INTERNATIONAL CONFERENCE ON AGRICULTURE AND PLANTATION MANAGEMENT

INTERNATIONAL CONFERENCE ON AGRICULTURE AND PLANTATION MANAGEMENT

16 – 18 MAY 2025

PROCEEDINGS

Faculty of Agriculture and Plantation Management
Makandura, Sri Lanka

Proceedings of the International Conference on Agriculture and Plantation Management

16 - 18 May 2025
Makandura, Sri Lanka

Responsibilities for the content of the abstracts included in this publication remain with the respective authors. All abstracts were printed after peer reviewing and editorial corrections for uniformity.

ISBN 978-624-6674-07-6

Printed by Vidyalankara Press, Kelaniya, Sri Lanka

Cover Design
Nimesh Dananjana

Editorial Assistance
Shenaz Amath
Janith Bandara
Rashmi Kumarasinghe

Proceedings of the
International Conference on
Agriculture and Plantation Management

Editorial Board

Contents

High-Tech Agricultural Production

Silvopasture System: A Green Climate Solution 3
Herath H. M. I. K., Mclaren S. and Fletcher A.

Blueberry Maturity Detection and Counting *via* Multi-stage Visual Perception and Machine Learning 4
Wang H., Wang L., Zhao L., Gu H., Wan X. and Wang Q.

Effects of Solar-Powered LED Lighting on the Growth and Quality of Nursery Tea Plants 5
Wijesinghe R. J., Weerarathna I. D., Ekanayake J. B., Samaranayake L., Mohotti K. M., Kumarihami H. M. P. C., Damayanthi M. M. N., Indramali O. S., Suriyagoda L. D. B., Benaragama C. K. and Mohotti A. J.

Impact of Magnesium Oxide and Copper Oxide Nanoparticle Dispersions on Surface Sterilisation of *Sansevieria trifasciata* L. for Micropropagation 6
Gimhani H. N. C., Withana H. N., Kandanapitiya M. S. and Kottearachchi N. S.

Globally Ultra-Trace Intelligent Detection of Hydrazine in Eco-Environment with Ratiometric Fluorescent Bioimaging 7
Li X. and Hao G.

GIS-based Land Suitability Model for Cinnamon in the Mahaweli H System in Sri Lanka 8
Wimalasiri E. M., De Soysa E. J. S. and Mendis H. S. C.

Development of an *In vitro* Protocol for Efficient Shoot Proliferation in *Murraya koenigii* 9
Premasiri W. M. A. C., Fonseka D. L. C. K. and Terensan S.

Host Plant Associations of Aphid Species (Aphididae) in the Garden of University of Peradeniya, Sri Lanka 10
Dilanka L. B. T. and Jayasinghe W. H.

ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Yield and Soil Fertility in a Paddy Cultivated Vertisol Amended with Rice Husk Biochar or Compost 11
Lewkebandara H. G., Manamperi N. P., Gunawardhana D., Munasinghe T. and Dharmakeerthi R. S.

Classification of Cinnamon (*Cinnamomum verum*) Leaf Diseases and Pests Using Transfer Learning 12
Senanayake M. M. V. and De Silva N. M. T.

Impact of Hardness of Irrigation Water on Growth and Yield of Gherkin (*Cucumis sativus* L.) 13
Piyumal M. D. R., Wijesuriya W. M. H. H., Kumarasinghe H. K. M. S. and Sampath K. H. H. U.

Evaluating the Potential of Biogenic Hydrolysates to Enhance Lettuce (*Lactuca sativa* L.) Productivity and Soil Health 14
Karunarathne J. M. G. M. T., Fernando D. H. M. L., Wang L., Weerarathna E. K. W. W. and Kandegama W. M. W. W.

Utilising UAV-based Vegetation Indices to Predict SPAD Values in Paddy Rice Fields 15
Fonseka C. L. I. S., Hewagamagea K. P., Rathnayake U., Halloluwa T. and Bandara R. M. U. S.

An Automated Ripeness and Surface Defect Detection System for Pineapple 16
Weragoda W. G. D. R. S. and Gonagala K. B.

Design, Synthesis, Biological Activity and Mechanism Study of 1,3,4-Oxadiazole Sulfonamide Derivatives 17
Ren X., Ruan R., Wang F., Zhou X. and Jin L.

Effects of Various Growing Media and Harvesting Periods on Yield and Quality Parameters of Mustard (*Brassica juncea*) Microgreens 18
Samarakoon D. M. A. D., Ranasinghe A., Herath U. S. and Egodawatta W. C. P.

***In vitro* Propagation of *Flueggea leucopyrus* (*Katupila*) Through Nodal Cultures** 19
Prasadini W. G. D., Madushani W. G. I. and Fonseka D. L. C. K.

Effectiveness of Organomineral Nutrient Sources: Biosolids and Sugarcane Filter Cake on Okra Production and Physicochemical Properties of Sandy Regosols 20
Kosgallane M. P. and Premanandarajah P.

Impact of Silicon Application on Yield and Quality of Salad Cucumber (*Cucumis sativus* L.) Under Protected Culture 21
Wimalasiri E. M., Kodikara K. M. S. and Prasadi B. A. D.

Nutrient Budgeting for Cashew Plantations in Sri Lanka: Addressing Yield Gaps Through Optimised Nutrient Supply 22
Guruge K. C., Herath H. M. I. K. and Herath H. M. S. P.

ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Evaluating the Effectiveness of a Compound Fertiliser on Grain Yield of Paddy Cultivated in Dry Zone of Sri Lanka 23
Vibhushana W. G. C., Kulasiri A. H. and Gamage D. N. V.

Determining the Growth and Yield Performance of Seasonal Crops Cultivated Using Fish Hydrolysate Liquid Fertiliser 24
Kandegama W. M. W. W., Karunarathne J. M. G. M. T., Weerarathna E. K. W. W., Chen W., Weerakkody G. K. and Dasanayake A. D. S. L.

Design, Synthesis, Biological Activity and Mechanism of Action of Streptochlorin Derivatives 25
Duan F. and Zhang M.

Chromosome-level Genome Assembly of the Hairy-legged Leaf Beetle (*Colaspoides femoralis*) 26
Zhang Q., Wei C., Li S., Dassanayaka S. M., Zhou X. and Jin L.

Effect of Standing Water Level on Rodent Damage in Rice Fields of Sri Lanka 27
Sarathchandra S. R., Nugaliyadde L., Hemachandra K. S., Sandadevani K. S., Jayaweera M. P. H. K. and Dilanka L. B. T.

A Web Platform to Facilitate the Ecological and Environmental Risk Evaluation of Pesticides 28
Chen D.Y. and Hao G. F.

Multimodal Big Data Facilitates Early Plant Disease Diagnosis 29
Wu X., Wang Q. and Hao G.

AI-Powered Long-Tail Disease Management for Smallholders 30
Liu Y., Wu X., Zhang D. and Wan Q.

Control Efficacy of the Novel Isoxazoline Insecticide Fluxametamide against Lepidopteran Pests in China 31
Chen Z. Y., Han Y. and Wang Z. Y.

Molecular Recognition Facilitates the Precision Delivery of Nanomaterials and Their Cargo in Plants 32
Senosy I., Kandegama W. M. W. W. and Hao G.

Plant Disease Diagnosis Agent: A Multimodal Large Language Model-Powered AI System for Automatic Plant Disease Diagnosis 33
Qin L., Wu X., Dong X., Wang H., Yang T. and Wang Q.

Genome-wide Profiling and Stress-responsive Functional Study of U-box E3 Genes in Tea Plant Using Transgenic Tobacco 34
Li S., Zhao G., Zhang Q. and Jin L.

Formula Optimisation of Liquid Medium for Culturing the Entomopathogenic Nematode *Steinernema carpocapsae* Strain All (Rhabditida: Steinernematidae) 35
Tian J. Y., Zhao G. Y., Zhou X., Hu F., Shao K. M., Dassanayaka S. M. and Jin L. H.

ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Study on Lead Optimisation and Antifungal Activity of Natural Product Streptochlorin 36
Duan F. and Zhang M.

Application of Entomopathogenic Nematode Modified Root-associated Microbial Community in Controlling Chive Gnats (*Bradysia odoriphaga*) 37
Zhao G., Tang R., Guo W., Zhou X., Hu F., Dasanayaka D., Kandegama W. M. W. W. and Jin L.

Chemical Properties and Nutrient Dynamics of Different Potting Media Before and After Raising Turmeric Nursery Plants 38
Jayaweera W.M.C.S., Amarasinghe S. R. and Ranawake A. L.

Varietal Innovations and Seeds

An Indel in the Promoter of *CsFGT* Determines Quercetin Tri-glycoside Content in Different Germplasm of *Camellia sinensis* 41
Zhang W., Fang Z., Zheng X., Ye J. and Lu J.

Establishment of Virus-induced Gene Silencing System in Tea Plant and Its Application in Gene Function Exploration 42
Chi N., Zheng X., Zhao D., Liang Y. R. and Lu J.

The *CsLHCB1.1* is Responsible for Temperature Sensitivity and Leaf Color Phenotype in Albino Tea Plant 43
Ye J. J., Lu J. L., Liang Y. R. and Zheng X. Q.

Physiological Response Mechanisms of the Tea Plant (*Camellia sinensis* L.) under Drought Stress 44
Zhang X. H., Huang L. Y., Lu J. L., Liang Y. R. and Zheng X. Q.

Characterization and Evaluation of Brinjal (*Solanum melongena* L.) Germplasm for Yield, Quality, and Resistance to Bacterial Wilt 45
Premadasa A. G. S. K., Pathirana M. G. S. P., Kusalani T. L. C. N., Herath H. M. S. N. and Jayaprada N. V. T.

Potential of Callus Induction and Plant Regeneration of Ugandan Rice Genotypes through Anther Culture 46
Buttibwa M., Eyokia M., Baguma J. K., Wagaba H., Lamo J. and Tugume A.

Micropropagation of Banana (*Musa* Spp.) using Nanoparticles: A Sustainable Approach for Clonal Propagation 47
Anasooya R., Thiruchchelvan N. and Mikunthan G.

Detection of Rice Blast Resistance Genes in *Attakkari* Rice Cultivar 48
Kishanthan A., Terensan S., Gajapathy K. and Ponnegipprenthiraraja A.

ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Exploring Nucleotide Variants Related to Salt Tolerance Mechanisms in Two Different *Indica* Rice Varieties 49
Kumarasiri L. P. M., Pathirana R. P. P. S., Amath S. M. and Kottearachchi N. S.

Unravelling the Mystery of Grain Filling: A Molecular Approach for Manipulation of Yield Enhancement in Rice for Boosting Farmers' Economy 50
Kariali E.

Cryo-EM Reveals Eukaryotic CIII Subunit Dynamics and Catalytic Efficiency 51
Chen Q., Lin H. and Ye Y.

Optimal Planting Density for Sustainable Cashew (*Anacardium occidentale* L.) Production in the Dry Zone (DL3) of Sri Lanka 52
Jayawardana H. M. A. S., Wijetunge P. M. A. P. K., Liyanarachchi H. L. A. N. T., Jayasekara S. J. B. A., Attanayaka D. P. S. T. G., Abeysinghe D. C. and Wijesuriya W.

Exploring the Binding Interactions of Potential Bioactive Agents in *Aegle marmelos* Against *Leishmania*: A Molecular Docking and ADME-Tox Study 53
Kaviththira P. and Fernando T. D.

Response of Interploidy Crosses on Seed Formation and Ploidy Levels of Progeny in Citrus 54
Song K. J., Oh E. U. and Han S.

Insights into DNA Barcoding and RNA Secondary Structure Predictions: Probing Genetic Discrimination among Wild and Cultivated Species of Various Horticultural Crops 55
Sahoo M. R.

Farmer Survey Reveals Gaps in Cassava Value Chain in Uganda 56
Buttibwa M., Namakula B. F., Wagaba H., Onyango S., Asio M. T., Ojara N. and Kilalo D.

Effect of *Gliricidia sepium* (Jacq.) Mulch on the Vegetative Growth of Cinnamon (*Cinnamomum verum*) Variety *Sri Gemunu* under Greenhouse Conditions 57
Sandamini P. K. D., Ranawaka R. A. A. K. and Geekiyanage S.

Innovative Food Processing Technologies

Fractionation of Polysaccharides from Brown Seaweeds (*Sargassum*) Species in Sri Lanka and Evaluation of Antioxidant Activity 61
Nimesha H. J. R., Awanthi M. G. G. and Jayasinghe P. S.

Characterization of Chemically and Physically Modified Cassava Starch and Their Applications in Food Models 62
Dissanayake D. M. P. K. G. N. D., Ranathunga R. A. A., Perumpuli P. A. B. N. and Hennayake H. M. N. D. B.

ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Suitability Evaluation of Different Tea Cultivars (*Camellia sinensis* (L.) Kuntze) for Manufacturing Pingyang Huangtang 63
Wu S., Hu S., Zheng, X., Liang, Y. and Lu J.

Physicochemical Characterization of a Goat Milk-Cow Milk Blended Yoghurt Supplemented with Probiotics and Coconut (*Cocos nucifera*) Treacle During Refrigerated Storage 64
Herath H. M. S. W. K. and Rasika D. M. D.

Quality Parameters of Dietary Fibre Concentrates Obtained from Coconut Kernel Residue, Banana Peels and Pineapple Peels 65
Kularathna E. N. T., Bandara, B. G. R. R., Fernando G. S. N. and Yalegama, L. L. W. C.

Application of Modified Tapioca Starch as a Binder in the Development of Gluten-Free Chicken Meatballs 66
Indumini M. V. C., Gunaratne A. and Gunathilaka L. A. C.

Formulation and Clinical Evaluation of a Herbal Tea with Hypotensive Benefits Using *Rauvolfia serpentine*, *Crateva adansonii* and *Terminalia arjuna* as Key Ingredients 67
Rangika R. N., Bokanda B. W. G. V. V., Bandara K. M. N. P. K., Darvin S. S., Karunarathne M. D. K., Wimalakeerthi W. M. B. and K. M. S. K. A. Dehideniya

Physicochemical, Techno-Functional and Antioxidant Properties of Palmyrah (*Borassus flabellifer* L.) Tuber Flour and Wheat (*Triticum aestivum*) Flour Blends and Their Applicability in Pizza Base 68
Akshana R. S., Balakrishna P., Robika K., Sajiwanie J. W. A. and Srivijeindran S.

Development of Fish Burger Patty from Silver Carp (*Hypophthalmichthys molitrix*) and Evaluate Its Quality Parameters 69
Ranasinghe B.G.R.T., Sanuja R.G., Fernando G.S.N. and Rathnapala J.M.S.N.

Exploring the Influence of Selected Sri Lankan Sweet Potato Cultivars and Frying Techniques on the Development of Sweet Potato Kenpi 70
Thudugala P. K., Perumpuli P. A. B. N. and Fernando H. R. P.

Optimization of Fermentation Time to Enhance Antioxidant Activity, Flavonoid Content, and pH of a Beverage Developed Using *Coffea arabica* Seed and Pulp Powder 71
Abijah P. and Hettiarachchi H. A. P. W.

Anti-Inflammatory and Antioxidant Activity of *Agaricus bisporus* and *Lentinula edodes*, Two Edible Mushrooms Cultivated in Sri Lanka 72
Pabasara G. V. S., Fernando M. D. M. and Abeysekera W. K. S. M.

Enhancing Flavour and Nutritional Value of Mandarin (*Citrus nobilis*) Jelly Using Natural Pectin and Rambutan (*Nephelium lappaceum* L.) Flakes 73
Samaranayake K. G. D., Liyanage G. L. R. P. and Senarathne S. M. A. C. U.

Efficacy of Wax Coatings in Extending the Storage Life and Postharvest Quality Management in 'Tom EJC' Mangoes in Sri Lanka 74

ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Muthumal T. G. M., Jayarathne D. G. D. D. S., Dissanayake P. K., Sewwandi D. D. P., Ekman J., Tan D. K. Y. and Hewajulige I. G. N.

Antioxidant Potential of Underutilized Flours: A Comparative Analysis with Refined Wheat Flour 75
Nirmani N. S., Jayathilake C., Liyanage R., Wickamasinghe I. and Jayasinghe M. A.

Effect of Probiotics and Coconut Treacle on Microbial and Organoleptic Properties of Yoghurt Made from Cow and Goat Milk Blend 76
Tissera W. M. W. and Rasika D. M. D.

Effects of Concentration and Processing Conditions on the Stability of *Bacopa monnieri* and Virgin Coconut Oil-in-Water Emulsion 77
Binduhewa A. M. C. U., Ranasinghe P. and Godakumbura P. I.

Evaluating the Feasibility of Iron Fortification into the Rice Grains through Parboiling Process 78
Gunathilaka M. D. K. A., Herath H. M. T. and Fernando G. S. N.

Effect of Oil Extraction on Proximate Composition of Sesame Seeds of Two Varieties: *Uma* and ANKSE3 79
Sazna M. F. F., Fahmidha H. F., Madujith T. and Marikkar J. M. N.

Development of Butterfly Pea Flower-Enriched Cosmetic Formulation for Industrial Application 80
Weerasiri K. P. A. K., Liyanaarachchi G. D. and Kottearachchi N. S.

Development and Evaluation of a Dairy-Based Ready-to-Serve Beverage Supplemented with Probiotics and Blue Pea Flower (*Clitoria ternatea*) Extract 81
Weerasekara N. P. M. S. and Rasika D. M. D.

Evaluation of Bacteriocin Production from *Lactococcus* sp. and Their Potential as Biopreservatives 82
Gupta C.

Formulation and Development of an Alcoholic Tea Beverage Using Tea Leaves (*Camellia sinensis* L.) 83
Wijewickrama H. A. S., Kaushalya K. C., Premachandra E. G. S. M., Wijewardhana U. S. and Jeewanthi P. B. D.

Effect of Backslopping on Quality Attributes of Buffalo Milk Curd 84
Kalpani D. K. S. and Rasika D. M. D.

Physicochemical, Microbial and Organoleptic Evaluation of Yoghurt Made of Cow and Goat Milk Blend Supplemented with Probiotics and Blue Pea Flower Extract 85
Vihangi R. G. M. and Rasika D. M. D.

Examining the Effect of Vinegar and Salt in the Screw Chiller on Broiler Meat Quality 86
Kannanthudawa K. V. G, Gunarathne D. M. A., Jayasooriya M. C. N. and Senanayake M. P.

ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Urban Consumers' Perception Towards Healthy Snacks (Jackfruit Chips) in Homagama Area, Sri Lanka 87
Elapatha G. S., Premarathna K. G. S. S., Pathmasiri P. A. M., Sandaruwan M. A. T. and Sandamali W. H. P.

Development of Vegan Sausage Incorporating Button Mushroom Stems and Assessment of Physicochemical and Sensory Properties 88
Ekanayake L. D. S. and Pathiraje P. M. H. D.

Developing Blooming Tea Infused with *Madhuca longifolia* Flowers: A Novel Approach to Diversifying Sri Lanka's Tea Offerings 89
Hapugaswaththa H. M. S. S., Idamgedara C. M. and Rajapaksha D. S. W.

***Odiyal Kool*: Jaffna's Traditional Functional Food** 90
Rakulini S.

Dietary Intake and Nutritional Status of the Adolescents in a Selected School in Kurunegala District 91
Premasiri S. B. W. D., Rathnayaka R. M. D. J., Bhagya K. A. D. L., Waidyarathna G. R. N. N. and Udayakumari L. A. M. H.

Do Levels in Hedonic Scaling Have an Effect on the Sensory Preference for Solid and Liquid Foods in Food Sensory Evaluation? 92
Jans H. M. and Abeysuriya A.P. H. I.

Microorganisms in Agro-Industry and Environment

Biological Management of Basal Rot of Onion by Soil Amendment with *Sisymbrium irio* and *Trichoderma* Species 95
Javaid A., Akhtar R. and Shoaib A.

Detection of Common Virus Diseases of Passionfruit (*Passiflora edulis*) in Colombo and Kalutara Districts in Sri Lanka 96
Jayarathne D. G. D. D. S., Basnayake B. M. V. S., Tharindi P. W. M., Aluthge A. D. R. P. and Dissanayake M. L. M. C.

Isolation, Detection and Antibiotic Sensitivity of *Listeria monocytogenes* in Pasteurized Milk Collected from Colombo District, Sri Lanka 97
Shanu M. S. F., Thalpavila T. S., Silva D. A. D. V. and Wijendra W. A. S.

Biological Characteristics of *Alternaria alternata* Strain JM and the Potential as a Biocontrol Agent for *Descurainia sophia* 98
Li J. Y., Sun X. Y., Jiang B., Lyu Q. H., Liu G. P., Bai S. and Li L. X.

***Trichoderma virens* as an Effective Biological Control Agent Against *Rigidoporus microporus*, the Causative Agent of White Root Disease in Rubber (*Hevea brasiliensis*) Plantations** 99
Fernando T. H. P. S. and Aberathne A. H. M. N. R.

ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Properties and Potentials of Mycelium-Based Composites Developed by *Pleurotus ostreatus* and, *Schizophyllum* sp., on Textile Wastes for Bio-based Packaging 100
Tharaka K. S. and Athukorala A. D. S. N. P.

Microbiome Associated with Acute Parkia roxburghii G. Don Decline in the North-Eastern Hill Region of India 101
Dasgupta M., Sapam R. and Sahoo M. R.

Seasonal Variation of Microbial Community in Paddy Fields Under Organic and Conventional Farming: A Case Study from Sri Lanka 102
Premachandra M. V. N., Boyagoda S. H., Gunaratne A. M. T. A., Abeysundara H. T. K., Madawala H. M. S. P. and Nanayakkara B. S.

Antibacterial Activity of Pomelo (*Citrus maxima*) Peel Extracts Against Fish Pathogenic Bacteria, *Vibrio parahaemolyticus* and *Pseudomonas aeruginosa* 103
Galappaththi S. V., Costa A. M. K. C. J. and Rathnapala J. M. S. N.

Antimicrobial and Weedicidal Potential of Crude Acetone Extracts of Selected Lichen Species in Sri Lanka 104
De Silva A. C. L., Athukorala A. D. S. N. P. and Gunawardana W. G. D. I.

Characterization of Antimicrobial Lipophilic Constituents in Wild *Pleurotus ostreatus* from Murree Hills, Pakistan 105
Asif U., Akbar M. and Khalil T.

Effect of *Trichoderma* sp. for the Management of Banana Anthracnose Caused by *Colletotrichum musae* 106
Madhushani D. R. I., Ferdinand J. J. M. N. and Rienzie K. D. R. C.

Arbuscular Mycorrhizal Fungi Drive Mulberry Root Nitrogen Uptake via Soil Microbial Mechanisms 107
Wu Z. and Zhang H.

Isolation and Identification of Native Entomopathogenic Fungi from Mycotic Insect Cadavers 108
Gunasekara M. S., Bamunuarachchige T. C., Hettiarachchi D. K., and Wijayawardene N. N.

Isolation, Identification and Characterization of *Microalgae Chlorella* sp. from Palm Oil Mill Effluent (POME) Ponds for Biotreatment of Wastewater 109
Indumini U. A. R., Balasooriya B. L. W. K., Bandara N. G. C. A. and Rathnayake R. M. D.

Effects of Autoclaved Aerated Concrete (AAC) on N_2O Emissions from Paddy Soil Under Laboratory Aerobic Conditions 110
Rathnayake N. R. R. W. S., Leelamanie D. A. L. and Liyanage T. D. P.

Evaluating *Bacillus subtilis* and *Trichoderma* sp. as Biological Control Agents for Controlling Post-Harvest Rhizopus Rot in Tomato 111
Ferdinand J. J. M. N., Madhushani D. R. I. and Rienzie K. D. R. C.

ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Prevalence and Antimicrobial Resistance Patterns of *Listeria* monocytogenes in Raw Milk Samples Collected from Colombo District, Sri Lanka 112
De Silva D. A. D. V., Weerasinghe O. T., Shanu M. S. F., Harshani H. B. C. and Wijendra W. A. S.

Effect of Brewing on Reducing Microbial Load of Black Tea 113
Amarasena N. D. U. D., Hettiarachchi H. A. P. W., Nagahawaththa N. K. M. C. and Maduwanthi S. D. T.

Plant-Microbial Interactions through Root and Leaf Exudates 114
Changxin-Yang, Shijie-Chen and Gefei-Hao

Patterns of Microbial Activity and Total Organic Carbon in The Farmer Field Soils in Northern Region of Sri Lanka 115
Jayasumana A. H. A. R., Kirisan A. and Gnanavelrajah N.

Applying *Aspergillus niger* as a Phosphorus Solubilizer with Combination of Rock Phosphates for Seed Germination in Tomato 116
Weerakoon W. M. R. W., Pitawala H. M. T. G. A. and Suriyagoda L. D. B.

Green Synthesis of Silver Nanoparticles, Phytochemical Profiling and Antimicrobial Activity of Leaf Extracts from *Passiflora quadrangularis* and *Cyanometra cauliflora* 117
M. J. A. Yaazmin, T. Manoranjan And A. C. Thavaranjit

Aesthetic Agriculture and Environment

Performance Evaluation of Marigold (*Tagetes erecta* L.) Varieties for Yield-related Parameters 121
Attanayake A. M. A. S., Eeswara J. P. and Kumari S. S.

A GIS-based Analysis of the Coral Reef Ecosystems in Sri Lanka 122
Madhubhashini E. T. S.

Efficacy of Selected Botanicals against Aphid (*Myzus persicae*) in Laboratory Conditions 123
Thalagala T. D. V. and Hemachandra K. S.

Allelopathic Potential of Dryland Plant Extracts Combined with Reduced Herbicide Dose as Pre-emergence Application against Purple Nutsedge (*Cyperus rotundus* L.) 124
Iqbal J., Aimen S., Aziz A. and Javaid M. H.

Application of Soft Computing Techniques for Soil Salinity Estimation in Native Paddy Cultivation of Sri Lanka 125
Premathilake K. C. M. C. and Premarathne U. S.

Chemical Nutrient Status of Soils in Different Drainage Blocks in Research Farm at Puliyankulama, Anuradhapura, Sri Lanka 126

ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Silva M. D. S. and Duminda D. M. S.

Assessing Bird Biodiversity and Ecological Significance across Anthropogenic Landscapes in the *Mathatilla* River Valley, Sri Lanka 127
Chathuranga H. N., Senanayake F. R., Sankalana K. M. V., Chandana M. K. L. and De Zoysa D.

Enhancing Okra (*Abelmoschus esculentus* L.) Production through a Pollinator Habitat 128
Kusumsiri W. B. U., Yakandawala K., Wijetunga A. D. M. A. K. and Herath H. M. D. N.

Phytochemical Profiling and Antibacterial Activity of Essential Oil of *Dombeya spectabilis* Leaves from Pakistan 129
Ferdosi M. F. H. and Javaid A.

Predicting Climate Change Impact on *Lagenandra praetermissa* Distribution 130
Madola I., Yakandawala K., Karunarathne S. B. and Yakandawala D. M. D.

Evaluation of Phenol Content and Development of Herbal Sunscreen Formulations using *Thespesia populnea* (L.) Sol. ex Corrêa, *Cascabela thevetia* (L.) Lippold and *Abutilon indicum* (L.) Sweet 131
Nifla M. R. F. and Manoranjan T.

Potential Agrochemical Pollution in Selected Dry Zone Reservoirs in Sri Lanka 132
Lakchani D. T., Jayasinghe U. A. D., Maithreepala R. A. and Ulrich U.

Characterization of Aromatic, Morphological, and Genetic Diversity in Mexican Mint (*Plectranthus amboinicus*) for Sustainable Fragrance and Medicinal Applications 133
Anushika C. M., Terensan S. and Gajapathy K.

Morphological and Molecular Analysis of Ant Mouthparts to Explore Functional and Evolutionary Adaptations 134
Sulakshana T., Terensan S. and Gajapathy K.

Effectiveness of Insecticides for the Control of Cashew Stem and Root Borer (*Plocaederus ferrugineus* L.) 135
Jayawardana H. M. A. S., Wijetunge P. M. A. P. K., Liyanarachchi H. L. A. N. T., Ranaweera B. and Wijesuriya W.

Exploring the Potential Application of Jellyfish Blooms as an Organic Fertilizer 136
Samaraweera V. D., Dissanayake D. C. T. and De Silva S. H. N. P.

Efficacy of Application Frequency of Monocrotophos on Controlling *Plocaederus ferrugineus* L. in Cashew 137
Jayawardana H. M. A. S., Wijetunge P. M. A. P. K., Liyanarachchi H. L. A. N. T., Ranaweera B. and Wijesuriya W.

ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Intercropping Increases Pollinator Visits, Conspecific Pollen Deposition, and Yield in Okra (*Abelmoschus esculentus*) 138
Vidanapathirana P. S., Wijesinghe S. A. E. C., Jayamanne D. and Dasanthi H. P. M.

Animal Production Systems and Industry Trends

Cool Wrap Technology for Milk Canisters: Preserving Raw Milk Microbial Quality during Transportation by Smallholder Dairy Farmers in Sri Lanka 141
Praveen C. and Kodithuwakku K. A. H. T.

Optimizing Water Quality Stability, Fish Health and Survival in Aquaculture through Probiotic and Herbal Feed Additives 142
Lageeshan V., Pushpitha N. P. G. and Haakkil N. M.

The Effect of Hen Age on Egg Weight, Hatching Performance, Length and Weight of Chicks 143
Perera P. H. K., Ranaweera A. L. and Atapattu N. S. B. M.

Effects of Dried Seaweed Supplementation on Growth Performance and Gastrointestinal Development of Broiler Chicken in Sri Lanka 144
Tharushika W. A. P. D. and Kodithuwakku K. A. H. T.

Roadside Forage Silage with Pineapple Peel: A Cost-Effective Strategy to Address Forage Shortages in Sri Lanka 145
Dissanayake K. G. V., Vithana H. M. T. O., Prathapasinghe G. A. and Kodithuwakku K. A. H. T.

Provision of an Additional Dust Bath Area to Enhance the Welfare of Broiler Chickens 146
Abeyrathne K. M. N. I., Bandara R. M. A. S. and Senanayake M. P.

Hatchery Performance, Embryonic Development and Chick Quality in Double Yolk Eggs of Layer Breeder Chickens 147
Moragoda M. A. H. S., Bandara R. M. A. S. and Mahindarathna J.

The Impact of Broiler Breed Types on Breast Meat Quality Parameters 148
Wijerathna M. G. N. T., Gunaratne D. M. A. and Zoyza W. G. M.

Effect of Eggshell Porosity for the Hatchery Performance with the Age of Cobb 500 Broiler Breeders 149
Hemarathna D. D. T. M., Munasinghe M. A. J. P., Sandaruwan L. and Kospalawaththe P.

Efficiency of Different Supportive Feeders on Training Broiler Chicks for Feeding in the Brooding Period 150
Premarathna E. G. S. D., Bandara R. M. A. S. and Welagedara D. G.

Impact of *Azolla pinnata* (Azolla) Supplementation on Crossbred Jersey Heifer Calves Undergoing a Stepdown Early Weaning Scheme 151
Perera I. P. S. and Wickramasinghe H. K. J. P

ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Assessment of Fatty Acid Profile and Antioxidant Properties of Sea Cucumber Obtained from Northern Coastal Areas of Sri Lanka 152
Athauda A. A. H. I., Shanuke D. S., Bandara W. M. M. D., Nishanthan G. and Rathnayake H. A.

Impact of Free Access to Drinking Water on Starter Intake, Growth, and Health of Crossbred Jersey Heifer Calves Undergoing a Stepdown Early Weaning Transition 153
Perera O. N. M. and Wickramasinghe H. K. J. P.

Impact of Age, Sex, Live Weight, Holding Time at Lairage on Carcass Yield and Water Holding Capacity in Cobb 500 Broilers 154
Hitige P. K., Munasinghe M. A. J. P. and Ayona T. A. W.

Exploring the Global Goat Milk Industry through Cluster Analysis: A Comprehensive Review for Uncovering Regional Insights 155
Rochelle E. J. S., Divarathna H. K. D. M. P. L., Kuruppu I. V. and Guruge T. P. S. R.

Development of a Low-Cost Diagnostic Model for Early Mastitis Detection in Small-Scale Dairy Farms Using Milk Quality Parameters 156
Shaswin M. N. F., Perera D. S., Janaka Priyadarshana P. A. D., Chinthaka U. G. S. and Kodithuwakku K. A. H. T.

Effect of Dried Seaweed Supplementation on Growth Performance and Hindgut Environment of Pre-Weaning Lambs 157
Fernando P. D. R., Samla M. R. F. and Kodithuwakku K. A. H. T.

A Comparative Analysis of Nutritional Composition and Meat Quality Characteristics of Commonly Consumed Pork Types in Sri Lanka 158
Cooray M. P. T. P. and Prathapasinghe G. A.

Agricultural and Resource Economics and Policy

Value Addition through Technological Innovation: KPIs as Catalysts for Growth in Sri Lanka's Export-Oriented Plantation Sector 161
Fernando S. N. S., Abeysiriwardana P. C. and Jayasinghe-mudalige U. K.

Uncovering the Economic Value of Green Spaces: A Land Valuation Study in Colombo District, Sri Lanka 162
Dissanayake D. M. W. S. H., Fernando W. A. M. and Edirisinghe J. C.

Factors Influencing the Abandonment of Cinnamon Oil Distillation Units in Matara District, Sri Lanka: A Comprehensive Analysis 163
Jayasinghe S. M., Sandika A. L. and Widanapathirana C. U.

Households' Demand for Disaggregated Meat Products in Sri Lanka: A Censored Quadratic Almost Ideal Demand System Model 164
Musthifa B., Sivashankar S., Sooriyakumar K. and Sarujan S.

ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Market Dynamics and Strategic Growth Opportunities in Sri Lanka's Floriculture Export Sector 165
Heenkenda H. M. K. A., Wanshaja K. A. D. P., Kuruppu I. V. and Guruge T. P. S. R.

Assessing Climate Uncertainty in Coconut Farming: A Bayesian Ricardian Study on Sri Lanka's Coconut Triangle 166
Wimalaweera G. N. I. and Edirisinghe J. C.

An Assessment of Recent Temperature Trends in Nuwara Eliya, Sri Lanka 167
Siriwardana K. D. V. F.

They need Flowers, not for Wreaths: Floriculture as a Therapeutic Tool for Enhancing Emotional Wellbeing of Older Female Adults with Mobility Restrictions 168
Tennakoon T. M. R. P. K.

External Assistance and Government Expenditure for Building Climate Resilience and Adaptation: A Study of the Agriculture Sector in South-Asian Countries 169
Ahmad J.

Production Efficiency of the Local Paddy Cultivation Under Valaichenai Agrarian Services Centre Area 170
Rimsath M., Sooriyakumar K., Sarujan S. and Sivashankar S.

An Econometric Analysis of the Impact of Weather and Natural Disasters on Sri Lankan Spice Exports: A Gravity Model Approach 171
Senanayaka S. A. C. S. and Edirisinghe J. C.

Expenditure on Health and Education and Their Impact on Efficiency of Agricultural Labourers: A Study of India and its Neighbouring Economies 172
Ahmad I., Qasim R., Faheem W., Imteyaz F. and Alam D.

Effectiveness of the Five-Day Training Programme Conducted by National Cinnamon Research and Training Centre, Sri Lanka 173
Lanka K. N. S., Sandika A. L. and Widanapathirana C. U.

Harnessing Value from Waste: Transforming the Banana Value Chain in Sri Lanka for Economic Growth and Sustainability 174
Wijemanne N. G. M. and Premaratna S. P.

Local Communities' Preferences and Willingness to Pay for Improving Tourist Facilities and Conservation of Ecosystem in Arugam Bay Lagoon, Sri Lanka 175
Misfa S. L. F., Sivashankar S., Sooriyakumar K. and Sarujan S.

A Stochastic Meta-Frontier Analysis of Technical Efficiency and Technology Gaps in Asian Agriculture (1992-2021) 176
Madhumali S. D. D. M. and Edirisinghe J. C.

Factors Influencing Farmer Adoption towards Organic Paddy Farming in Monaragala District, Sri Lanka 177
Thilakarathna J. M. I. A. and Wijesinghe A. G. K.

ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Unlocking Livelihood Opportunities through Bee Honey Value Chain Development in Village Tank Cascade Systems of Rural Sri Lanka 178
Herath H. M. L. K., Kuruppu I. V., Ujana N., Bandara A. L. J. and Gurusinghe D. C.

Assessing the Impact of Subsidy Loans from Rotary Club on Paddy Farmers Productivity in Kilinochchi, Sri Lanka 179
Ratheeban P., Sooriyakumar K., Sarujan S. and Sivashankar S.

Exploring Farmer Preferences for Watershed Conservation: A Case Study of Bargi Dam, India 180
Seelanatha S. S. K. T., Thangavel M. and Udugama J. M. M.

An Assessment of Food Security among Undergraduates in Sri Lankan State Universities during the Economic Crisis 181
Weerasinghe W. M. H., Lakshani H. I., Ihlas M. A. M. and Sasanka U. B. E.

The Recent Trends of Tea Research and Industry in Korea 182
Song K. J., Kim S. J. and Hong H. R.

Impact of Fertiliser Policy Implemented in 2021 on Rice Production in the South Coastal Region of the Ampara District, Sri Lanka 183
Disanayaka D. M. P. S., Bandara A. M. A. C. and Razmy A. M.

Surfacing R&D in the Legislative Process: An Ethnomethodological Analysis of the Journal of Proceedings of a City Government's Committee Hearing on an Agricultural Ordinance 184
Claus J. A. P.

Why Does Entrepreneurship Remain a Challenge? Insights From Farmers in the Ratnapura District, Sri Lanka 185
Rathnachandra S. D. D., Malkanthi S. H. P., Esham M. and Samaraweera G. R. S. R. C.

Global Energy Transition Towards a Sustainable Future: A Comprehensive Review of Renewable Technologies, Innovations, and Policy Frameworks for Sustainable Energy Demand 186
Jayathilaka M. A. D. K., Ukwatte T. S. and Jayasinghe G. Y.

Geographical Indication as a Mode of Protection for Agricultural Exports: A Critical Review of the Intellectual Property (Amendment) Act, No. 8 of 2022, Sri Lanka 187
Vitharana W. A. Y. W.

Spatial Pattern of Crop Vulnerability to Drought in Jaffna District , Sri Lanka 188
Kayathri S. and Dishani C.

Author Index 189

ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

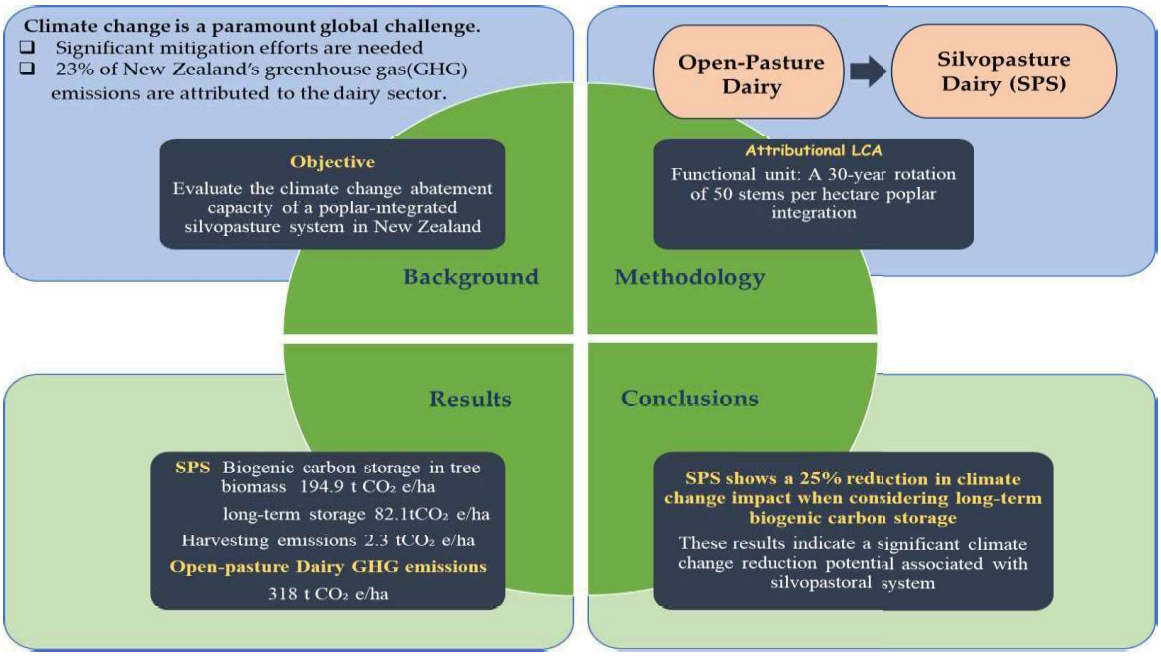
High-Tech Agricultural Production

Silvopasture System: A Green Climate Solution

H. M. I. K. HERATH[1,4*], S. McLAREN[1] and A. FLETCHER[2,3]
*Corresponding Author: indikaherath@wyb.ac.lk

Climate change stands as a paramount global challenge, demanding urgent solutions to foster sustainable and low-carbon development across all sectors. Silvopasture is an agricultural practice that combines trees, forage plants, and livestock in a symbiotic system, offering environmental and ecological benefits. This study models the climate change abatement capacity of a poplar-integrated silvopasture system in the Waikato region of New Zealand using the attributional Life Cycle Assessment (LCA) methodology. A 30-year, 50-stems/ha poplar rotation was assumed, with trees harvested for timber and replanted at the same rate. The functional unit was one hectare of a silvopastoral system over a 30-year period. According to the results, the total carbon storage in tree biomass was 194.9 tCO_2e/ha, with an annual variation ranging from 0.7 to 10.5 tCO_2e/ha. The climate impact of end-cycle tree harvesting was 2.3 tCO2e/ha, with residual biogenic carbon gradually released through the decaying of organic matter. The long-term storage of biogenic carbon in the harvested timber was 82.1 tCO2e/ha. Consequently, the carbon removal from tree integration considering long-term storage, was 79.8 tCO2e/ha. This reduction is about 25% relative to currently reported emissions from dairy farming. According to the LCA methodology, claiming this carbon credit depends on the final use of the harvested timber, its duration of use, and the end-of-life treatments. These factors must be evaluated in relation to the global warming potential over the time horizon considered. Additionally, the static LCA method does not account for the timing of carbon removal and emissions, which requires further consideration for an accurate assessment.

