contribute 44.35%, 50.49%, and 5.17%, respectively, to the total carbon footprint. Among emission sources Nitrogen fertilizer accounted for the largest share (44.3%), followed by fuel wood (41.67%), electricity (8.42%), and diesel (5.12%). Drying was identified as the most carbon-intensive processing activity, with withering being the second significant hotspot. Green leaf transportation also contributed to emissions. However, factories using estate-grown leaves can reduce this fraction. The study estimated an average carbon footprint of 9.898 kg CO₂ eq/kg of tea, with processing dominating emissions. Despite 85% of energy being renewable, the 81% reliance on externally sourced, often unsustainably harvested fuel wood significantly increased the carbon footprint. The study emphasizes the need for factory-specific strategies to reduce carbon emissions and highlights the lack of Sri Lanka-specific emission factors, recommending future research to address this gap. It also suggests optimizing fertilizer use, adopting energy-efficient equipment, improving processing efficiency, and promoting sustainable forestry practices to mitigate the carbon footprint in tea production.

Keywords: Black tea, Carbon footprint, Energy efficiency, Greenhouse gas, Life cycle assessment

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Vector Autoregressive Modeling between Crop Production Index and Permanent Cropland in Sri Lanka

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Understanding the relationship between the Crop Production Index (CPI) and Permanent Cropland (PCL) is crucial for enhancing food security and economic growth. Despite its importance, , research exploring this relationship, particularly in Sri Lanka, remains limited. This study aims to fill this gap by modelling the dynamic interactions between CPI and PCL using historical data from 1961 to 2018. The analysis began by ensuring stationarity of the data through first differencing, followed by a cointegration test. The results revealed no cointegration between CPI and PCL, justifying the use of a Vector Autoregression (VAR) model. Based on lag selection criteria, an optimal lag length of three was chosen, and a VAR(3) model was subsequently estimated. The VAR(3) model demonstrated a significant relationship between CPI and PCL, providing reliable predictions for 2019 and 2020 ($MAPE_{CPI}=7.0206$, $MAPE_{PCL}=1.2556$). These findings suggest that CPI can be accurately predicted using PCL data, though regular updates to the model are recommended for long-term forecasting accuracy considering emerging trends. This research offers valuable insights into agricultural dynamics in Sri Lanka, serving as a foundation for further studies in similar contexts.

Key Words: VAR Model, Stationarity, Cointegration

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Functional Properties of Insoluble Dietary Fiber Obtained from Ceylon Cinnamon (*Cinnamomum zeylanicum* or *Cinnamomum verum*) Spent Bark Waste

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Cinnamon spent bark waste (CBW), a byproduct of cinnamon oil extraction is produced in large quantities at cinnamon oil distillation plants and creating disposal challenges. This study aimed to extract dietary fiber (DF) from CBW using aqueous, chemical and enzymatic methods and evaluate the functional properties of resulting fiber. Analysis revealed that CBW contains a very low soluble dietary fiber (SDF) but a significantly higher ($p < 0.05$) insoluble dietary fiber (IDF) content (0.84 % and 78.86 % respectively). Consequently, only the IDF fraction was extracted further evaluation of its functional properties including water holding capacity (WHC), water swelling capacity (WSC), oil holding capacity (OHC) and glucose adsorption capacity (GAC). The extraction methods yielded different DF quantities, with water extraction achieving the highest yield (93.87%) and chemical extraction the lowest (70.92%) ($p < 0.05$). Chemically extracted DF exhibited significantly higher ($p < 0.05$) WHC (3.91 g/g) compared to CBW (3.29 g/g). Enzymatically extracted DF demonstrated the highest ($p < 0.05$) WSC (0.90 mL/g) compared to CBW (0.17 mL/g). All extraction methods produced DF with significantly higher ($p < 0.05$) OHC than the original CBW, with chemically extracted DF exhibiting the highest OHC (3.6 g/mL). GAC of fiber extracted by chemical (0.86 mmol/g) and enzymatic (0.35 mmol/g) treatments were significantly higher ($p < 0.05$) than that of water (0.08 mmol/g) extracted fiber and original samples. The results showed that though the DF yield was low, the functional values of DF was higher with chemical extraction than those with enzymatic and water extraction methods.