KEYWORDS: Agroforestry, Carbon removal, Climate resilience, Sustainable farming



[1]School of Agriculture and Environment, Massey University, New Zealand; [2]Sustainable Nutrition Initiative, Riddet Institute, Massey University, New Zealand; [3]Fonterra Research and Development Centre, Palmerston North, New Zealand; [4]Department of Plantation Management, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka, Makandura (NWP), Sri Lanka

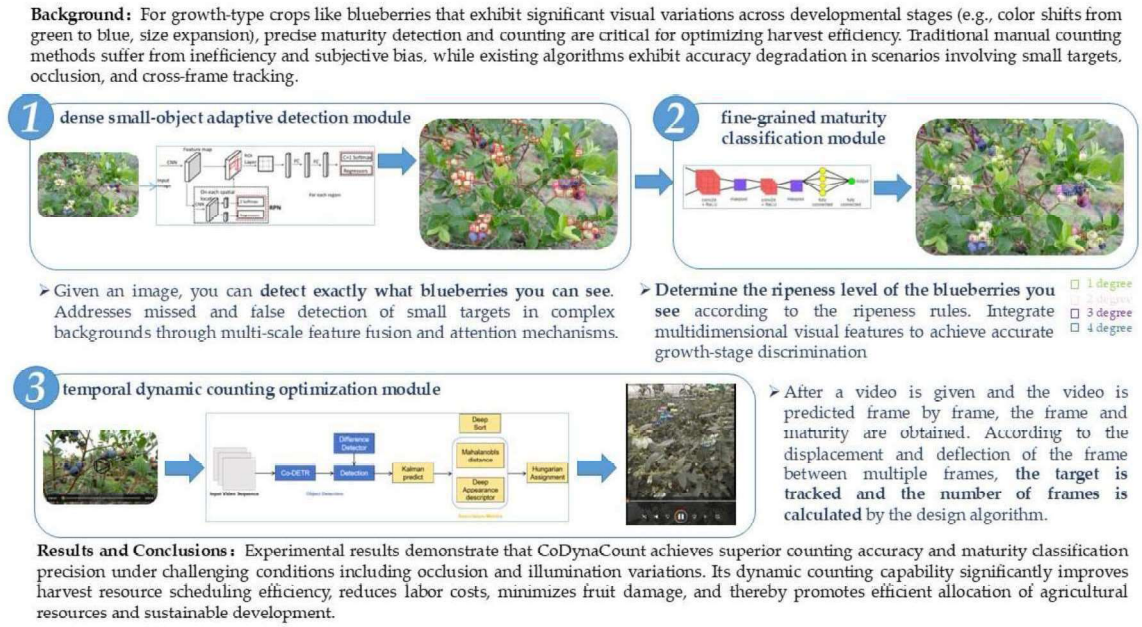
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Blueberry Maturity Detection and Counting *via* Multi-stage Visual Perception and Machine Learning

H. WANG, L. WANG, L. ZHAO, H. GU, X. WAN and Q. WANG*
*Corresponding Author: qiwang@gzu.edu.cn

For the crops like blueberries that exhibit significant visual variations across developmental stages such as colour shifts from green to blue and size expansion, precise maturity detection and counting are critical for optimising harvest efficiency. Traditional manual counting methods suffer from inefficiency and subjective bias, while existing algorithms exhibit accuracy degradation in scenarios involving small targets, occlusion, and cross-frame tracking. To address this, CoDynaCount, a collaborative dynamic counting algorithm with a three-module cascaded architecture was developed: 1) a dense small-object adaptive detection module that addresses missed and false detection of small targets in complex backgrounds; 2) a fine-grained maturity classification module integrating multidimensional visual features to achieve accurate growth-stage discrimination; and 3) a temporal dynamic counting optimisation module leveraging spatiotemporal correlations to eliminate duplicate counts. The algorithm combines static detection robustness with dynamic scene adaptability, achieving precise blueberry counting and maturity assessment in complex field environments. Experimental results demonstrate that CoDynaCount achieved superior counting accuracy (94.2%) and maturity classification precision (91.5%) under challenging conditions including occlusion and illumination variations. Its dynamic counting capability significantly improves harvest resource scheduling efficiency, reduces labour costs, minimises fruit damage, and thereby promotes efficient allocation of agricultural resources and sustainable development.

KEYWORDS: Collaborative architecture, Dynamic counting, Harvest optimisation, Maturity detection



State Key Laboratory of Public Big Data, Guizhou University, Guiyang 550025, China

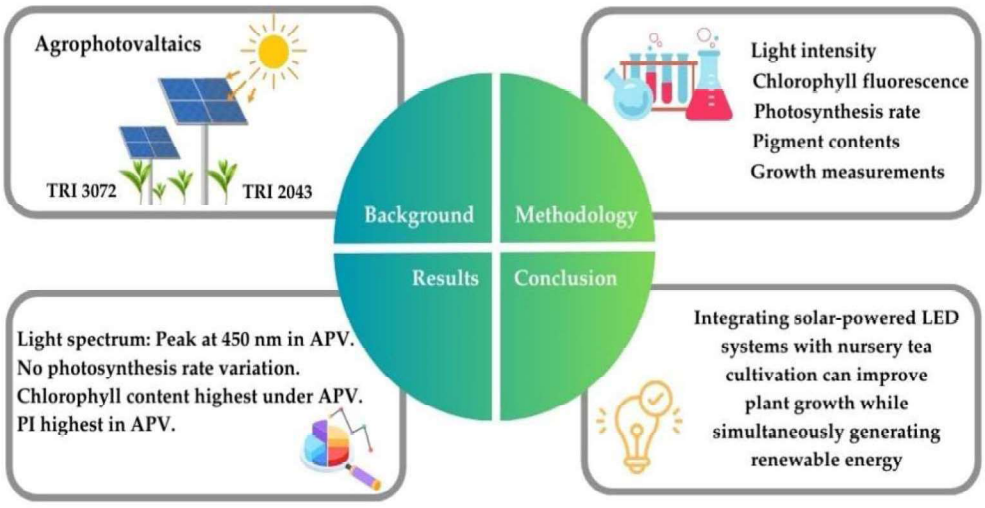
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Effects of Solar-Powered LED Lighting on the Growth and Quality of Nursery Tea Plants

R. J. WIJESINGHE[1], I. D. WEERARATHNA[1], J. B. EKANAYAKE[2], L. SAMARANAYAKE[2], K. M. MOHOTTI[3], H. M. P. C. KUMARIHAMI[1], M. M. N. DAMAYANTHI[3], O. S. INDRAMALI[1], L. D. B. SURIYAGODA[1], C. K. BENERAGAMA[1] and A. J. MOHOTTI[1*]
*Corresponding Author: mohottij@agri.pdn.ac.lk

Agrophotovoltaics (APV) integrates renewable solar energy harvesting and agriculture, optimizing usage of land resource. This study examined photovoltaic-powered blue LED light effects on nursery tea growth and quality (cultivars TRI-3072 and TRI-2043) compared to blue and black shade nets. The experiment was arranged as a complete randomized design with 60 plants each as replicates. The light intensity, photosynthesis rate and chlorophyll fluorescence, the contents of leaf chlorophyll, anthocyanin, polyphenol, and leaf area, plant height and total dry weights were measured. The light spectrum under the blue and black nettings ranged between 317 nm to 886 nm, while a peak around 450 was observed under the APV system. Results showed that leaf area, plant height and photosynthetic rates were similar among the treatments. However, total chlorophyll content (TRI-3072; 1.77 mg/g and TRI-2043; 1.81 mg/g) and performance index (TRI-3072; 2.41 and TRI-2043; 2.18) were significantly higher in plants under the APV system compared to other treatments. The highest anthocyanin (14.19 ppm) and polyphenol contents (60.33 mm/g) were observed under black and blue netting, respectively, in cultivar TRI-2043. Despite the enhanced photosynthetic performance under the APV system as indicated by PI, total dry weight was significantly higher under blue netting. The study suggests that solar-powered LED systems can be used to enhance growth and quality of nursery tea plants, while supporting renewable energy generation and economic growth.

KEYWORDS: Chlorophyll fluorescence, Nursery tea, Photosynthesis, Photovoltaic system



Acknowledgements: Authors wish to acknowledge the University Research Council of University of Peradeniya (Grant No. 180) and the National Research Council of Sri Lanka (Grant IDG 22-131).

[1]Department of Crop Science, Faculty of Agriculture, University of Peradeniya, Peradeniya, Sri Lanka; [2]Department of Electrical and Electronics, Faculty of Engineering, University of Peradeniya, Peradeniya, Sri Lanka; [3]Tea Research Institute, Talawakele, Sri Lanka

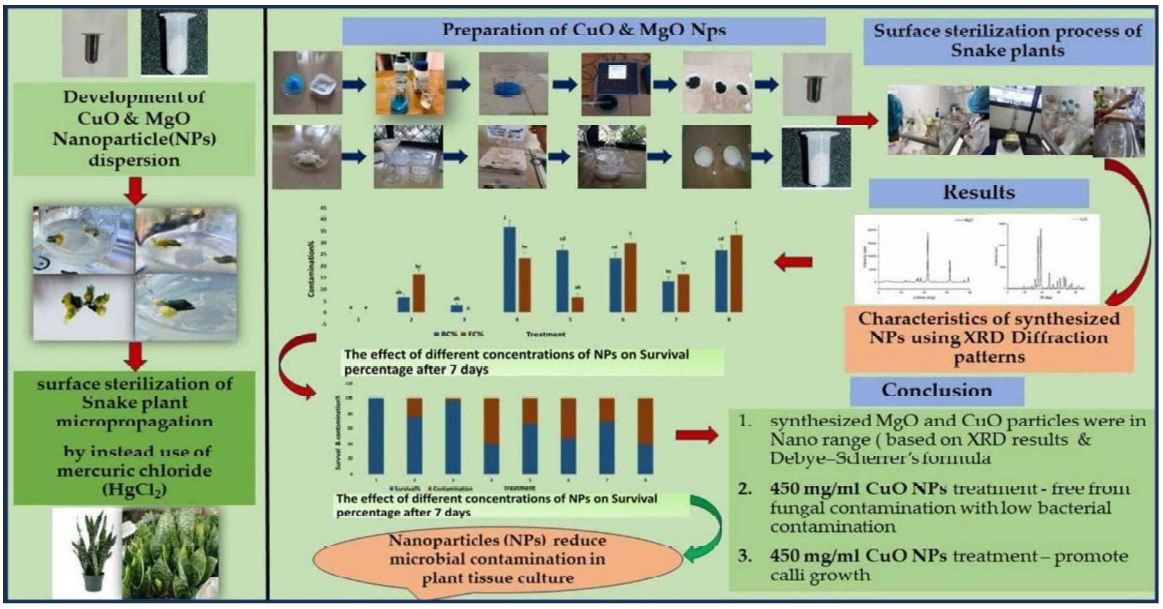
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Impact of Magnesium Oxide and Copper Oxide Nanoparticle Dispersions on Surface Sterilisation of *Sansevieria trifasciata* L. for Micropropagation

H. N. C. GIMHANI[1], H. N. WITHANA[1], M. S. KANDANAPITIYA[2] and N. S. KOTTEARACHCHI[1*]
*Corresponding Author: nisha@wyb.ac.lk

Sansevieria trifasciata, commonly known as the snake plant, holds significant economic and ecological value, being used for fibre production, biocomposites, and air purification. However, conventional propagation methods like division and cuttings are inadequate to meet rising commercial demand, highlighting the need for *in vitro* propagation. A major challenge in tissue culture is microbial contamination, typically controlled with mercuric chloride ($HgCl_2$), a toxic and environmentally harmful disinfectant. This study investigates magnesium oxide (MgO) and copper oxide (CuO) nanoparticles (NPs) as alternative surface sterilising agents for snake plant explants. CuO NPs were synthesised *via* co-precipitation, and MgO NPs through chemical precipitation using magnesium nitrate and sodium hydroxide. X-ray diffraction (XRD) was used for nanoparticle characterisation. Explants were treated with CuO, MgO, and their combination at 300 mg/L and 450 mg/L, with $HgCl_2$ as a positive control. Each treatment was replicated thrice with 10 explants per replicate. A completely randomised design (CRD) was used, and data analysed *via* the CATMOD procedure using Maximum Likelihood Estimation (MLE), with significance at $P < .05$. The 450 mg/L CuO NP treatment showed the highest survival rate (96.66%) and the lowest contamination. Callus initiation was also observed, with the highest formation in 450 mg/L CuO-treated explants. These findings indicate CuO NPs as a promising, eco-friendly alternative to $HgCl_2$ in snake plant micropropagation.

KEYWORDS: Antimicrobial activity, CuO nanoparticles, MgO nanoparticles, Micropropagation, Surface sterilisation



[1]Department of Biotechnology, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka, Makandura, Gonawila (NWP), 60170, Sri Lanka; [2]Department of Nano Science Technology, Faculty of Technology, Wayamba University of Sri Lanka, Kuliyapitiya (NWP), Sri Lanka

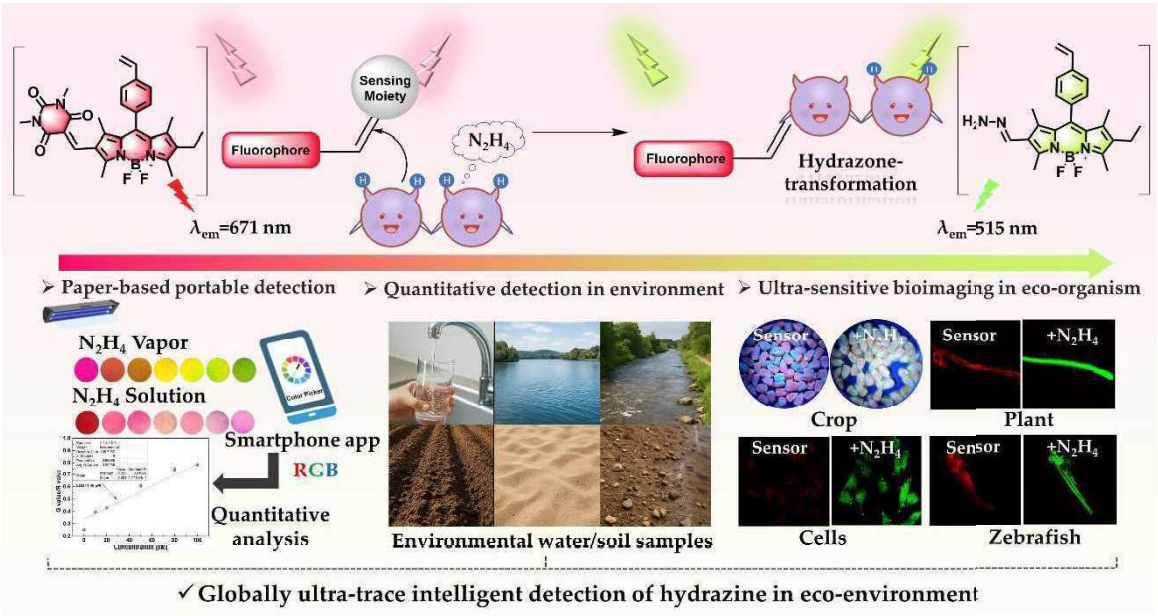
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Globally Ultra-Trace Intelligent Detection of Hydrazine in Eco-Environment with Ratiometric Fluorescent Bioimaging

X. LI and G. HAO*
*Corresponding Author: gefei_hao@foxmail.com

Inorganic pollutants have become a growing concern for global ecosystems. Among them, hydrazine (N_2H_4), a highly reactive species widely used in industrial processes because of its high reactivity, poses significant ecological risks. Despite considerable progress in detecting N_2H_4 in environmental contexts, challenges remain in achieving globally accessible and simple detection methods. This study aimed to develop a novel ultra-trace ratiometric fluorescence chemosensor, DIPOT, designed for intelligent and quantitative detection of N_2H_4. DIPOT exhibited excellent ratiometric fluorescence performance in aqueous solution, with a significant red-to-green shift, providing excellent sensitivity with detection limit as low as 4.5 nM. The sensor was integrated into a portable and fluorometric tool, compatible with a smartphone application, to enable intelligent analysis and real-time detection of N_2H_4. Furthermore, it has been successfully applied to the detection of ultra-trace levels of N_2H_4 in over 13 different eco-environmental samples, including water, soil, crops, and environmentally polluted samples, showcasing its versatility. Additionally, DIPOT has enabled ultra-sensitive ratiometric bioimaging of N_2H_4 in various ecological organisms, offering valuable insights into the ecological and biological impacts of hydrazine. Our findings provide a robust and portable approach for global, eco-friendly monitoring of N_2H_4, representing a significant advancement in environmental sensing technology.

KEYWORDS: Eco-environmental hydrazine, Global analysis, Intelligent detection, Ratiometric fluorescence chemosensor, Ultra-sensitive bioimaging



Acknowledgements: This study was supported by the NSFC (22077045), the Fundamental Research Funds for the Central Universities (CCNU24JCPT030, CCNU24JC021) and the National Natural Science Foundation of China (32125033 and 32260687).

National Key Laboratory of Green Pesticide, Key Laboratory of Green Pesticide and Agricultural Bioengineering, Ministry of Education, Center for Research and Development of Fine Chemicals, Guizhou University, Guiyang 550025, P. R. China

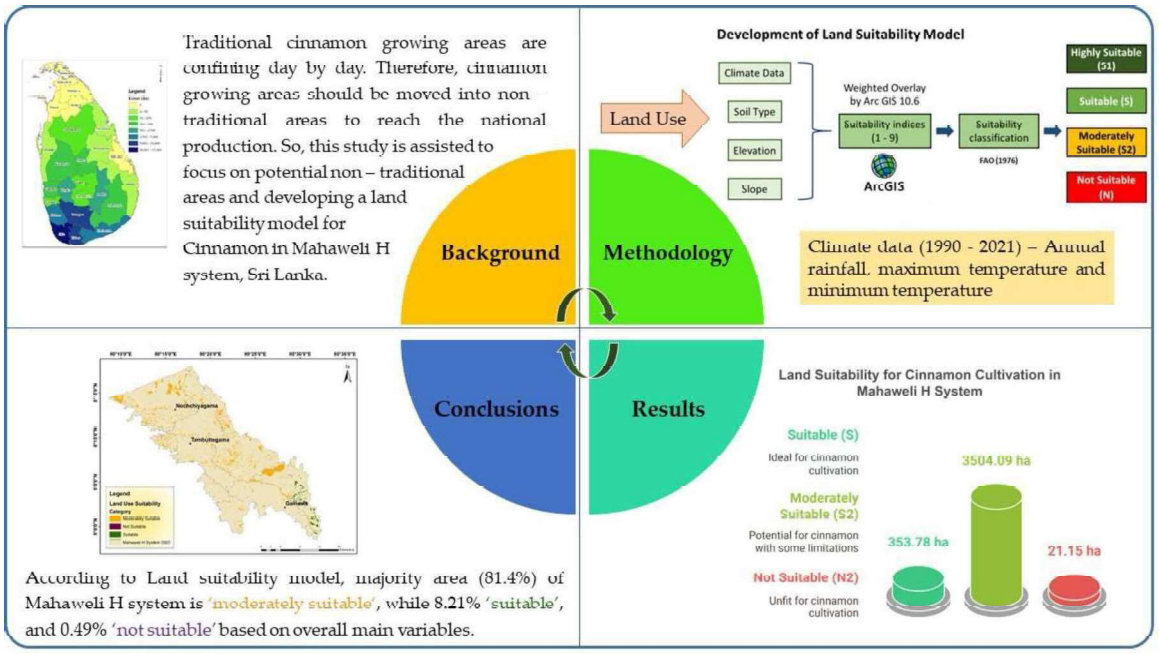
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

GIS-based Land Suitability Model for Cinnamon in the Mahaweli H System in Sri Lanka

E. M. WIMALASIRI[1], E. J. S. DE SOYSA[2] and H. S. C. MENDIS[1*]
*Corresponding Author: sahanskchathuranga@gmail.com

Among all export agricultural crops, cinnamon (*Cinnamomum verum*) is one of the main spice crops grown in Sri Lanka. Around 80% - 90% of the world's true cinnamon market is claimed by Sri Lanka, and expanding cultivation is essential to fulfil the growing demand in the global marketplace. Since the traditional cinnamon-growing land areas are becoming limited due to urbanisation and recreation, expanding cinnamon into non-traditional dry zone areas has become crucial to achieving the national production targets. Therefore, this study has mapped the potential areas and developed a land suitability model for cinnamon cultivation in the Mahaweli H system, Sri Lanka. The weighted overlaying analysis was used to develop the model in the Geographic Information System (GIS) environment. The weights for the main variables, namely, annual cumulative rainfall, maximum and minimum temperatures, slope, elevation, and soil type, were determined through an analytical hierarchical process by the expert opinions. Results revealed that out of the total potential lands in the Mahaweli H system, 353.78 ha of lands were suitable (S) with 8.21% of the total potential lands. Further, 3,504.09 ha with 81.4% of the total potential lands and 21.15 ha with 0.49% of the total potential lands were also within the moderately suitable (S2) and not suitable (N2) categories, respectively. Ipalogama Divisional Secretariat (DS) Division has the highest extent in the suitable category (325.32 ha), while Thalawa DS Division has the highest extent in the moderately suitable category (1147.07 ha). Therefore, the Mahaweli H system is moderately suitable for cinnamon cultivation.

KEYWORDS: Cinnamon, GIS, Land suitability model, Mahaweli H system, Weighted overlaying analysis



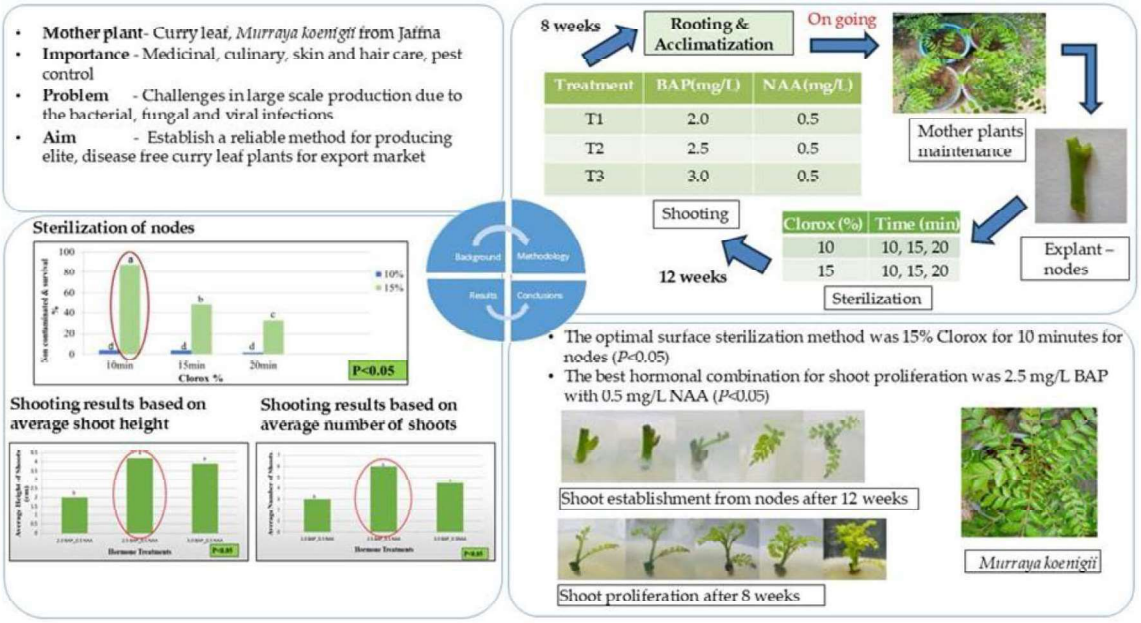
[1]Department of Export Agriculture, Faculty of Agricultural Sciences, Sabaragamuwa University of Sri Lanka, Belihuloya, Sri Lanka; [2]Department of Cinnamon Development, Borakanda, Karandeniya, Sri Lanka

Development of an *In vitro* Protocol for Efficient Shoot Proliferation in *Murraya koenigii*

W. M. A. C. PREMASIRI[1], D. L. C. K. FONSEKA[2]* and S. TERENSAN[1]
*Corresponding Author: dlckumari@crop.ruh.ac.lk

Murraya koenigii (curry leaf), a semi-hardwood plant grown in tropical and subtropical regions, faces major propagation challenges due to bacterial, fungal, and viral infections. These pathogens reduce yield and compromise high-quality genotypes by causing mutations, weakening plant vigour, and diminishing desirable traits such as disease resistance, aroma, and growth potential. Their presence threatens sustainable cultivation and commercial production. This study aimed to develop a reliable method for producing high-quality, disease-free curry leaf plants selected from Jaffna for export. Nodal segments were tested as explants to determine optimal surface sterilisation, and the resulting shoots were used for experiments arranged in a completely randomised design with 20 replicates. Shoot proliferation was tested using three hormonal treatments: 2.0, 2.5, and 3.0 mg/L 6-benzylaminopurine (BAP), each with 0.5 mg/L naphthaleneacetic acid (NAA). All data were analysed using ANOVA and Duncan Multiple Range Test (DMRT) in SAS 9.4 software. The most effective sterilisation method was 15% Clorox for 10 minutes, achieving the highest decontamination rate, 87.5% ($P < .05$). After eight weeks, the highest number of shoots per explant (6.0) was observed with 2.5 mg/L BAP + 0.5 mg/L NAA ($P < .05$). The number of shoots per explant observed with 3.0 mg/L BAP + 0.5 mg/L NAA ($P < .05$) was 4.5 while a lower number of shoots per explant (3.0) was observed with 2.0 mg/L BAP + 0.5 mg/L NAA ($P < .05$). The optimal treatment for commercial applications was 2.5 mg/L BAP + 0.5 mg/L NAA ($P < .05$), balancing shoot proliferation and resource efficiency. These findings support efficient large-scale propagation, improving their export potential.

KEYWORDS: Curry leaf, *Murraya koenigii*, Nodes, Shoot proliferation, Sterilization



[1]*Department of Agricultural Biology, Faculty of Agriculture, University of Jaffna, Jaffna, Sri Lanka;*
[2]*Department of Crop Science, Faculty of Agriculture, University of Ruhuna, Matara, Sri Lanka*

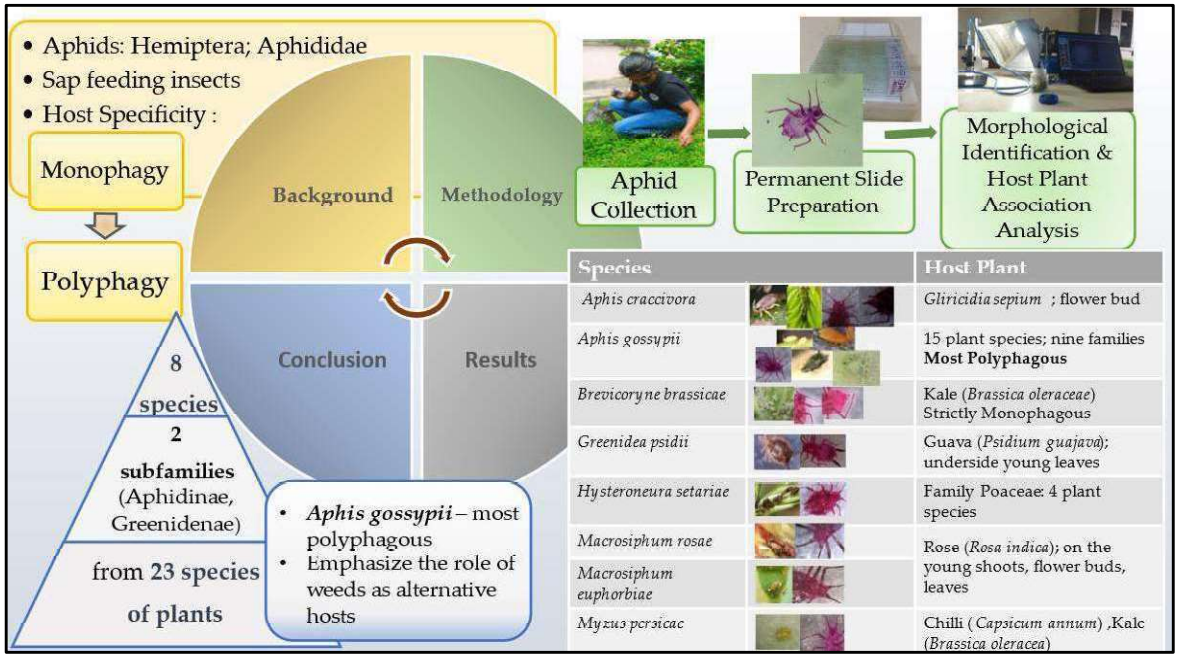
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Host Plant Associations of Aphid Species (Aphididae) in the Garden of University of Peradeniya, Sri Lanka

L. B. T. DILANKA* and W. H. JAYASINGHE
*Corresponding Author: tharinidilanka124@gmail.com

Aphids (Hemiptera: Aphididae), sap-feeding insects, exhibit a wide range of host specificity, from strict monophagy to polyphagy. This study aimed to investigate the host plant associations of aphid species present in the garden of the University of Peradeniya, Sri Lanka. Field surveys were conducted across approximately 250 ha, covering cultivated, ornamental, and wild plant species. Aphid specimens were purposefully collected from plant canopies (≤1.5 m) using a host-based approach. Morphological identification was performed *via* live photographs and permanent slide preparations using taxonomic keys. Among ten collected species, eight were taxonomically identified up to species level, belonging to six genera and two subfamilies (Aphidinae, Greenidenae). *Aphis gossypii* exhibited the widest host range and was the most polyphagous species; found on 15 plant species from nine families, including cultivated, ornamental, and wild plants. It was observed on multiple plant parts, including leaf buds, flower buds, tender leaves, and stems. *Hysteroneura setariae* was only associated with weeds of the family Poaceae, particularly in panicles and stems. *Macrosiphum rosae* and *Macrosiphum euphorbiae* exhibited monophagy on the flower buds and young shoots of *Rosa indica* (rose), while *Myzus persicae* primarily infested cultivated plants, particularly *Brassica oleracea* (kale) and *Capsicum annum* (chilli). *Brevicoryne brassicae* and *Greenidia pisdii* were recorded in Sri Lanka for the first time, associated with *Brassica oleracea* (kale) and *Psidium guajava* (guava), respectively. These findings highlight the host specificity of aphids in the garden at the University of Peradeniya, emphasising the role of weeds as alternative hosts that may facilitate aphid spread into cultivated areas, posing a risk to crops.

KEYWORDS: Aphids, Host plants, Polyphagous species, University garden



Department of Agricultural Biology, Faculty of Agriculture, University of Peradeniya, Peradeniya, Sri Lanka

ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

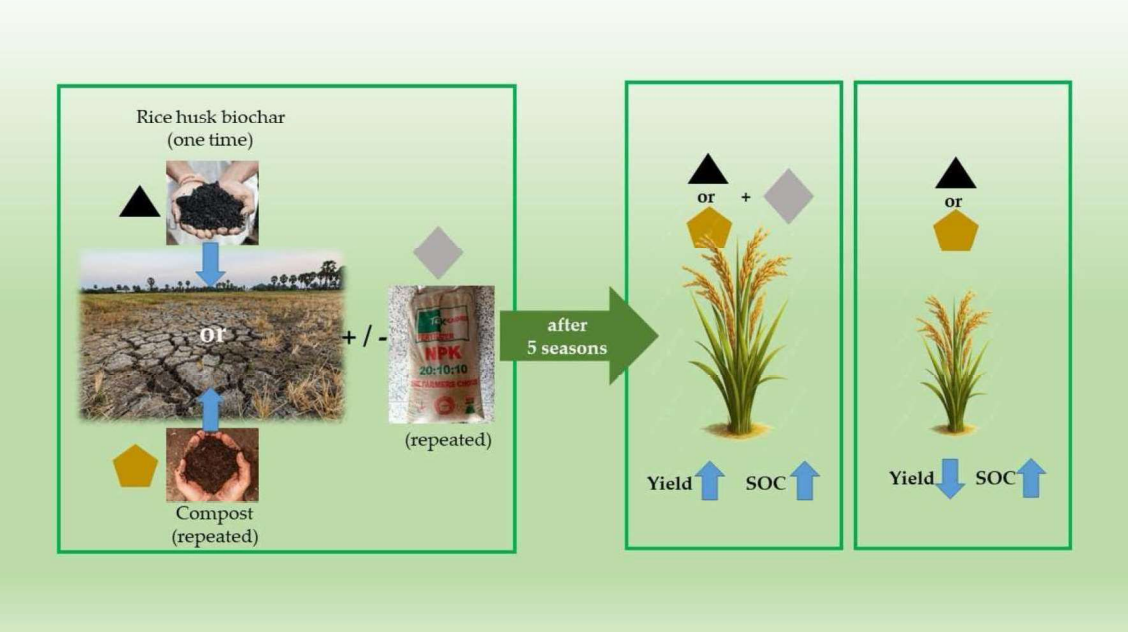
Yield and Soil Fertility in a Paddy Cultivated Vertisol Amended with Rice Husk Biochar or Compost

H.G. LEWKEBANDARA[1], N.P. MANAMPERI[2], D. GUNAWARDHANA[2], T. MUNASINGHE[2] and R.S. DHARMAKEERTHI [1*]

*Corresponding Author: dharmakeerthirs@agri.pdn.ac.lk

Sustainability of paddy cultivation is threatened by declining soil fertility and crop productivity. Integration of organic amendments such as Rice Husk Biochar (RHBC) and compost with synthetic NPK fertilisers (SF) has shown a potential to increase the soil fertility and paddy yield. This study aimed to determine the effect of organic amendments and SF on paddy yield and soil fertility parameters. A field experiment was conducted using paddy for five consecutive seasons, under seven treatments namely; control (no amendments or SF), 0.5% (w/w) of RHBC only, 10 t/ha compost only, 0.5% (w/w) RHBC with SF, 10 t/ha compost with SF, 2% (w/w) RHBC only, 2% (w/w) RHBC with SF. RHBC was applied only once at the beginning of the experiment, whereas compost was applied repeatedly at the beginning of every season. SF was applied as recommended by the Department of Agriculture (DOA). Yield and soil fertility parameters were measured at the end of each season. The pH, available P and K levels were similar in all amended treatments. However, paddy yields in treatments that were supplied with SF together with organic amendments (5.13, 4.96, 4.63 t/ha respectively, from compost, 2% RHBC, 0.5% RHBC) were significantly ($P < .10$) higher than control (3.34 t/ha) or amendments only treatments (4.11, 3.87, 3.59 t/ha respectively, from compost, 2% RHBC, 0.5% RHBC). In conclusion, one-time application of RHBC at 0.5% w/w (10 t/ha) with SF is agronomically as effective as the current DOA recommendation of repeated application of 10 t/ha compost with SF over a period of three years.

KEYWORDS: Organic amendments, *Oryza sativa*, Synthetic fertilisers, Vertisol



[1]*Department of Soil Science, Faculty of Agriculture, University of Peradeniya, Peradeniya, 20400, Sri Lanka;*
[2]*Rice Research Station, Ambalantota, Sri Lanka*

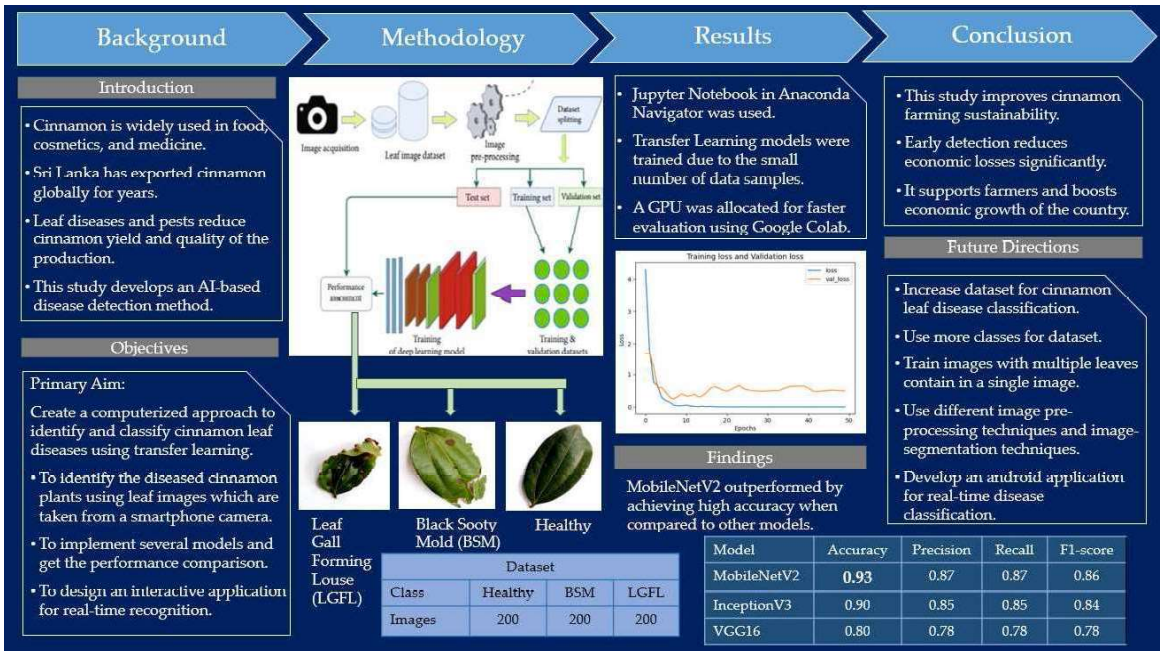
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Classification of Cinnamon (*Cinnamomum verum*) Leaf Diseases and Pests Using Transfer Learning

M. M. V. SENANAYAKE[1*] and N. M. T. DE SILVA[2]
*Corresponding Author: vindya@sjp.ac.lk

Cinnamon *(Cinnamomum verum)* is a multi-purpose crop with applications in culinary arts, cosmetics, Ayurvedic medicine, and pharmaceutical preparations. Sri Lanka is a leading country producing and exporting to the worldwide cinnamon trade. True cinnamon in Sri Lanka is popular in the global market due to its uniqueness, quality, flavour, and aroma. However, there are diseases and pests that affect the reduction of yield and quality of cinnamon cultivation. Identification of such infections is very important to prevent large-scale economic losses. Among these, black sooty mould and leaf gall forming louse are notable threats to cinnamon leaves. To tackle the drawbacks of conventional human diagnostic methods, a computerised approach for classification of diseases and pests in cinnamon leaves using transfer learning was developed in the present study. A dataset of 600 total images, with 200 images in each category, was collected with three classes: healthy, black sooty mould, and leaf gall forming. Image filtering techniques were used to enhance the quality of RGB images captured. The investigation was carried out by considering transfer learning due to a small set of data samples. MobileNetV2 demonstrated high performance by achieving an accuracy of 0.93, precision of 0.87, recall of 0.87, and f1-score of 0.86 compared to other models. Experimental results showed how accurately transfer learning classifies the selected cinnamon leaf disease and pest to ensure effective disease management and production quality. The findings of this study increase the sustainability of cinnamon cultivation and reduce economic losses by helping the agricultural sector strengthen the country's economic growth.

KEYWORDS: Cinnamon, Leaf diseases, Image filtering techniques, Transfer learning



[1]*Department of Knowledge Engineering and Communication, Faculty of Computing, University of Sri Jayewardenepura, Sri Lanka;* [2]*Department of Statistics and Computer Science, Faculty of Science University of Kelaniya, Sri Lanka*

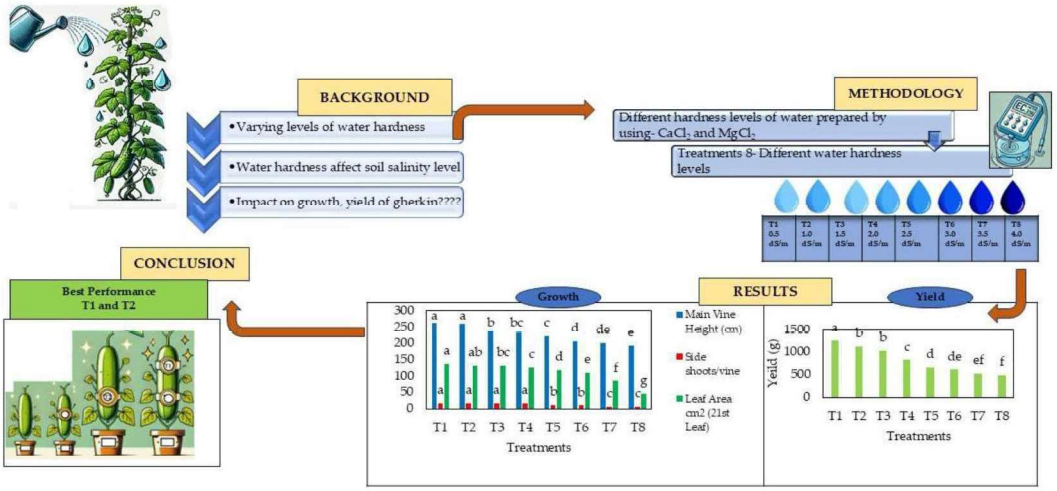
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Impact of Hardness of Irrigation Water on Growth and Yield of Gherkin (*Cucumis sativus* L.)