Keywords: Cellulose, Glucose adsorption, Oil retention, Water holding capacity

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Effect of Polyphenol-Rich Antioxidants Supplementation on Growth Performance and Meat Quality of Broiler Chicken Fed Rice Bran Stored for Extended Time Periods

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This study was conducted to evaluate the effect of polyphenol-rich sugarcane extract concentrations (PRSE) supplementation through feed and water on growth performance and meat quality of broiler chicken fed rice bran stored for 30 days. A total of 120, Cobb500 day-old chicks were randomly assigned into five treatment groups (n=4, 6 birds per replicate). Four groups were fed with one of the four iso-energetic and iso-nitrogenous experimental diets: a control diet with rice bran stored for <24 h (CD); a diet with rice bran stored for 30 days (RB); a diet with rice bran stored for 30 days and 0.02% Bulylated Hydroxytoluene (BHT) (RB+BHT); and a diet with rice bran stored for 30 days and 0.1% PRSE (RB+PRSE_{Diet}). The fifth group was fed with the diet containing rice bran stored for 30 days and supplied 0.5 mL/L PRSE with water (RB+PO_{Water}). The experimental period spanned 35 days. Body weight gain, feed intake, feed conversion ratio were recorded weekly. After slaughter, carcass and breast meat yields, weights and lengths of digestive tract organs were measured, and breast muscle was stored at 4 °C for meat quality and sensory evaluations. Inclusion of PRSE resulted in lower Thiobarbituric Acid Reactive Substances (TBARS) value of feed in 2nd and 5th weeks of the experimental period. However, the birds given antioxidant (BHT and PRSE) together with 30 days old rice bran had no significant influence on growth performance of broiler chicken. The supplementation of the PRSE also caused no favourable changes in the meat quality, particularly the lipid oxidation in meat. Despite these, the meat of the birds supplied with BHT and PRSE were preferred by the sensory panelists. In conclusion, PRSE supplementation, either through the diet (0.1%) or water (0.5 mL/L), had no positive impact on the growth performance and meat quality of broiler chickens fed rice bran stored for 30 days. However, it did enhance the sensory properties of broiler chicken meat.

Key words: Broiler feed, Body weight gain, Lipid oxidation, Sugarcane extract

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Association of Dietary Patterns and Sarcopenia in the Ageing Population in Polonnaruwa District, Sri Lanka: A Cross-Sectional Study

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Sarcopenia involves age-related muscle loss, posing a significant concern for the older people. This study investigates the relationship between dietary patterns and sarcopenia prevalence among the ageing population in the Polonnaruwa district, Sri Lanka. A cross-sectional study was conducted with 150 randomly selected individuals aged 65 and above. Assessments included nutritional status using the Mini Nutritional Assessment-Short form, evaluating dysphagia risk with the EAT-10 tool, and measuring physical activity using the International Physical Activity Questionnaire-Short Form. Sarcopenia was diagnosed using the Asian Working Group for Sarcopenia-2019 (AWGS) criteria, including the SARC-Calf questionnaire, handgrip strength, Skeletal Muscle Mass Index (SMI), and gait speed. Statistical analyses, including logistic regression for the outcome variable (prevalence of sarcopenia) using continuous predictors (age and BMI), and Chi-square tests for categorical predictors (nutritional status and gender), were performed with a significance threshold of 0.05. The average age of the participants was 70 years and 7 months. The prevalence of sarcopenia was 49.6%, affecting 44.6% of males and 52.9% of females. The odds of sarcopenia increased with age (OR: 1.0654, $p > 0.05$) and decreased with higher BMI (OR: 0.7542, $p < 0.05$). Significant associations were observed between sarcopenia and legume consumption, nutritional status, and physical activity levels ($p < 0.05$), and no significant associations were found between sarcopenia and gender, dysphagia, smoking, drinking water, vegetarianism, meat, dairy and alcohol consumption ($p > 0.05$). These findings highlight that adequate nutrition, increased physical activity, and legume consumption may protect against and delay the onset of sarcopenia, suggesting targeted interventions for aging people in Polonnaruwa.