M. D. R. PIYUMAL[1], W. M. H. H. WIJESURIYA[2], H. K. M. S. KUMARASINGHE[1*] and K. H. H. U. SAMPATH[2]
*Corresponding Author: skumarasinghe@agri.ruh.ac.lk

This study aimed to investigate the impact of the hardness of irrigation water on the growth and yield of gherkin (*Cucumis sativus* L.). The experiment was conducted at the University of Ruhuna, Sri Lanka. Industrial-grade $CaCl_2$ and $MgCl_2$ were used to prepare water with different levels of hardness. Eight different treatments were designed with varying electrical conductivity values, specifically 0.5 dS/m, 1.0 dS/m, 1.5 dS/m, 2.0 dS/m, 2.5 dS/m, 3.0 dS/m, 3.5 dS/m, and 4.0 dS/m, designated as T_1 to T_8, and these were tested in a randomised complete block design with five blocks. As growth parameters, the height of the main vine (cm), number of side shoots/vine, and leaf area (cm^2) were recorded, and as yield parameters, the total yield (g)/vine was recorded. Analysis of Variance (ANOVA) was adapted to analyse the data, and means were compared using Duncan's multiple range test at a 5% probability level. The results revealed that significantly higher ($P < .05$) values for the height of the main vine (263.2 cm and 259.0 cm), number of side shoots/vine (17), and leaf area of the 21st leaf (137.8 cm^2 and 132.9 cm^2) were obtained for T_1 (0.5 dS/m) and T_2 (1.0 dS/m) respectively. The significantly highest ($P < .05$) value for total yield/vine (1256 g) was obtained in T_1 (0.5 dS/m). Therefore, T_1 (0.5 dS/m) and T_2 (1.0 dS/m) showed a positive effect, while water hardness levels above 1.0 dS/m showed a negative effect on the growth and yield of gherkin. These findings suggest that optimising irrigation water hardness can enhance gherkin growth and yield, benefiting farmers and strengthening the national economy.

KEYWORDS: Gherkin, Growth parameters, Irrigation, Water hardness, Yield



[1]*Department of Crop Science, Faculty of Agriculture, University of Ruhuna, Sri Lanka;* [2]*Faculty of Graduate Studies, University of Ruhuna, Sri Lanka*

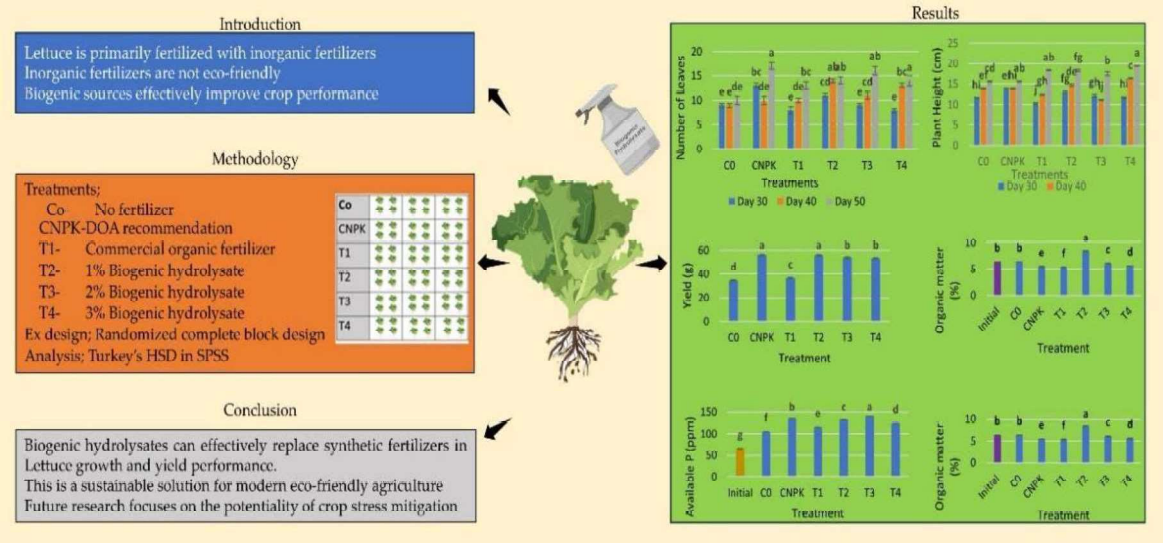
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Evaluating the Potential of Biogenic Hydrolysates to Enhance Lettuce (*Lactuca sativa* L.) Productivity and Soil Health

J. M. G. M. T. KARUNARATHNE[1,3], D. H. M. L. FERNANDO[2], L. WANG[3], E. K. W. W. WEERARATHNA[3] and W. M. W. W. KANDEGAMA[2,3*]
*Corresponding Author: wishwajith@wyb.ac.lk

Lettuce (*Lactuca sativa* L.) is a leafy vegetable of the Asteraceae family, primarily fertilised with inorganic fertilisers (NPK), posing ecological risks. Biogenic hydrolysate (BH) is a sustainable alternative to NPK; however, correct application dosages for lettuce under field conditions are not established. This study aimed to evaluate the effect of BH on the morphology and yield of lettuce and soil conditions in an open field. Plants were subjected to commercial organic fertiliser (T1), and different levels of fish hydrolysate (0.5%, 1%, and 1.5%) (T2-T4) respectively, the Department of Agriculture, Sri Lanka recommendation (CNPK; positive control), and no fertiliser (Co; negative control). BH was applied as a foliar spray weekly, while commercial fertilisers followed the manufacturer's recommendation. Each treatment was replicated four times in a randomised complete block design and plant growth and soil parameters (collected at 30, 40, and 50 days) were analysed using Tukey's HSD mean separation in SPSS. According to the results, T4 showed significantly higher ($P < .05$) plant height (19.4±0.09 cm), leaf count (14±1.0), root biomass (7.73±0.02 g), and T2 showed significantly higher yield (55.97±0.48 g) attributed to higher leaf area index (66.82±2) vs. CNPK and Co at 50 days. Available phosphorus (P) was significantly higher in T3 (141.5±0.1 ppm) vs. CNPK, Co, and initial P content before treatment. Exchangeable K was significantly higher in CNPK (207.5±0.07 ppm), and T2-T4 were significantly higher than Co and K content before treatment. Organic matter (OC) was significantly higher in T2 (8.47%) compared to other treatments and the OC content before treatment. Results elucidated that BH is an effective bio-stimulant for lettuce, improving productivity.

KEYWORDS: Biogenic hydrolysate, Fish hydrolysate, Lettuce, Soil health



[1]Department of Soil Science, Faculty of Agriculture, University of Peradeniya, 20400, Sri Lanka; [2]Department of Horticulture and Landscape Gardening, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka, Makandura, Gonawila, 60170 Sri Lanka; [3]State Key Laboratory of Green Pesticide, Key Laboratory of Green Pesticide and Agricultural Bioengineering, Ministry of Education, Center for Research and Development of Fine Chemicals, Guizhou University, Guiyang 550025, P. R. China

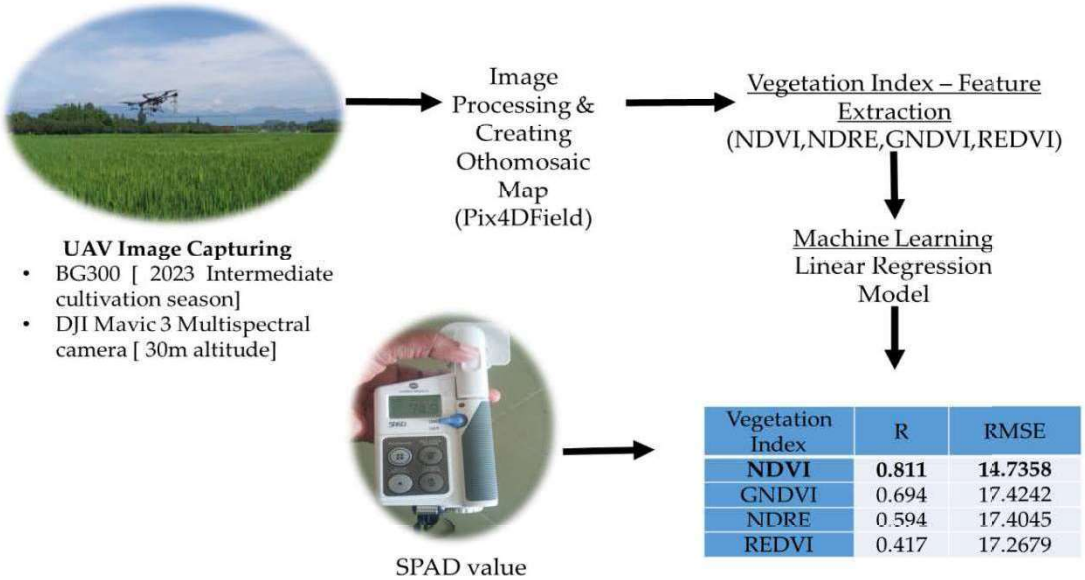
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Utilising UAV-based Vegetation Indices to Predict SPAD Values in Paddy Rice Fields

C. L. I. S. FONSEKA[1]*, K. P. HEWAGAMAGEA[1], U. RATHNAYAKE[1], T. HALLOLUWA[2] and R. M. U. S. BANDARA[3]
*Corresponding Author: cli@ucsc.cmb.ac.lk

In Sri Lanka, the overuse of fertilisers by farmers leads to financial losses and environmental concerns. Due to the high cost and limited availability of SPAD equipment, UAV-based imagery presents a practical and cost-effective alternative for monitoring nitrogen levels in crops. This study evaluates the use of UAV-based multispectral imagery to assess the nitrogen status of rice crops and compares various vegetation indices with SPAD readings. The research was conducted at the Rice Research and Development Institute (RRDI), Bathalagoda, using a DJI Mavic 3 Multispectral drone at a 30 m altitude, focusing on the BG300 rice variety during the 2023 intermediate cultivation season. Linear Regression (LR) model was selected as the machine learning model. Four vegetation indices—Normalised Difference Vegetation Index (NDVI), Green Normalised Difference Vegetation Index (GNDVI), Normalised Difference Red-Edge Index (NDRE), and Red-Edge Difference Vegetation Index (REDVI)—were used to analyse their correlation with SPAD values. The results revealed that NDVI exhibited the highest correlation (R = 0.811) with SPAD values, outperforming the other indices. This indicates that NDVI is the most reliable vegetation index for assessing the nitrogen status of rice crops. The findings suggest that UAV-based imagery, particularly NDVI, could serve as a valuable tool for improving fertiliser management practices, optimising nitrogen use, and enhancing crop yield prediction. This approach offers a cost-effective solution for Sri Lanka's rice farming sector, aiding farmers in making more informed decisions to reduce fertiliser use and mitigate environmental impacts.

KEYWORDS: Nitrogen status, Random forest regression, UAV-based imagery, Vegetation indices



[1]*AgroTech Research Group, School of Computing, University of Colombo, Sri Lanka;* [2]*School of Electrical Engineering and Computer Science, University of Queensland, Australia;* [3]*Rice Research and Development Institute, Batalagoda, Sri Lanka*

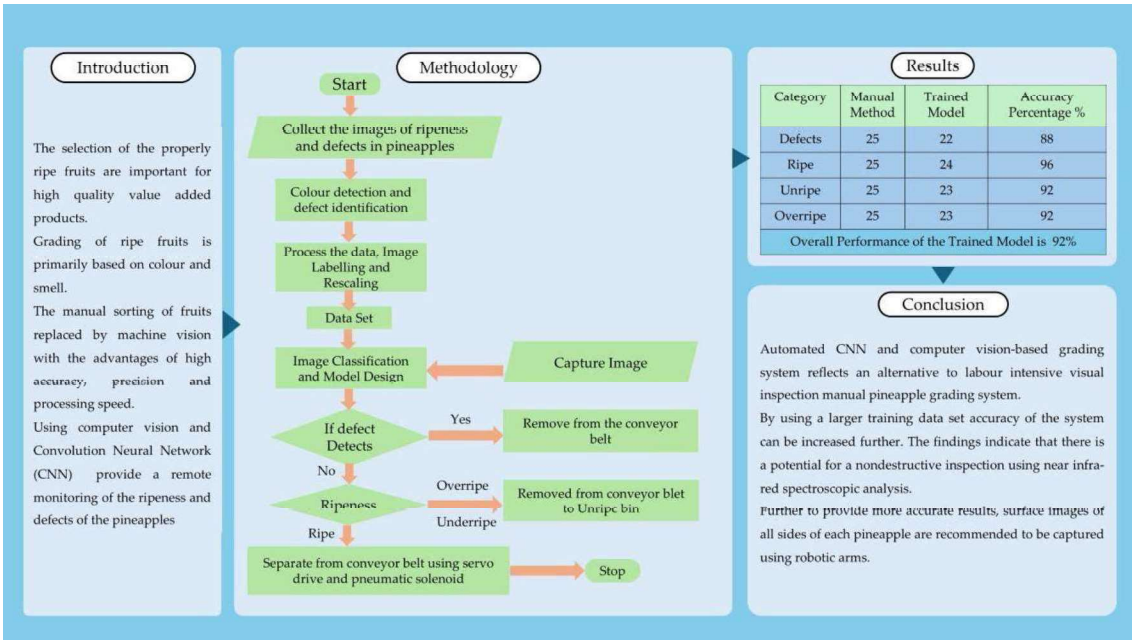
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

An Automated Ripeness and Surface Defect Detection System for Pineapple

W. G. D. R. S WERAGODA* and K. B GONAGALA
*Corresponding Author: ravin7shamalka@gmail.com

Selecting properly ripe fruits is vital for manufacturing high-quality value-added products and boosting agricultural products. Manual grading of pineapples through visual inspection is labour-intensive, expensive, and unreliable in large manufacturing systems. This study presents an automated pineapple grading system incorporating computer vision and a custom-made algorithm using Convolution Neural Network (CNN) to sort ripe pineapples and reject defective pineapples. 224 images of unripe, ripe and overripe pineapples with black rots, white spots, insect damages and pink decrease surface defects were captured using a 720P webcam for training CNN. The CNN was trained using image processing to analyse Hue, Saturation and Value (HSV) colour space. Maturity levels were classified from one to eight based on shell yellowing, one indicating 100% green and eight indicating 100% yellow. Analysing the abnormalities presented by the pixels, surface defects were detected using image processing. Images of each pineapple were captured using the webcam for the real-time analysis with Arduino and computer while pineapples were moving along a conveyor belt. If a defect was identified, it was removed, and only the pineapples with maturity levels from 3 to 5 were selected using the CNN model. The system achieved up to 93% accuracy after 18 training iterations, with an average accuracy of 92% on the test dataset to identify both maturity levels and surface defects. To enhance the accuracy of the algorithm, surface images of all sides of each pineapple are recommended to capture along with near infrared spectroscopic analysis.

KEYWORDS: Computer vision, Fruit maturity, Image processing, Pineapple grading, Surface defect detection



Department of Electrical and Electronic Engineering, Skills College of Technology, 102, Stanley Tilakaratne Mawatha, Nugegoda, Sri Lanka

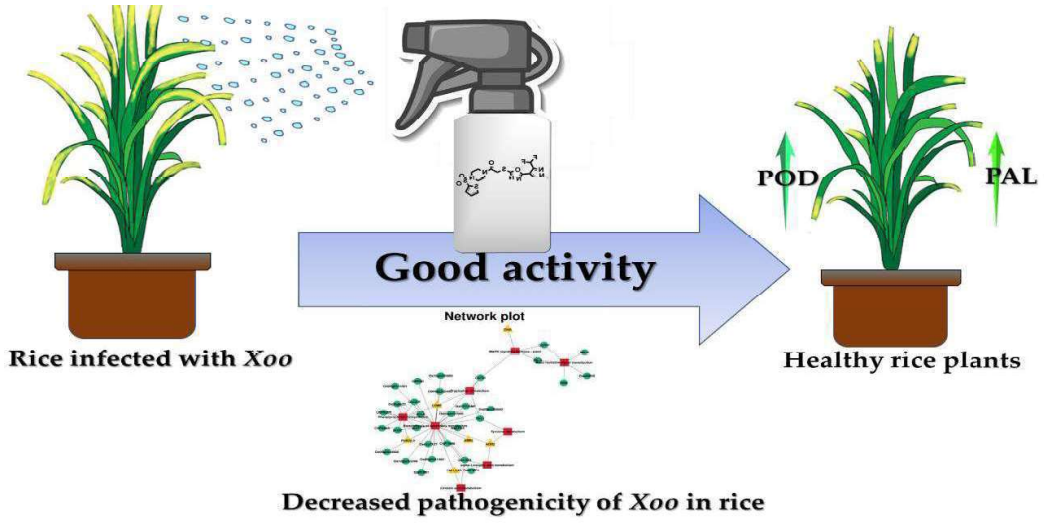
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Design, Synthesis, Biological Activity and Mechanism Study of 1,3,4-Oxadiazole Sulfonamide Derivatives

X. REN, R. RUAN, F. WANG, X. ZHOU and L. JIN*
*Corresponding Author: lhjin@gzu.edu.cn

Recent advancements in agrochemical discovery have highlighted the structural versatility of sulfonamide-based pharmacophores in phytopathology management. Thus, the present study focused on the design and synthesis of highly active compounds against agricultural bacterial diseases, with modified skeletons restricted to 1,3,4-oxadiazole and sulfonamide-structured compounds. Accordingly, 1,3,4-oxadiazole and sulfonamide structures were introduced with pyrazole as the core by an active substructure splicing strategy, and the biological activity of the 1,3,4-oxadiazole sulfonamide derivatives containing pyrazole structures was assessed for their antimicrobial activity testing by turbidimetry. Three replicates were set up for each treatment. In addition, the antibacterial mechanism of 1,3,4-oxadiazole sulfonamide derivatives containing pyrazole structures with thiophene groups linked on the side (A1) was investigated through defence enzyme enzymatic activity assays and proteome analyses. Compounds with excellent activity were evaluated for their mechanism of action by omics and other relevant methods. The activity test showed that A1 exhibits noticeable *in vitro* anti-*Xanthomonas oryzae* pv. *oryzae* activity. The capability of A1 to enhance the innate immunity of rice and activate its disease resistance by regulating the phenylpropanoid biosynthesis and tryptophan metabolism pathway was revealed. These findings establish A1 as a prototypical plant defense potentiator with a novel mode of action, providing a molecular blueprint for developing next-generation resistance inducers that circumvent conventional antimicrobial resistance mechanisms. The structure-activity relationship paradigm presented offers new dimensions in agrochemical design through host-pathogen dual-targeting strategies.

KEYWORDS: Antibacterial mechanism, Biological activity, 1,3,4-Oxadiazole derivatives



Acknowledgements: This study was supported by the National Nature Science Foundation of China (21967006) and the Central Government Guides Local Science and Technology Development Fund Projects (Qiankehezhongyindi (2024) 007).

State Key Laboratory of Green Pesticide, Key Laboratory of Green Pesticide and Agricultural Bioengineering, Ministry of Education, Center for R and D of Fine Chemicals of Guizhou University, Guiyang, 550025, China

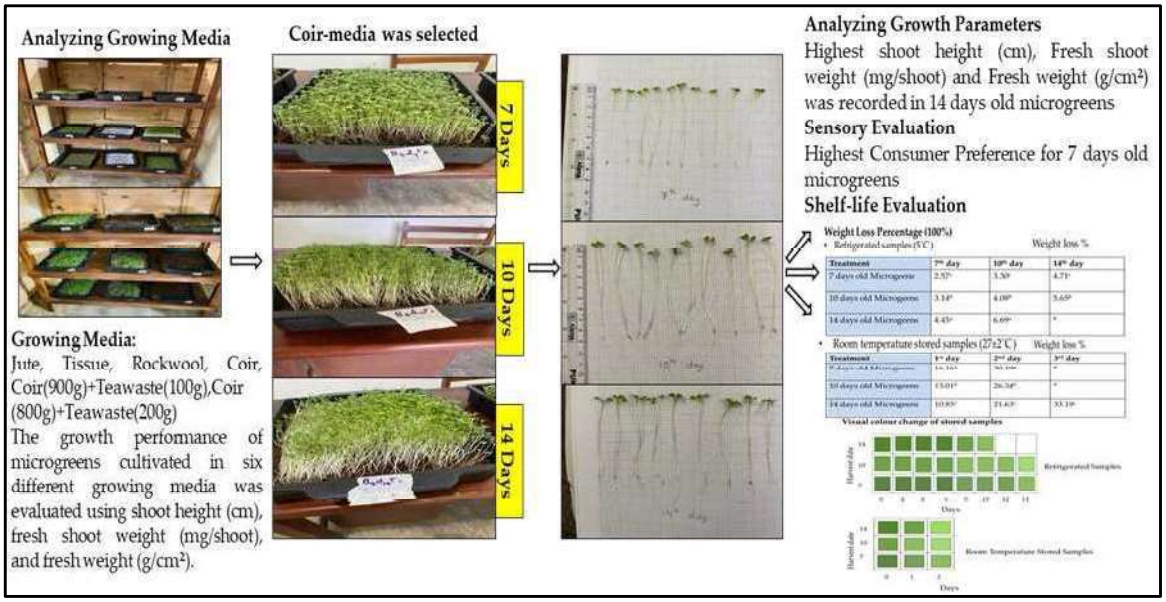
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Effects of Various Growing Media and Harvesting Periods on Yield and Quality Parameters of Mustard *(Brassica juncea)* Microgreens

D. M. A. D. SAMARAKOON[1], A. RANASINGHE[2], U. S. HERATH[1] and W. C. P. EGODAWATTA[1*]
*Corresponding Author: egowcp@agri.rjt.ac.lk

The burgeoning interest in microgreens underscores the importance of optimising growth conditions to improve yield and quality. This study aimed to enhance the growth environment of mustard *(Brassica juncea)* microgreens to maximise resource efficiency and support sustainable, economically viable semi-intensive vertical farming. Controlled experiments evaluated the effects of different growing media—jute, paper tissue, rockwool, coir, and coir mixed with tea waste (900 g: 100 g and 800 g: 200 g)—on the shoot height (cm), shoot fresh weight (mg/shoot), and fresh weight (g/cm²). The best-performing medium was tested under different harvest durations to determine the optimal time based on yield, shelf life, visual quality, and sensory traits. Microgreens at 7, 10, and 14 days were assessed for shelf life based on weight loss (%) and visual colour under ambient and refrigerated conditions. The experiment followed a two-factor factorial design in a completely randomised layout with three replicates. Sensory attributes—colour, odour, texture, visual quality, and overall appeal—were rated by 30 untrained panellists. Sole coir produced the highest fresh yield (62.48 mg/shoot; 0.33 g/cm²) and was selected as the best medium. Although 14-day-old microgreens had the maximum fresh weight (0.44 g/cm²), 7-day-old fresh samples received top sensory scores (colour: 3, odour: 5, texture: 5, visual appearance: 5, and acceptability: 5). Microgreens spoilt within two days at ambient temperature (27±2 °C), while refrigeration (5 °C) preserved the quality and acceptance of 7-day-old fresh samples for up to seven days. In industrial or culinary settings focused on customer satisfaction, harvesting 7-day-old fresh microgreens may be more beneficial despite their lower fresh weight.

KEYWORDS: *Brassica juncea*, Microgreens, Mustard, Shelf life, Tea waste



Acknowledgement: Financial assistance by Dilmah Conservation

[1]*Department of Plant Sciences, Faculty of Agriculture, Rajarata University of Sri Lanka, Anuradhapura;*
[2]*Dilmah Ceylon Tea Company PLC, Negombo Road, Peliyagoda, Sri Lanka*

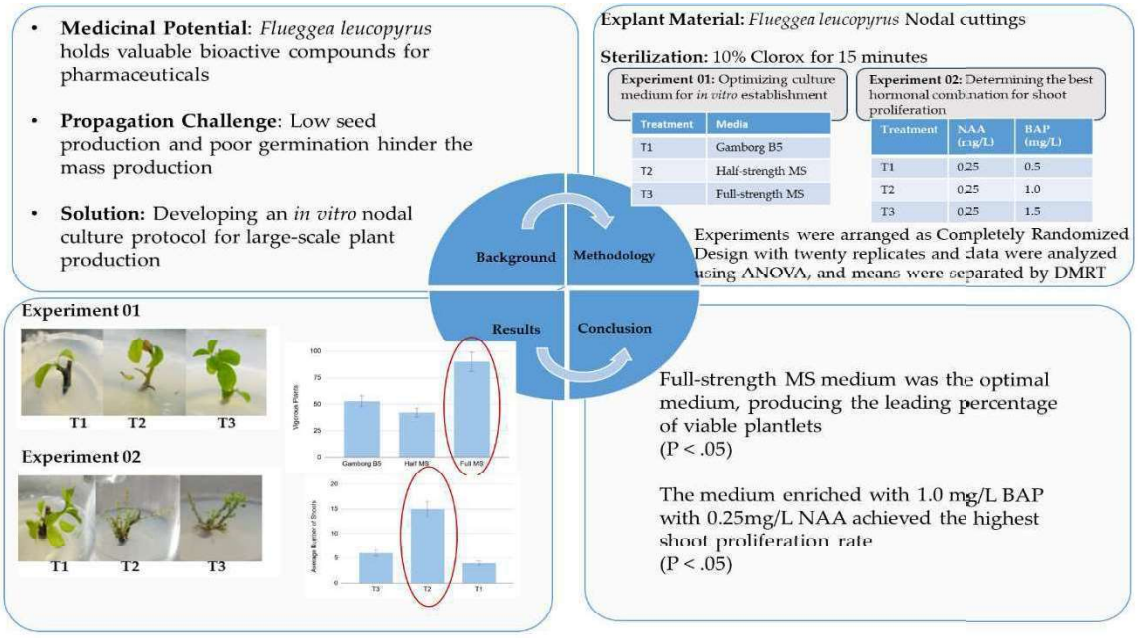
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

In vitro Propagation of *Flueggea leucopyrus* (*Katupila*) Through Nodal Cultures

W. G. D. PRASADINI, W. G. I. MADUSHANI and D. L. C. K. FONSEKA*
*Corresponding Author: dlckumari@crop.ruh.ac.lk

Flueggea leucopyrus, commonly known as *Katupila* has significant attention in traditional therapeutic systems in Asian countries. Recent applications in complementary and alternative medicine, particularly for cancer treatments and as a dietary supplement, have further heightened its significance. However, challenges such as low seed production and poor germination rates have constrained the mass propagation of high-quality plants. The current study aimed to establish an *in vitro* protocol for mass production of *F. leucopyrus* using nodal cultures. For *in vitro* establishment, explants were sterilised with a 10% Clorox solution for 15 minutes. Three plant tissue culture media: Gamborg B5, half-strength Murashige and Skoog (MS) and full-strength MS medium were evaluated to identify the most suitable medium for *in vitro* growth. Shoot proliferation was assessed using full-strength MS medium enriched with varying concentrations of 6-benzylaminopurine (BAP; 0.5, 1.0, and 1.5 mg/L) in combination with a fixed concentration of α-naphthaleneacetic acid (0.25 mg/L). Experiments were arranged as completely randomised design with 20 replicates, and data were analysed using Analysis of Variance (ANOVA), and means were separated by Duncan Multiple Range Test. The results demonstrated that full-strength MS medium was the optimal medium, producing the leading percentage (90%) of viable plantlets ($P < .05$). Additionally, the medium enriched with 1.0 mg/L BAP achieved the highest shoot proliferation rate (15 shoots/shoot tip; $P < .05$). These findings establish a foundational framework for future *in vitro* studies and the commercial propagation of *F. leucopyrus*, potentially overcoming its limited availability and expanding its applications in the pharmaceutical industry.

KEYWORDS: *Flueggea leucopyrus*, *In-vitro* establishment, Nodal segments, Secondary metabolites, Shoot proliferation



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

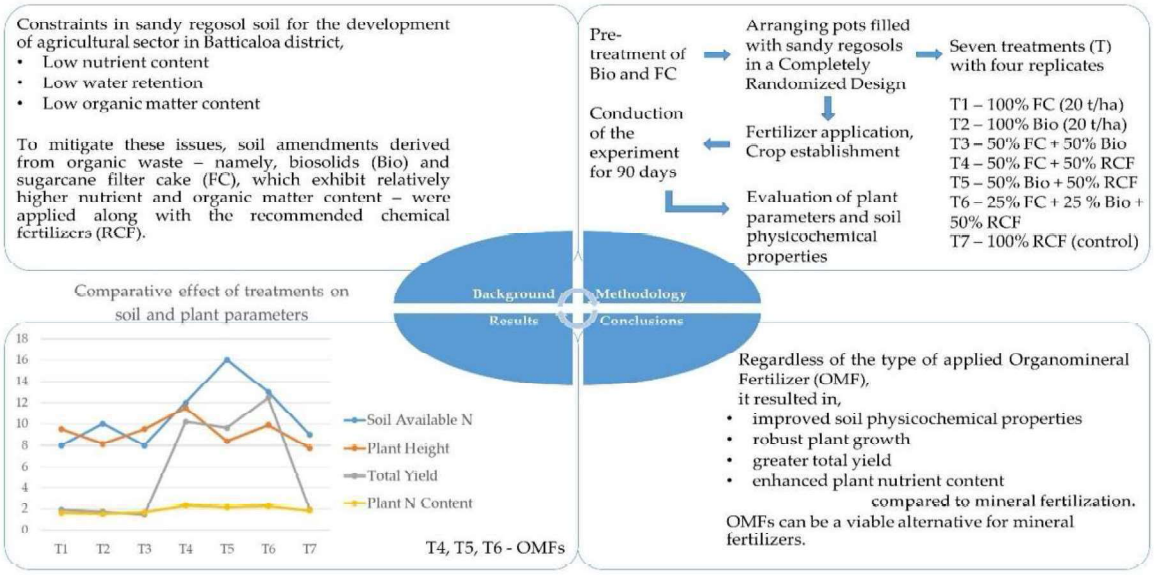
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Effectiveness of Organomineral Nutrient Sources: Biosolids and Sugarcane Filter Cake on Okra Production and Physicochemical Properties of Sandy Regosols

M. P. KOSGALLANE* and P. PREMANANDARAJAH
*Corresponding Author: piyumali1314@gmail.com

In the current state of agriculture, innovative soil conditioning techniques are essential for improving soil quality and plant health, thereby maximising agricultural production to meet the growing demand for food. Thus, this experiment was conducted to study the effectiveness of organomineral fertiliser (OMF) technology using biosolids (Bio) and sugarcane filter cake (FC), which are good sources of organic matter and mineral nutrients, on okra production and physicochemical changes in sandy regosol soil. A pot experiment with seven treatments was performed at the Agro farm, Eastern University, Sri Lanka. The seven treatments—T1 (100% FC – 20 t/ha), T2 (100% Bio – 20 t/ha), T3 (50% FC + 50% Bio), T4 (50% FC + 50% RCF (recommended chemical fertilisers)), T5 (50% Bio + 50% RCF), T6 (25% FC + 25% Bio + 50% RCF), and a control – T7 (100% RCF – DOA recommendation)—were replicated four times in a completely randomised design (CRD). The experiment lasted 90 days, after which plant parameters and soil physicochemical attributes were evaluated. The results revealed that OMFs (T4, T5, and T6) significantly improved ($P < .05$) most of the soil physicochemical properties (moisture content—8.28%, 7.18%, 7.81% and soil available nitrogen content—0.012%, 0.016%, 0.013%), plant growth and yield parameters (plant height—107.00 cm, 60.63 cm, 83.38 cm, and total yield—10.18 t/ha, 9.62 t/ha, 12.45 t/ha), and plant nitrogen content (2.34%, 2.18% and 2.27%), compared to 100% mineral fertilisation (T7: 6.21%, 0.009%, 37.38 cm, 1.97 t/ha, and 1.86%, respectively). Therefore, OMFs have the potential to be a viable substitute for mineral fertilisation, either entirely or partially, thereby reducing overall production costs.

KEYWORDS: Biosolids, Okra, Organomineral fertilisers, Regosol soil, Sugarcane filter cake



Department of Agricultural Chemistry, Faculty of Agriculture, Eastern University, Sri Lanka

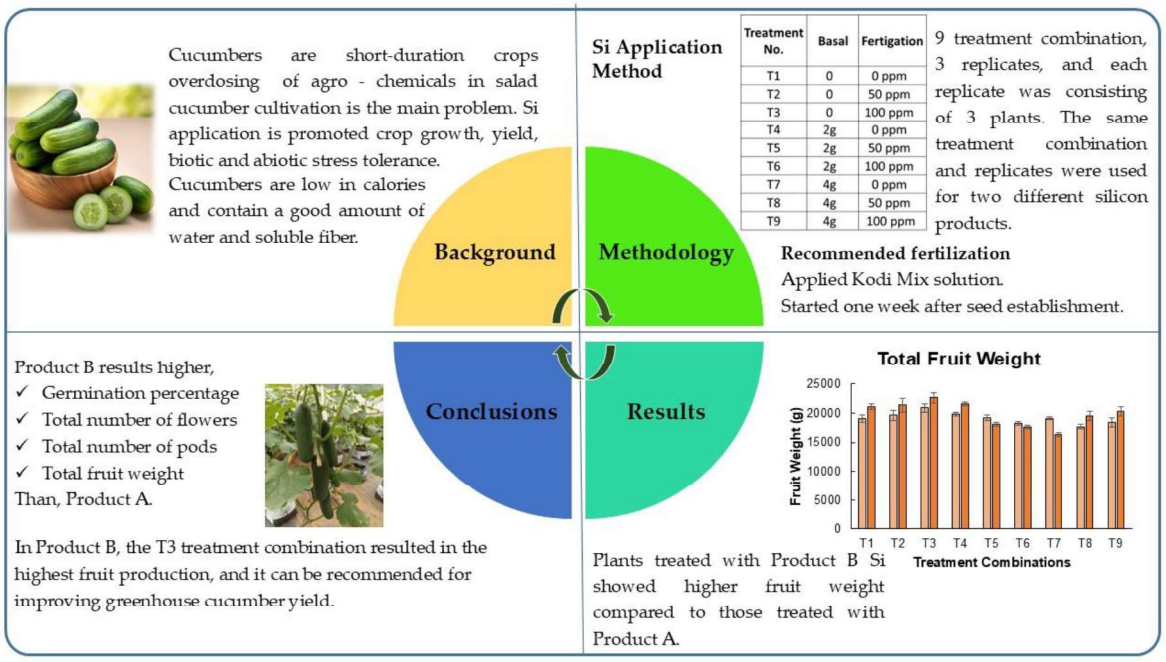
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Impact of Silicon Application on Yield and Quality of Salad Cucumber (*Cucumis sativus* L.) Under Protected Culture

E. M. WIMALASIRI[1], K. M. S. KODIKARA[2] and B. A. D. PRASADI[1*]
*Corresponding Author: prasadidilmi488@gmail.com

Cucumber (*Cucumis sativus* L.) is a widely cultivated, economically valuable vegetable that benefits from silicon (Si) fertigation, which enhances yield and stress resistance. Overuse of agrochemicals in protected salad cucumber cultivation has led to reductions in yield and quality while increasing costs. This study aimed to assess the effect of Si on cucumber yield and quality while minimising agrochemicals. Two Si products introduced by leading companies (product A and B) and nine different treatment combinations were tested in this study. Treatments T1, T2, and T3 involved no basal Si application with fertigation levels of 0, 50, and 100 ppm, respectively. Treatments T4, T5, and T6 included 2 g of basal Si, while T7, T8, and T9 included 4 g of basal Si, with the same fertigation levels to determine the most effective Si amount. Pots were arranged in a completely randomised design (CRD) with three replicates. Germination percentage, plant height, number of flowers, dropped flowers per plant, chlorophyll content, number of fruits, fruit weight and Brix value were recorded. Means were compared using the Duncan Multiple Range Test (DMRT) at a 5% probability level. Product B, which contained 95% amorphous silica, resulted in higher mean values for cucumber fruit weight (19,862.38 g), germination percentage (93.83%), and Brix value (3.90^0) compared to product A. The highest values were observed in T3 treatment combination of the product B, with a total fruit weight of 22,623.35 ± 843.61 g for nine plants. These results revealed that the product B, with T3 treatment can be suggested for enhanced cucumber yield under protected culture, potentially increasing exports to other countries.

KEYWORDS: *Cucumis sativus* L., Fertigation, Protected culture, Salad cucumber, Silicon



[1]Department of Export Agriculture, Faculty of Agricultural Sciences, Sabaragamuwa University of Sri Lanka, Belihuloya, Sri Lanka; [2]Regional Agriculture and Development Center, Bandarawela, Sri Lanka

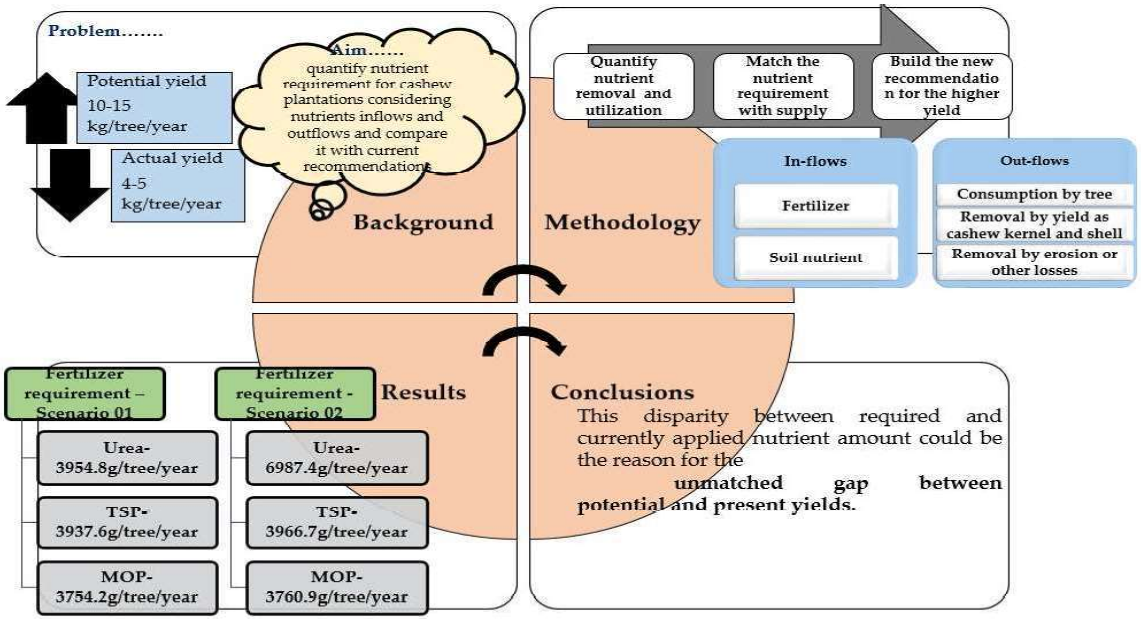
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Nutrient Budgeting for Cashew Plantations in Sri Lanka: Addressing Yield Gaps Through Optimised Nutrient Supply

K. C. GURUGE[1], H. M. I. K. HERATH[1*] and H. M. S. P. HERATH[2]
*Corresponding Author: indikaherath@wyb.ac.lk

Cashew is an important cash crop in Sri Lanka. There is a significant gap between the actual (4-5 kg/tree/year) and potential yield (15 kg/tree/year) set by Cashew Corporation, Sri Lanka (CCSL). A major cause of low yield could be insufficient nutrient supply. This study aimed to quantify the nutrient requirements for cashew plantations by analysing nutrient inflows and outflows and comparing them with current fertiliser recommendations. The nutrient budget was calculated based on inflows, including fertiliser application and soil nutrient pools, and outflows, such as tree consumption, harvested nuts, and other losses. Ten years of yield data from CCSL plantations and laboratory analyses of harvested nuts were used to quantify nutrient off-take. Two scenarios were evaluated: one assuming no nutrient losses and another assuming losses equal to soil nutrient supply. In both scenarios, nutrients from leaf litter, flowers, and cashew apples were considered recycled based on current practices. The harvested nuts contained 1.97% N, 0.24% P, and 0.68% of K. The plant dry weight increment in terms of N, P, and K was 3000 g/tree/year, 494 g/tree/year, and 1776 g/tree/year respectively. Soil analysis indicated that soil nutrient content was very low. Accordingly, the required fertiliser for the expected yield in the first scenario was Urea-3954.8 g/tree/year, TSP-3937.6 g/tree/year and MOP-3754.2 g/tree/year. Fertiliser requirement according to the second scenario was Urea-6987.4 g/tree/year, TSP-3966.7 g/tree/year and MOP-3760.9 g/tree/year which were much higher than the current recommendation. This disparity between the required and currently applied nutrient amounts highlights the unmatched gap between potential and present yield when other factors are not limiting.