Keywords: Ageing, Dietary patterns, Nutritional status, Prevalence, Sarcopenia

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Quality and Shelf Life of Boiled and Unboiled Palmyrah (*Borassus flabellifer*) Shoot Flour Incorporated Chicken Meatballs During Refrigerated Storage

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Plant-based non-meat ingredients have been studied for decades and recently gained more attraction in the food industry and research communities. The current study was conducted to produce chicken meatballs incorporating boiled-dried (*Plukodiyal*) and dried Palmyrah (*Odiyal*) flour with a focus on reducing manufacturing costs. Chicken meatballs were prepared with two flours as binders at the levels of 5% and 10% (w/w), i.e., Control-without Palmyrah flour, T1- 5% *Odiyal*, T2 -10% *Odiyal*, T3- 5% *Plukodiyal*, 10% *Plukodiyal*. Samples of those treatments were stored at 4±1 °C for five days until further analysis. Sensory properties, proximate composition, physical properties such as processing yield, diameter changes, cooking loss, colour, and microbial properties such as total viable plate count, total yeasts and mould count and total coliform count of meatballs were determined. Moreover, samples of those formulations were subjected to sensory evaluation to obtain the optimum product in terms of aroma, taste, texture, juiciness, and overall acceptability. From the sensory evaluation, the treatments T2 (10% of Palmyrah unboiled flour) and T4 (10% of Palmyrah boiled flour) were found to be superior in terms of taste and overall acceptability ($P < 0.05$). From the physicochemical analysis, T2 was found to be superior in terms of taste, colour, fat content ($3.96 \pm 0.015\%$), crude fibre content ($2.16 \pm 0.055\%$), diameter reduction ($3.27 \pm 0.026\%$), and cost of production for ingredients (LKR.109.36) ($P < 0.05$). Incorporating Palmyrah flours was positively associated with processing yield, moisture retention, diameter reduction, sensory properties, and nutrients such as high crude protein and low fat. Under aerobic refrigerated (4±1 °C) storage, Palmyrah flour incorporated meatballs retained their microbiological quality for up to three days. Results of the present study suggest that Palmyrah has excellent prospects for the formulation of chicken meatballs as a viable alternative to wheat flour.

Keywords: Binder, Chicken meatballs, Palmyrah flour, Plant-based non-meat ingredient

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Nutritional Status of the Lip, Oral Cavity and Pharynx Cancer Patients in Different Stages of the Disease in Sri Lanka

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Cancers of the lip, oral cavity, and pharynx pose significant challenges to patients' nutritional well-being, thereby influencing overall treatment efficacy and quality of life. However, the correlation between nutritional status and cancer stage remains under-explored. This cross-sectional analysis examines the relationship between nutritional health and cancer progression in adults. A convenience sampling strategy was used to recruit 282 adults from a leading oncology institution in Sri Lanka. Eligibility was restricted to individuals aged 18 and above, of any sex, histologically confirmed with lip, oral cavity, or pharynx cancer, and proficient in Sinhala and/or English. Patients with diabetes or other chronic conditions affecting diet were excluded. Nutritional status was evaluated via the Patient-Generated Subjective Global Assessment and anthropometrics was measured using stadiometer and floor scale. Demographic information was obtained using a record sheet. Pearson's Chi-squared test facilitated the statistical interpretation, with $p < 0.05$ as the threshold for significance. Since, p -value of the test static is $p = 0.007$ a significant positive association was found between the cancer progression in the lip, oral cavity and pharynx and the nutritional status of the patients. This study suggests a comprehensive care strategy that includes nutritional evaluation attuned to cancer stage. Since, 49.65% of study population was cachexic, need for a multifaceted management approach for these cancer patients was highlighted. Over 83% of study population has critical need for improved symptom management and/or nutrient intervention options to combat the malnutrition and involuntary weight loss. These insights lay a solid groundwork for crafting precise, research-backed nutritional protocols for this patient group.