KEYWORDS: Cashew, Fertiliser requirement, Nutrient budgeting, Yield gap



[1]Department of Plantation Management, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka, Makandura, Gonawila (NWP), 60170, Sri Lanka; [2]Sri Lanka Cashew Cooperation, Kamandaluwa, Andigama, Sri Lanka

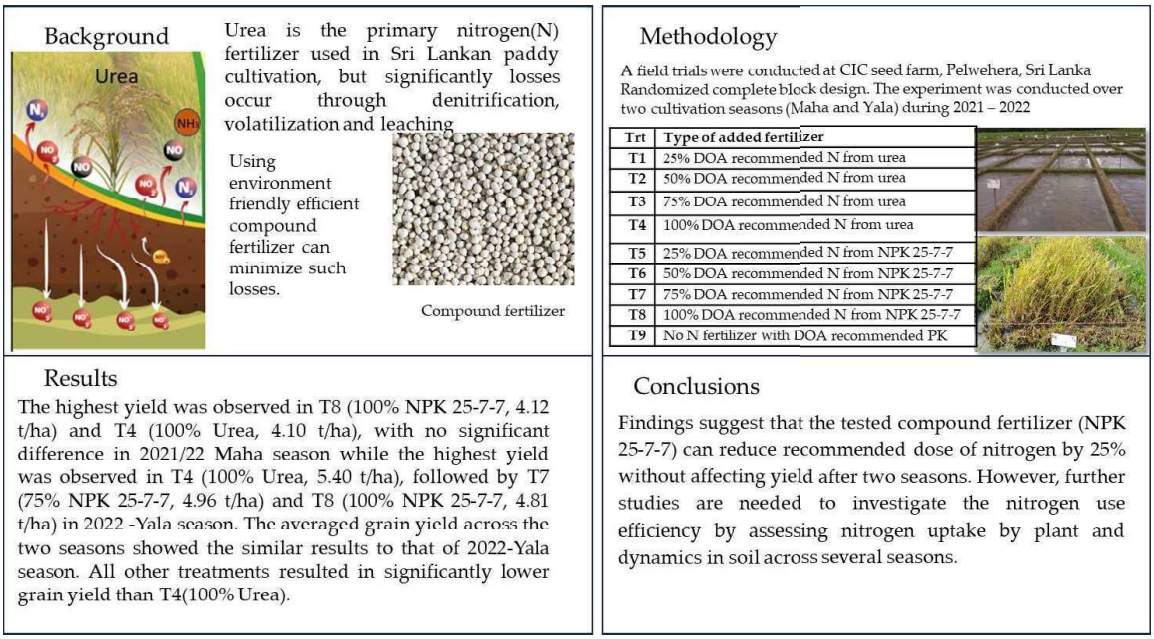
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Evaluating the Effectiveness of a Compound Fertiliser on Grain Yield of Paddy Cultivated in Dry Zone of Sri Lanka

W. G. C. VIBHUSHANA[1]*, A. H. KULASIRI[1] and D. N. V. GAMAGE[2]
*Corresponding Author: chamaravibhushana@gmail.com

Urea is the primary nitrogen (N) fertiliser used in Sri Lankan paddy cultivation, but significant losses occur through denitrification, volatilisation, and leaching. Using environmentally friendly, efficient compound fertiliser can minimise such losses. This study was conducted at CIC seed farm in Pelwehera to evaluate the effectiveness of a compound fertiliser (NPK 25-7-7) on paddy grain yield while reducing fertiliser application amount using BG352 rice variety. Nine different treatments in a randomised complete block design were tested: nitrogen was applied at 25%, 50%, 75%, and 100% of the recommended dose (RDN) using either urea or NPK 25-7-7 phosphorus and potassium were applied at the Department of Agriculture (DOA)-recommended levels, while the control treatment received no nitrogen. The experiment was conducted over two cultivation seasons (2021/22-*Maha*, 2022-*Yala*). The highest yield was observed in T8 (100% NPK 25-7-7, 4.12 t/ha) and T4 (100% urea, 4.10 t/ha), with no significant difference in 2021/22-*Maha* season while the highest yield was observed in T4 (100% urea, 5.40 t/ha), followed by T7 (75% NPK 25-7-7, 4.96 t/ha) and T8 (100% NPK 25-7-7, 4.81 t/ha) in 2022-*Yala* season. The average grain yield across the two seasons showed similar results to that of 2022-*Yala* season. All other treatments resulted in significantly lower grain yield than T4. Findings suggest that the tested compound fertiliser (NPK 25-7-7) can reduce the recommended dose of nitrogen by 25% without affecting yield after two seasons. However, further studies are needed to investigate the nitrogen use efficiency by assessing nitrogen uptake by plants and dynamics in soil across several seasons.

KEYWORDS: Compound fertiliser, Grain yield, Paddy, Urea



[1]CIC Agri Businesses Private Limited, 199, Kew Road, Colombo 02, Sri Lanka; [2]Department of Soil Science, Faculty of Agriculture, University of Peradeniya, Sri Lanka

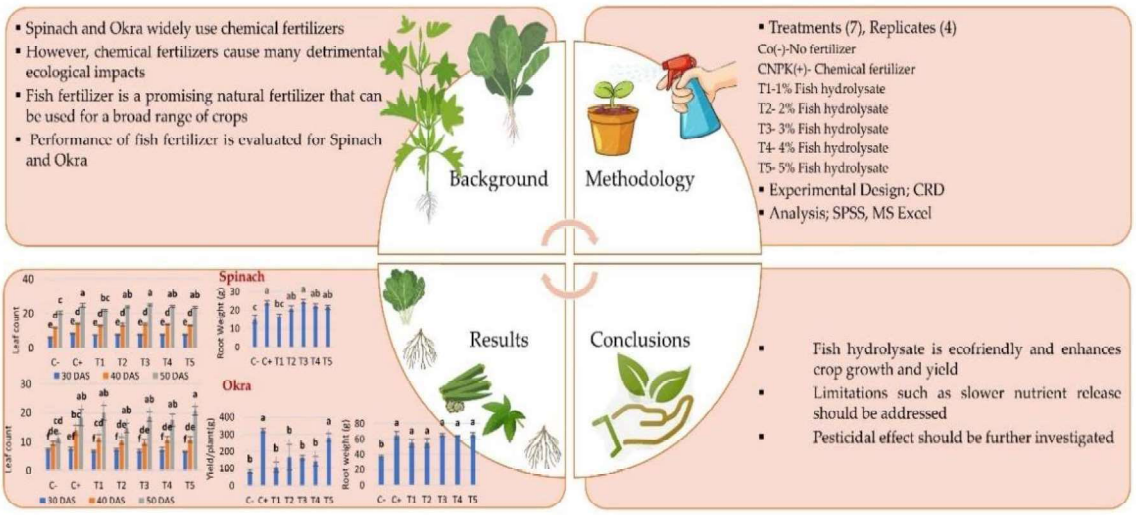
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Determining the Growth and Yield Performance of Seasonal Crops Cultivated Using Fish Hydrolysate Liquid Fertiliser

W. M. W. W. KANDEGAMA [1,2*], J. M. G. M. T. KARUNARATHNE [2,3], E. K. W. W. WEERARATHNA[2], W. CHEN[2], G. K. WEERAKKODY [4] and A. D. S. L. DASANAYAKE[5]
*Corresponding Author: wishwajith@wyb.ac.lk

Spinach (*Spinacia oleracea* L.) and okra (*Abelmoschus esculentus* L.) are nutritionally rich annual crops that use a higher content of inorganic fertilisers (NPK). Biogenic amendments like fish hydrolysate (FH) are gaining popularity; however, optimal application rates for greenhouse conditions remain unclear. This study aimed to evaluate the effect of FH on the growth performance of spinach and okra using growth and yield factors. The plants were treated with 1%, 2%, 3%, 4%, and 5% FF concentrations (T1-T5), respectively, and NPK (CNPK) and no fertiliser (Co) as controls. Each treatment was replicated four times in a completely randomised design. Data collection spanned an 8-week growing period, at 30, 40, and 50 days, and plant growth parameters were analysed in Tukey's HSD using SPSS. In spinach, the results showed that T4 produced the highest leaf count (24.16±0.4) and yield (268.16±11.1 g), while T3 had the greatest root weight (24.66±1.0 g), all significantly ($P < .05$) higher than the control and the highest FF concentration (T5), which suppressed plant vegetative growth. The growth parameters of okra, such as leaf count, leaf area index, branch count, and shoot weight, were highest ($P < .05$) in T5, accounting (20.6±1.5), (30.8±0.2 cm^2), (4±0.7), (344±7.4 g), respectively, while root weight was highest in T3 (65.6±1.7 g) compared to the control. Pod yield was significantly higher ($P < .05$) in CNPK (323.2±13.9 g); nevertheless, there was no significant difference from T5 (281.8±9.7 g). The results showed that FH could be a potential alternative to NPK for seasonal crops, highlighting the importance of using specific application rates for different crops.

KEYWORDS: Fish hydrolysate, Growth parameters, Okra, Spinach, Yield performance



[1]Department of Horticulture and Landscape Gardening, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka, Makandura, Gonawila, 60170 Sri Lanka; [2]State Key Laboratory of Green Pesticide, Key Laboratory of Green Pesticide and Agricultural Bioengineering, Ministry of Education, Center for Research and Development of Fine Chemicals, Guizhou University, Guiyang 550025, P. R. China; [3]Department of Soil Science, College of Agriculture, Guizhou University, Guiyang 550025, P. R. China; [4] Faculty of Science, Horizon Campus, Knowledge City Malabe, KCM Drive, Off Millenium Road, Malabe, 10115, Sri Lanka, [5]Department of Soil Science, Faculty of Agriculture, Puliyankulama, Anuradhapura, Sri Lanka

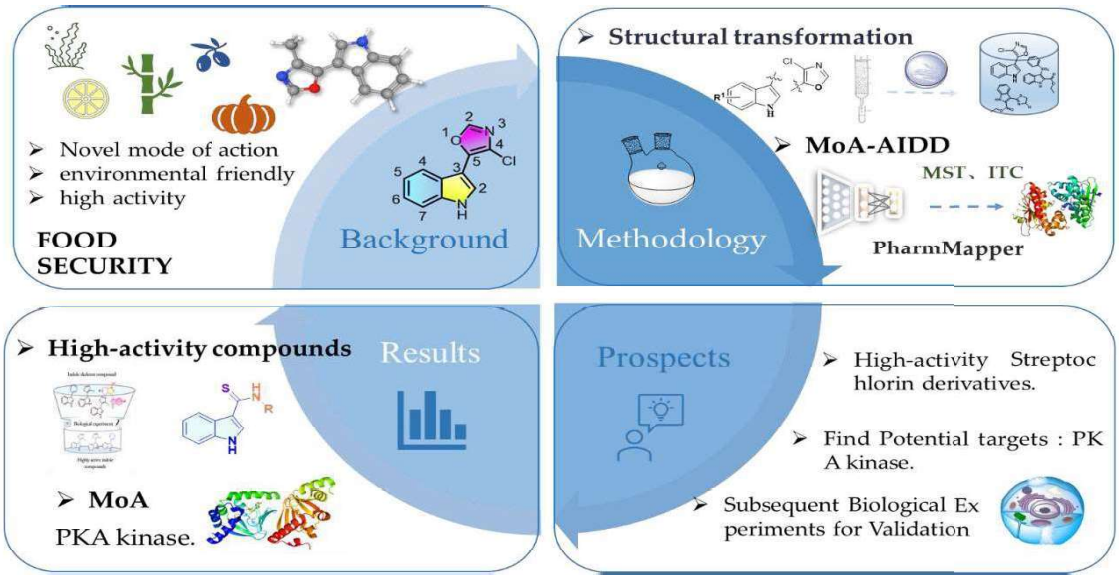
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Design, Synthesis, Biological Activity and Mechanism of Action of Streptochlorin Derivatives

F. DUAN and M. ZHANG*
*Corresponding Author: mzzhang@njau.edu.cn

Natural products serve as essential resources in the development of new pesticides, with structural optimisation frequently yielding, environmentally friendly and highly active candidate compounds. This study builds upon our previous findings regarding streptochlorin, a natural indole known for its significant antifungal activity. By preserving its core indole structure, innovative strategies involving open-ring modifications and active substructure linkages were employed to introduce amide and thioamide groups, and a series of streptochlorin derivatives was successfully synthesised. The derivatives were evaluated for their fungicidal activity against six common plant pathogenic fungi under *in vitro* conditions. The bioassay results revealed that most of the target compounds exhibited more significant fungicidal activity under the concentration of 50 μg/mL, and especially the highlighted compounds A13 and A15 exerted impressive fungicidal activity, which was obviously better than positive controls. This information suggests substantial potential for reducing disease incidence while enhancing crop yield. The study further integrated computer-aided drug design (CADD) to predict potential targets. Subsequent experimental validation using microscale thermophoresis (MST) and isothermal titration calorimetry (ITC) confirmed the binding affinity between the compounds and target proteins, thereby elucidating their structure-activity relationships and mechanism of actions. This research provides novel high-activity molecular scaffolds for the development of green pesticides, supporting the sustainable transformation and advancement of the global pesticide industry and agricultural economies.

KEYWORDS: Computer-aided drug design, Fungicidal activity, Lead optimisation, Streptochlorin



Acknowledgements: Financial assistance by National Key Research and Development Program of China (2023YFD1700500), and the National Natural Science Foundation of China (22177051)

College of Sciences, Nanjing Agricultural University, Nanjing, 210095, China

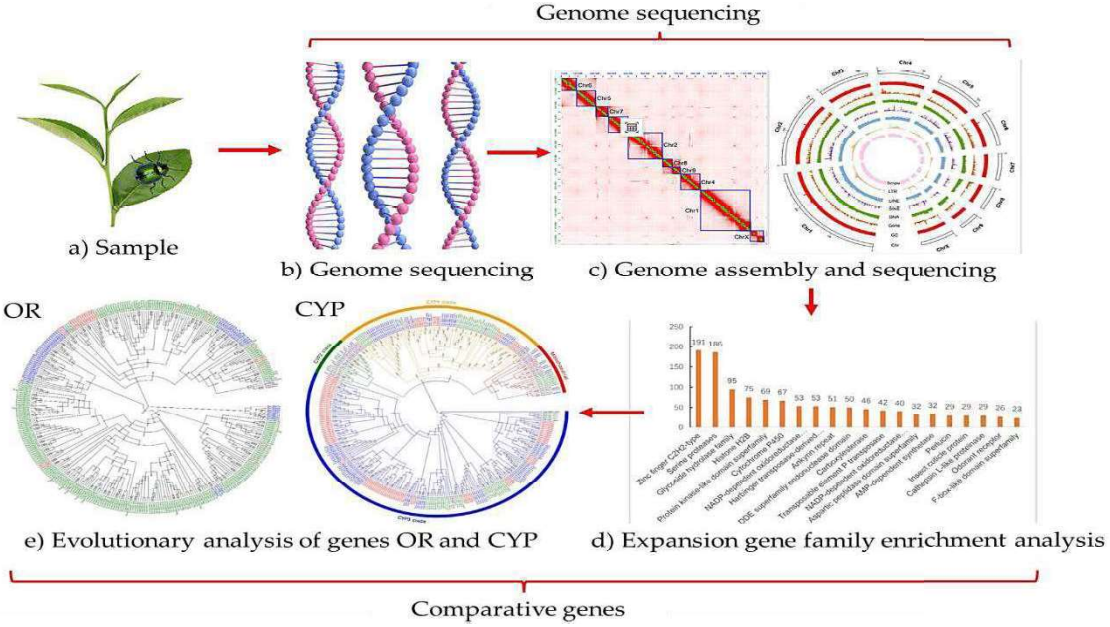
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Chromosome-level Genome Assembly of the Hairy-legged Leaf Beetle (*Colaspoides femoralis*)

Q. ZHANG[1,2], C. WEI[1,2], S. LI[1,2], S. M. DASSANAYAKA[1,2], X. ZHOU[1,2] and L. JIN[1,2*]
*Corresponding Author: linhong.j@126.com

Colaspoides femoralis Lefevre is a new outbreak of the most notorious pest in Chinese tea gardens. It primarily feeds on tea plant leaves through its mouthparts, causing the leaves to break down into sieve-like holes, which seriously affects the quality of tea leaves. In this study, high-quality genome assembly of *C. femoralis* at the chromosome level was achieved by combining PacBio HiFi sequencing and Hi-C scaffolding technologies. The assembled genome spans 1222.62 Mb, with a contig N50 of 7.27 Mb and a scaffold N50 of 118.29 Mb. Using Hi-C data, it was successfully anchored 1,209.46 Mb (98.92% of the genome) onto ten chromosomes. Across 13 species, a total of 14,446 gene clusters were identified. The completeness of the final genome and proteome was rigorously assessed using BUSCO, yielding highly complete scores of 98.7% and 98.4%, respectively. A comparative genomic analysis revealed that *C. femoralis* Lefevre possesses 995 expanded and 1,915 contracted gene families relative to other insect species. REVIGO analysis highlighted that the expanded orthogroups are significantly enriched in functional categories such as serine proteases, cytochrome P450, AMP-dependent synthetases, and odorant receptors. Based on these findings and considering the feeding biology of *C. femoralis*, a comprehensive investigation of gene families associated with detoxification metabolism (CYP and CCE) and chemosensation (GR, IR, OBP and OR) could be proposed as future activities. These analyses aimed to provide deeper insights into the molecular mechanisms underlying the pest's adaptation and its interactions with tea plants.

KEYWORDS: Chemosensation, *Colaspoides femoralis* Lefevre, Cytochrome P450, Genome



Acknowledgement: Financial assistance by National Key Research and Development Program of China (2024YFE0214300), Guizhou Science and Technology Cooperation Achievement (2022) Key 006 and Guizhou Modern Agriculture Research System-Tea

[1]State Key Laboratory of Green Pesticide; [2]Center for R and D of Fine Chemicals, Guizhou University, Guiyang, 550025, China

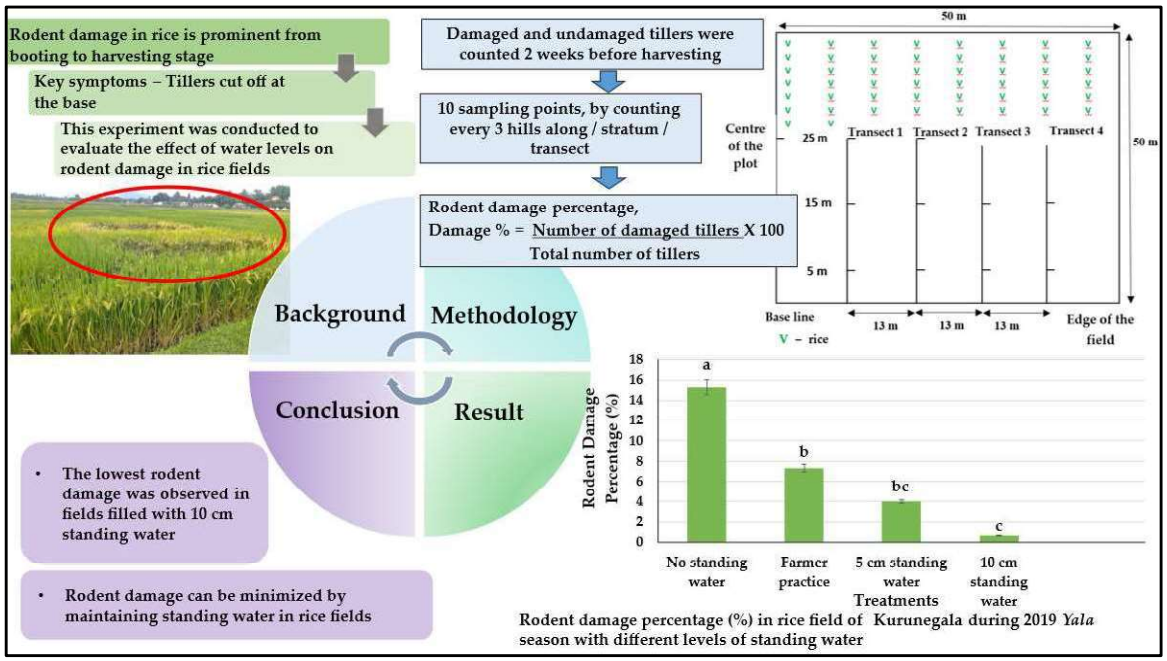
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Effect of Standing Water Level on Rodent Damage in Rice Fields of Sri Lanka

S. R. SARATHCHANDRA[1,2]*, L. NUGALIYADDE[1], K. S. HEMACHANDRA[1],
K. S. SANDADEVANI[2], M. P. H. K. JAYAWEERA[2] and L. B. T. DILANKA[2]
*Corresponding Author: siriwardanadoa@gmail.com

Rice is a major crop cultivated in Sri Lanka, and rodents have long been identified as one of the most significant pests (5-10% yield loss per annum), demanding intervention for rodent management. This study aimed to examine the effect of standing water level on rodent damage in rice fields. This experiment was conducted in a selected farmer field in Kurunegala district with four experimental plots, each measuring 50×50 m. Treatments—no standing water (T1-control), conventional farmer practice (T2), 5 cm of standing water (T3), and 10 cm of standing water (T4)—were applied one week before panicle initiation following a standard statistical design. A baseline was demarcated along the long axis of the field, with four perpendicular transects per treatment plot, considered as replicates. Each transect was further divided into three perpendicular strata. The damaged and undamaged tillers were counted two weeks before harvesting. This task was done by counting every three hills along each stratum of each transect until 10 sampling points were recorded. The results indicated significant differences among treatments ($F_{(3,8)}$ = 23.71, P = .0002), and the damage was reduced with increasing water depth. Tiller damage percentage was highest in T1 (15.3%) and lowest in T4 (0.7%), while T2 and T3 recorded 7.3% and 4%, respectively. This data indicates that maintaining a certain water level effectively mitigates rodent damage in rice cultivation. While farmers rely on rodenticides, maintaining water levels serves as an additional strategy to minimise damage, supporting sustainable agriculture and Sri Lanka's rice self-sufficiency.