Keywords: Cancer progression, Nutritional assessment, Nutritional condition, Oral cancer, Under nutrition

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A Comparative Study of Total Phenolic Content and Antioxidant Activity of Cultivated and Wild *Cinnamomum* Species in Sri Lanka

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Recent scientific evidence confirmed the biochemical superiority of Ceylon cinnamon compared to Cassia cinnamon. Similarly, wild species of cinnamon have also gained attention as useful crop wild relatives. The present study compared the Total Phenolic Content (TPC) and Antioxidant Activity (AOX) of two commercial cultivars and two wild samples of *Cinnamomum verum* and seven endemic wild species found in Sri Lanka named *C. capparucoronade*, *C. litseifolium*, *C. citriodorum*, *C. dubium*, *C. sinharajaense*, *C. rivulorum*, and *C. ovalifolium*. Samples were collected from various agro-ecological regions. The bark powder (phloem layer) was dissolved in methanol and crude was extracted using a rotary evaporator. The results showed significantly higher TPC and AOX in the cultivated varieties. Interestingly *C. verum* has shown significant intra-species variation for TPC and AOX amongst which the highest was shown by *Sri Gemunu* (17.08 mg GAE/100g and 85.1 %) followed by *Sri Wijaya* (15.65 mg GAE/100g, 83.6 %) and the wild sample. Among the wild species, *C. sinharajaense* exhibited the highest TPC and AOX values (10.52 mg GAE/100g and 75.3 %, respectively), followed by *C. capparucoronade* (9.81 mg GAE/100g, 72.6 %) and *C. dubium* (8.29 mg GAE/100g, 71.4 %). These values were not significantly different from those of the wild *C. verum* sample collected from *Noorwood* (10.26 mg GAE/100g, 74.5 %) ($p>0.05$). However, it demonstrated significantly higher TPC and AOX from *Bibila* sample (12.01 mg GAE/100g, 79.5 %) ($p<0.05$). The genus demonstrates a significant inter-species variation in TPC and AOX, with notable high intra-species variation within *C. verum*, *C. sinharajaense*, *C. capparucoronade*, and *C. dubium*. These species demonstrated competitive performance against wild samples of *C. verum*, highlighting the need for their conservation and indicating their potential as promising candidates for future breeding programmes to enhance the pharmaceutical applications of the genus.

Keywords: Ceylon cinnamon, Wild accessions, Total phenolic content, Antioxidant activity

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Effect of Storage Time of Dietary Rice Bran on Growth Performance and Meat Quality of Broiler Chicken

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This study investigated the effects of dietary rice polish storage time on the growth performance and meat quality of broiler chicken. Ninety-six male, Cobb 500, one-day old chicks were randomly allotted into four treatment groups (n=4 and 6 birds per replicate). The birds were fed with one of the four isonitrogenous and isoenergetic experimental diets: control diet (commercial corn-soy based broiler diet without inclusion of rice polish) and three diets containing rice polish stored for <24 hours, 1 week and 30 days. Feed consumption was measured daily, and body weights were measured on day 21 and at the end of the feeding period. After 35 days of feeding period, weights of the carcass & breast muscle, and the weights and lengths of the digestive tract organs were measured. In addition, meat quality parameters were also measured. Diets containing rice polish stored for 1 week and 30 days showed higher TBARS (2-thiobarbituric acid reactive substances) values, indicating higher lipid oxidation. Feeding rice polish stored for 30 days decreased ($P<0.05$) final body weight, weight gain and feed intake, and increased ($P<0.05$) feed conversion ratio compared to the control diet, whereas other diets showed no differences ($P>0.05$) in growth with the control diet. The diet with rice polish stored for 30 days also increased ($P<0.05$) relative digestive tract organ weights and lengths. Furthermore, these birds showed higher ($P<0.05$) TBARS values in meat than the birds fed control diet. There were no significant differences ($P>0.05$) in other meat quality characteristics (cooking loss, drip loss, water holding capacity, pH, color) among the dietary groups. In conclusion, dietary inclusion of rice polish stored for 30 days can negatively affect the growth performance and meat TBARS values in broiler chicken.

Keywords: Body weight gain, Broiler feed, Feed conversion ratio, Meat colour

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A Conceptual Framework to Evaluate the Performance of Multipurpose Cooperative Societies in Sri Lanka

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Multipurpose Cooperative Societies (MPCS) are integral to community development and economic sustainability in Sri Lanka. To enhance their overall performance, a robust evaluation framework is essential. However, their performance is inconsistent, with some failing to reach their full potential, leading to member withdrawal and impacting local economies. This study proposes a conceptual framework to assess MPCS performance, based on a review of 35 journal papers and identified key indicators. The proposed framework includes seven core indicators: sustainability, human resource management, physical resource utilization, management practices, social justice, member responsibilities, and IT adaptation. By integrating these dimensions, the proposed framework aims to provide a structured tool for assessing and enhancing the effectiveness of MPCS. The methodology involves empirical data collection from MPCS across diverse settings in Sri Lanka, employing both quantitative and qualitative approaches to capture the multifaceted nature of cooperative performance. This framework aims to provide a comprehensive tool for evaluating and improving MPCS effectiveness, offering valuable insights for policymakers, cooperative managers, and researchers. Ultimately, this research contributes to a deeper understanding of the performance dynamics within MPCS, supporting their role in rural development and national economic growth. The findings are anticipated to inform future studies and facilitate the optimization of cooperative practices, fostering social and economic advancement within the community they serve.

Keywords: Cooperative effectiveness, Conceptual framework, Performance evaluation, Performance indicators, Sustainability in cooperatives

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Optimization of some Agronomic Practices for Yield Enhancing of Scotch Bonnet Pepper (*Capsicum Chinense* Jacq.) under Controlled Cultivation

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Scotch Bonnet (*Capsicum chinense* L), locally known as “*Nai Miris*”, has gained prominence in Sri Lanka’s Protected Agriculture sector due to its high market value. However, lack of specialized management practices suited to protected culture of this crop is a challenge. This study aimed to optimize the agronomic management practices to enhance yield of Scotch Bonnet grown in polytunnels. The experiment was conducted in Regional Agriculture Research and Development Centre, Bandarawela during *Yala* 2022. Two growth media; medium A (coir dust and partially burned paddy husk mixture) and medium B (topsoil and compost blend), Two plant spacings (75 x 50 cm and 100 x 75 cm) and two pruning management systems (pruned and un-pruned) were tested using split plot design with 4 replicates. Results revealed that plant spacing did not significantly affect the yield of Scotch Bonnet. However, pruning had a negative impact on fruit yield ($p < 0.0123$), where un-pruned plants yielding more, especially in Medium A at 75 x 50 cm spacing (1.048 kg/plant). Medium B produced the highest yield (1.022 kg/plant) with un-pruned plants with 100 x 75 spacing. Growth media ($p=0.0054$) and the interaction between pruning and media t ($p=0.0003$) significantly influenced yield. These findings indicate that selecting optimal growth media and spacing configurations can enhance Scotch Bonnet *Capsicum* production in polytunnels.

Keywords: Agronomic practices, Combination, Performance

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Developing and Validating a Localized SDG Indicator Framework for Uva Province, Sri Lanka

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This study developed and validated a tailored Sustainable Development Goals (SDGs) indicator framework for Uva Province, Sri Lanka, to enhance the localization of SDGs from 2024 to 2029. The unique biodiversity and topographical features of the Uva Province necessitate a tailored approach to the global SDG framework. The study employed a mixed-methods approach, including literature reviews, document analysis, expert consultations, and participatory engagement of diverse stakeholders. The study identified and adapted 131 relevant indicators from the SDG indicator framework (53%) to reflect the specific development priorities of Uva Province, while addressing key challenges such as data gaps and social inequalities. Expert validation workshops included suitability assessment, to identify relevance to the provincial context and the feasibility of data collection, and to reach consensus on a final list of indicators, ensuring the relevance and practical application, and alignment with local development priorities. The findings highlighted the need of moving beyond simple adaptation of global indicators and emphasized the importance of creating a hybrid framework that blends global targets with locally relevant data, priorities, and participation. The findings also revealed that while global indicators are adaptable, they require modifications to fit local contexts, particularly the situations arise due to outdated data and methodological constraints. Recommendations include the integration of SDG targets with provincial budgeting, establishing data repositories, and using the Uva Province framework as a model for other regions. This study provides a practical model for SDG localization which can be replicated by other regions, while addressing key challenges such as data gaps, social inequalities and lack of community engagement.

Keywords: Agenda 2030, Localization, Provincial development indicators, Regional development, Sustainability

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The Influence of Social Capital on Adoption of Conservation Agriculture-based Sustainable Intensification (CASI) Technology by Farmers in Nepal

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This study investigates the role of social capital in the adoption of Conservation Agriculture-based Sustainable Intensification (CASI) technologies by farmers in Nepal. Data from a survey of 337 households comprising 122 CASI adopters and 215 non-adopters in Sunsari and Dhanusha districts were used. The survey assessed other possible explanatory variables such as gender, education, and perceptions of adoption of CASI technologies. Exploratory Factor Analysis (EFA) identified key dimensions of social capital: perceived trust and cohesion and perceived threat to property. Multiple regression analysis revealed that perceived community trust, cohesion, and perceived benefits significantly influence CASI adoption. The analysis showed that gender and education play crucial roles in adoption decisions, with male farmers and those with higher education levels more inclined to adopt CASI technologies. There was also evidence of interaction between gender and education indicating that education can empower women in technology adoption. The study highlights that enhancing social capital, fostering education, and implementing gender-sensitive policies can be effective in promoting CASI adoption among farmers in Nepal. The findings offer valuable insights for policymakers in developing targeted interventions to encourage sustainable agricultural practices.

Keywords: Adoption, Conservation agriculture-based sustainable intensification (CASI), Nepal, Social capital

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Effect of Different Cutting Styles on the Quality of Fresh-Cut Carrots (*Daucus carota* L.)

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Carrots (*Daucus carota* L.), a commonly consumed root vegetable in Sri Lanka, have shown a growing demand as fresh-cut products due to convenience and health benefits. However, as it can result in food-borne illnesses, microbial contamination of fresh-cut vegetables poses a serious threat to public health. According to consumer surveys, the majority of consumers prefer fresh produce that has been naturally cleaned using organic acids. In commercial production, it is important to determine the best cutting shapes that provide optimum quality characteristics for a longer shelf life. This study evaluated the impact of different cutting styles (small diced, batons, shredded) on the physical and microbial quality of fresh-cut carrots treated with 1% citric acid and stored at 4°C for 10 days. The weight loss, color (L^* , a^* , b^*), pH, and total soluble solids (TSS) of the samples were assessed on the day of processing, day 5 and day 10. Results showed that cutting styles significantly influenced the weight loss, color and pH of fresh-cut carrots. The shredded samples had the highest weight loss (up to 8% by day 10), while batons showed the lowest (3%). Batons retained color better than shredded and diced cuts ($p < 0.05$). Citric acid treatment effectively preserved overall quality compared to distilled water and control treatments. These findings suggest that optimizing cutting style and incorporating citric acid treatment can extend the shelf life and quality of fresh-cut carrots, catering to the growing demand for fresh produce.

Keywords: Carrot, Citric acid, Cutting styles, Physical characteristics

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Quality Changes of Fresh Diced Carrots (*Daucus carota* L.) Treated with Organic Acids during Refrigerated Storage

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The increasing consumer demand for minimally processed vegetables necessitates effective preservation method to maintain the overall quality during storage. Therefore, this study investigated the effect of citric and acetic acid treatment on the quality characteristics of fresh cut carrots during refrigerated storage. The cleaned, and diced carrots were dipped in 1% citric acid, 1% acetic acid or distilled water (control) for 5 mins, drip dried, and stored at 4 °C. The colour (L, a, b and whiteness index), pH, total soluble solids (TSS), total aerobic plate count (APC) and sensory characteristics were assessed at 0, 5 and 10 days. The APC of both treated samples were significantly low (citric acid = 9.1×10^4 CFU/g, and acetic acid = 5.9×10^4 CFU/g) compared to the control samples (13×10^4 CFU/g). Results also indicated that both organic acid treatments had significantly different color profiles, compared to the control ($p < 0.05$) during the storage period. Notably, citric acid treatment effectively maintained the lightness of the carrots over time, while acetic acid treatment showed initial color degradation. Sensory evaluations revealed that at day 0, there was a significantly lower acceptance for two treated samples compared to the control ($p < 0.05$). However, there was no significant difference in the consumer acceptability between the samples by day 10. Even though the organic acid treatments significantly improved the microbial quality of diced carrots, the treatments could have a negative impact on the sensory properties. Thus, more research is needed to optimize the treatment conditions to improve the sensory parameters.

Keywords: Acetic acid, Aerobic plate count, Citric acid, Physical characteristics, Sensory evaluation

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Keynote Address & Panel Discussion

KEYNOTE ADDRESS

A system approach to precision agriculture

Prof. Viacheslav Adamchuk

Department of Bioresource Engineering
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PANEL DISCUSSION

Precision Agriculture Towards Resilient Food Systems

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THIRTY-SIXTH ANNUAL CONGRESS - 2024

The Director PGIA and the Coordinator extend their sincere appreciation to the following for the assistance provided in numerous ways to make the 36th Annual Congress a success.

- Chief Guest, HE. Mr. Eric Walsh, the Canadian High Commissioner in Sri Lanka, and the Maldives
- Keynote speaker, Prof. Viacheslav Adamchuk, Professor and Chair, Department of Bioresource Engineering, McGill University, Canada.
- Invited speakers of the panel discussion, Mr. Nalin Munasinghe, Assistant Representative, Food & Agriculture Organization of the United Nations, Mr. Mizuno Tsuyoshi, The Representative, Japan International Cooperation Agency, Dr. Buddika Hapuarachchi, United Nations Development Programme, Mr. Abdur Rahim Siddiqui, The Country Director, World Food Program, and Dr. Athula Senarathne, World Bank.
- Invited Alumni speaker, Dr. Shamen Vidanage, Country Representative, International Union for Conservation of Nature
- Prof. Terrence Madujith, the Vice Chancellor of the University of Peradeniya
- Prof. B. C. Jayawardana, the Dean of the Faculty of Agriculture, University of Peradeniya
- Academic staff members of the Faculty of Agriculture, University of Peradeniya
- Chairpersons and Secretaries of all Boards of Studies of the PGIA
- Deputy Registrar, Senior Assistant Bursar and the staff of the PGIA
- Chairpersons of Sub-committees and members of the Organizing Committee of the 36th PGIA Annual Congress
- Authors of papers
- Panel of reviewers
- Editorial Board of the journal of ‘Tropical Agricultural Research’
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