KEYWORDS: Rice cultivation, Rodent damage, Sustainable agriculture, Water level



[1]*Postgraduate Institute of Agriculture, University of Peradeniya, Peradeniya, Sri Lanka;* [2]*Rice Research and Development Institute, Batalagoda, Sri Lanka*

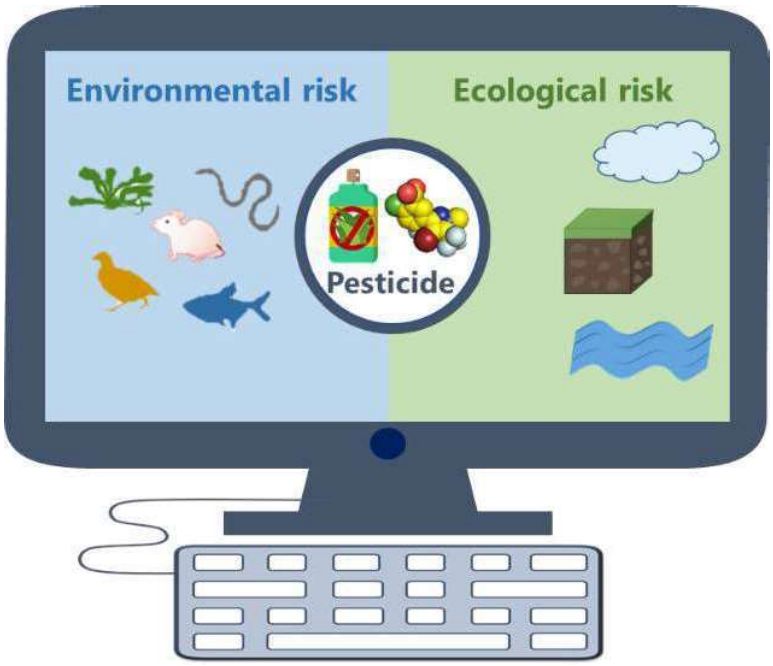
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

A Web Platform to Facilitate the Ecological and Environmental Risk Evaluation of Pesticides

D. Y. CHEN and G. F. HAO*
*Corresponding Author: gefei_hao@foxmail.com

Developing new pesticides often encounters some difficulties, such as low bioavailability, high risk, synthetic accessibility *etc*. Risk assessment is a key part of pesticide discovery, which includes human health and ecological effect testing. In recent decades, waiver policies and *in silico* methodologies of risk assessment have been promoted worldwide to reduce animal testing and costs. However, there is a lack of a comprehensive framework for risk assessment, which could help researchers improve the success rate of pesticide discovery. Therefore, this study aimed to develop a comprehensive framework and a web platform (available at http://chemfree.agroda.cn/chemfree/). Inputting SMILES strings of chemicals, users will obtain the assessment outputs of ecological and environmental risk *etc*. A performance evaluation of 2935 external chemicals revealed that most classification models achieved an accuracy rate above 0.816, such as in the case of mammalian oral toxicity. Therefore, it facilitates the ecological and environmental risk evaluation of pesticides.

KEYWORDS: Ecological risk, Environmental risk, Pesticide discovery, Risk assessment



Acknowledgements: This work was supported by the National Natural Science Foundation of China (32125033), the Central Government Guides Local Science and Technology Development Fund Projects (Qian kehezhongyindi (2023)001) and Program of Introducing Talents of Discipline to Universities of China (111Program, D20023).

State Key Laboratory of Green Pesticide, Key Laboratory of Green Pesticide and Agricultural Bioengineering, Ministry of Education, Center for Research and Development of Fine Chemicals, Guizhou University, Guiyang 550025, P. R. China

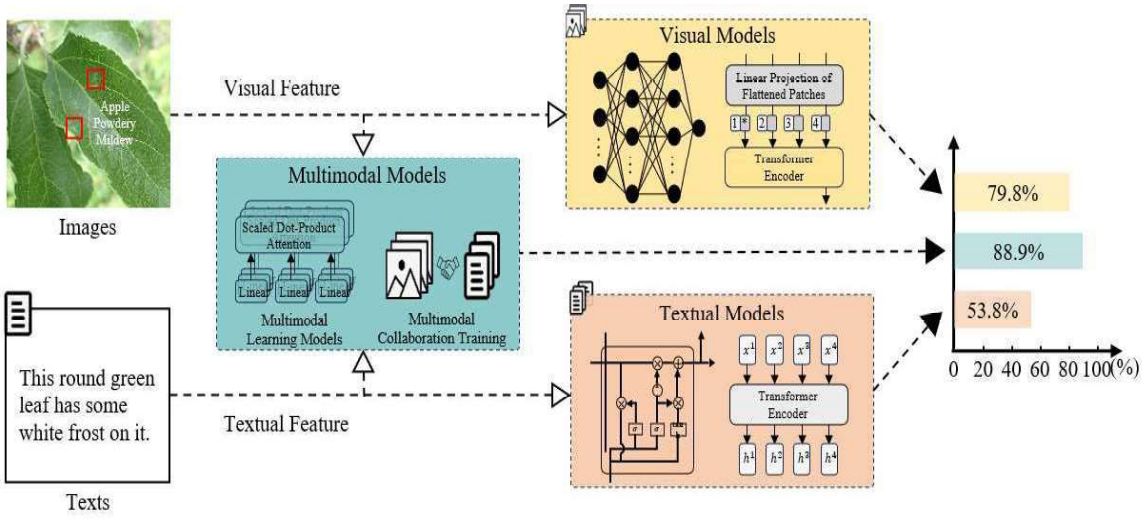
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Multimodal Big Data Facilitates Early Plant Disease Diagnosis

X. WU[1], Q. WANG[1*] and G. HAO[2]
*Corresponding Author: qiwang@gzu.edu.cn

Ensuring global food security requires a rapid and accurate identification of plant diseases, which continue to pose serious threats to agricultural productivity. Although artificial intelligence techniques based on visual data have made significant progress in plant pathology, their reliance on single-modality inputs limits their effectiveness in detecting diseases at early stages. To overcome this limitation, a novel framework that integrates heterogeneous data—namely images and textual annotations—through a multimodal learning strategy was tested to enhance early diagnostic accuracy. Specialised visual encoders and language decoders were incorporated to the architecture, with contrastive learning employed to semantically align visual and textual features. These aligned representations were then fused using cross-attention mechanisms and a dedicated multimodal decoder, enabling the model to effectively capture subtle indicators of disease onset. To support training and evaluation, a large-scale dataset comprising 205,007 plant images and 410,014 expert annotations spanning 40 crop species and 116 disease categories was constructed. Fine-tuning the proposed model using early-stage samples from this dataset led to marked improvements in diagnostic performance. Extensive experiments validated the robustness of our framework, including successful early identification of *Phytophthora capsici* infection in pepper plants. This research demonstrates that the integration of multimodal big data can significantly advance early plant disease detection, reduce pesticide usage, lower production costs, and contribute to more sustainable and secure agricultural practices.

KEYWORDS: Agricultural AI, Big data, Early diagnosis, Multimodal learning, Plant disease



Acknowledgement: National Natural Science Foundation of China (No. 62162008)

[1]State Key Laboratory of Public Big Data, College of Computer Science and Technology, Guizhou University, Guiyang, 550025, China; [2]National Key Laboratory of Green Pesticide, Guizhou University, Guiyang 550025, China

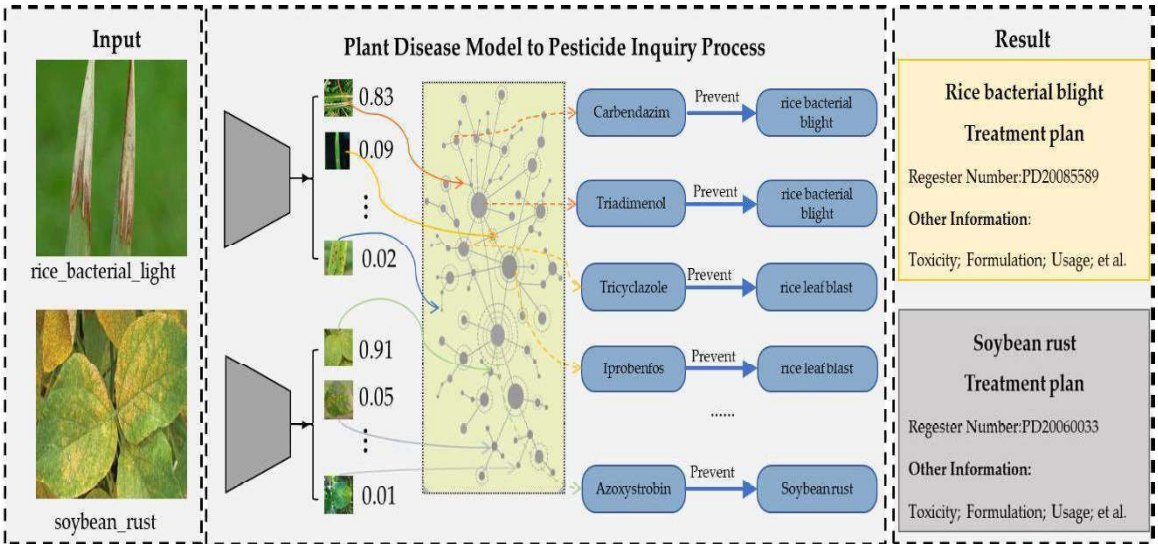
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

AI-Powered Long-Tail Disease Management for Smallholders

Y. LIU, X. WU, D. ZHANG and Q. WAN
*Corresponding Author: qiwang@gzu.com

Sri Lanka, with a population nearing 22 million and a strong agricultural dependence, faces significant food security challenges. Rice, the staple crop, accounts for much of the arable land and livelihoods but is frequently threatened by diseases like blast and sheath blight, causing substantial yield losses annually. These losses are compounded by inefficiencies in current pest management practices, particularly for small-scale farmers lacking access to specialised knowledge. A major obstacle is the lack of integrated technological solutions that can both diagnose these diseases and provide optimised pesticide recommendations. This distribution, where a few prevalent diseases dominate while numerous rare ones remain under-represented, complicates accurate recognition and effective control strategies for small-scale farmers. This study addresses these challenges by introducing an innovative framework integrating advanced AI-based disease diagnosis with precise control strategies. This study presented a novel long-tail dataset encompassing 41 crop diseases across five staple crops, reflecting real-world disparities, and developed a reinforced prototype contrastive learning method to enhance feature extraction for rare diseases. Further, a pesticide knowledge graph covering nine countries was established by uniting information in guidelines tailored to Sri Lanka. Experiments demonstrate that our long-tail algorithm optimised for plant diseases, improved model accuracy by 14% and that answers generated using the pesticide knowledge graph are more reliable and interpretable than those from large models. By integrating cutting-edge AI with local agricultural expertise, this framework significantly enhances crop disease management, offering solutions critical to improving food security in Sri Lanka and beyond.

KEYWORDS: AI-driven diagnosis, Disease management, Long-tail distribution, Pesticide knowledge graph



Acknowledgement: Financial assistance by State Key Laboratory of Public Big Data[1] through the grant 146

State Key Laboratory of Public Big Data, College of Computer Science and Technology, Guizhou University, Guiyang, 550025, China

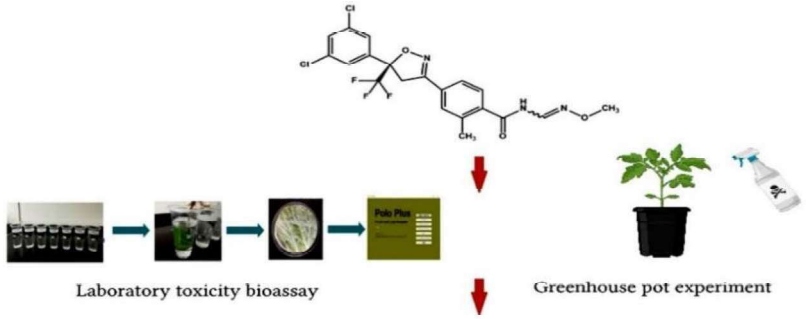
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Control Efficacy of the Novel Isoxazoline Insecticide Fluxametamide against Lepidopteran Pests in China

Z. Y. CHEN, Y. HAN and Z. Y. WANG*
*Corresponding Author: zywang@mail.ccnu.edu.cn

Lepidopteran pests seriously threaten agricultural production in China, where chemical control remains the primary method. However, overuse of insecticides has led to resistance, reducing efficacy. Fluxametamide, a novel isoxazoline insecticide targeting GABA-gated chloride channels, offers great potential due to its unique mode of action and lack of cross-resistance. A comprehensive efficacy evaluation is essential before its registration in China. This study evaluated the efficacy of fluxametamide against seven field-collected lepidopteran pests: *Plutella xylostella*, *Spodoptera exigua*, *Spodoptera litura*, *Spodoptera frugiperda*, *Mythimna separata*, *Ostrinia furnacalis*, and *Chilo suppressalis*. Laboratory bioassays were conducted using the leaf-dip method: cabbage leaves were immersed in solutions of different concentrations, air-dried, and placed in 60 mm Petri dishes. Ten second-instar larvae were introduced per dish, with four replicates per concentration and a negative control. Mortality was recorded after 72 hours, corrected using Abbott's formula, and LC_{50} values were calculated with PoloPlus 2.0. Fluxametamide showed high toxicity to all tested pests, with the highest activity against *M. separata* (LC_{50}=0.013 mg/L) and the lowest against *O. furnacalis* (LC_{50}=1.292 mg/L). A greenhouse pot experiment was conducted using corn and *O. furnacalis*. Fifty eggs were placed per pot, and larval numbers were counted at the second instar before spraying. Larval survival was recorded at 1, 3, 5, and 7 days post-treatment. At a dose of 20 g/mu (≈0.15 kg/ha), control efficacy reached 62.36% on day seven. No cross-resistance to fluxametamide was observed in a diamide-resistant strain of *P. xylostella*. These results suggest that fluxametamide remains effective against field populations, though species-specific differences warrant continuous monitoring.

KEYWORDS: Fluxametamide, Greenhouse experiment, Laboratory bioassays, Lepidopteran pests



Insect	LC_{50} 95% CL (mg/L)
Plutella xylostella	0.090 (0.072~0.112)
Spodoptera exigua	0.078 (0.064~0.093)
Spodoptera litura	0.181 (0.158~0.208)
Spodoptera frugiperda	0.037 (0.014~0.159)
Mythimna separata	0.013 (0.012~0.014)
Ostrinia furnacalis	1.292 (0.914~1.823)
Chilo suppressalis	0.776 (0.522~0.886)

Concentration	Control Efficacy(%)			
	1d	3d	5d	7d
20g/mu	46.06±6.8	48.73±5.7	59.69±2.5	62.36±1.4
10 g/mu	37.30±4.6	41.39±2.6	44.72±3.9	47.45±4.2
5 g/mu	13.37±5.3	16.82±3.8	17.80±3.6	21.25±4.9

Acknowledgements: This work was supported by the Natural Science Foundation of China (Grant number: 22077047), the Natural Science Foundation of Hubei Province (Grant numbers: 2023AFB922, 2024AFB938), and the Fundamental Research Funds for the Central Universities (Grant number: CCNU24JCPT031).

State Key Laboratory of Green Pesticide, Central China Normal University, Wuhan 430079, China

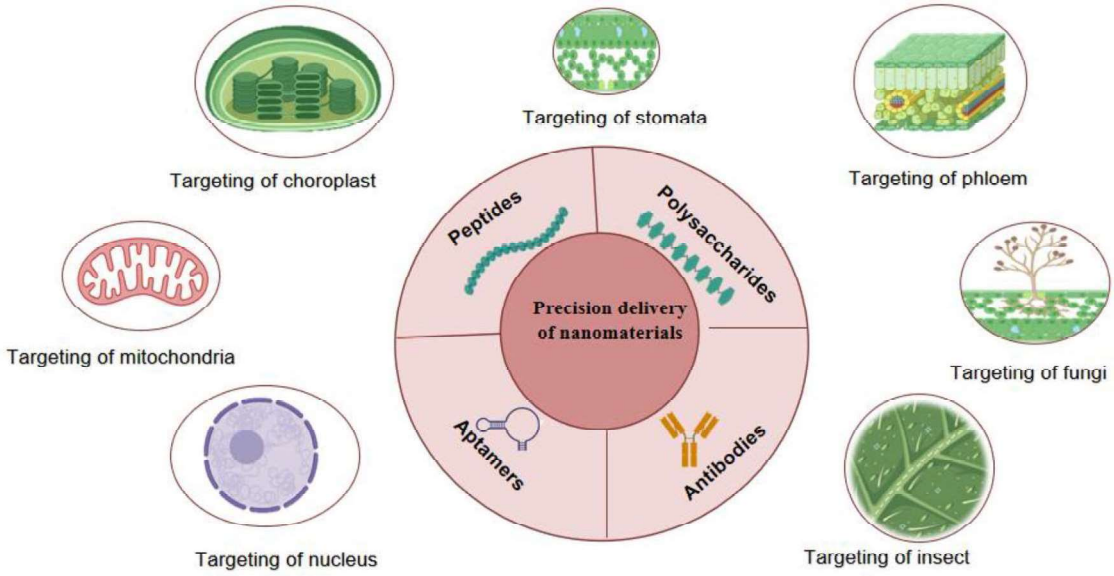
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Molecular Recognition Facilitates the Precision Delivery of Nanomaterials and Their Cargo in Plants

I. SENOSY[1,2], W.M.W.W. KANDEGAMA[1,3] and G. HAO[1*]
*Corresponding Author: gefei_hao@foxmail.com

The significant inefficiencies of conventional biochemical delivery methods in plant tissues result in unintended alterations in plant functions. Nanotechnology has emerged as a promising strategy for improving delivery efficiency. Recent advances in molecular recognition have enabled the precision delivery of nanomaterials and their cargo in specific locations of plants. However, a comprehensive analysis of the molecular recognition driving these interactions remains underexplored. Herein, a systematic overview was provided through analysis of 350 articles related to the molecular mechanisms of biorecognition for precise plant delivery of nanomaterials. First, the advancements in precision delivery of nanomaterials to plants were highlighted. Next, the precision molecular recognition of agrochemical delivery, gene editing, and biochemical sensing were elucidated. These engineered nanomaterials achieved site-specific delivery by binding to plant receptors, demonstrating over 6.8-fold greater efficiency than their non-functionalised counterparts. Finally, the challenges and perspectives of large-scale agricultural applications were identified. This study can guide the design of targeted delivery systems for specific plant sites, ultimately developing sustainable agriculture and enhancing food security.

KEYWORDS: Molecular recognition, Nanomaterials, Precision delivery, Sustainable agriculture



Acknowledgement: Financial assistance by the China National Foreign Expert Project (Y20240106)

[1]State Key Laboratory Breeding Base of Green Pesticide and Agricultural Bioengineering, Ministry of Education, Guizhou University, Guiyang 550025, P. R. China; [2]Faculty of Agriculture, Department of Plant Protection, Fayoum University, Fayoum 63514, Egypt; [3]Department of Horticulture and Landscape Gardening, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka, Makandura, Gonawila, Sri Lanka

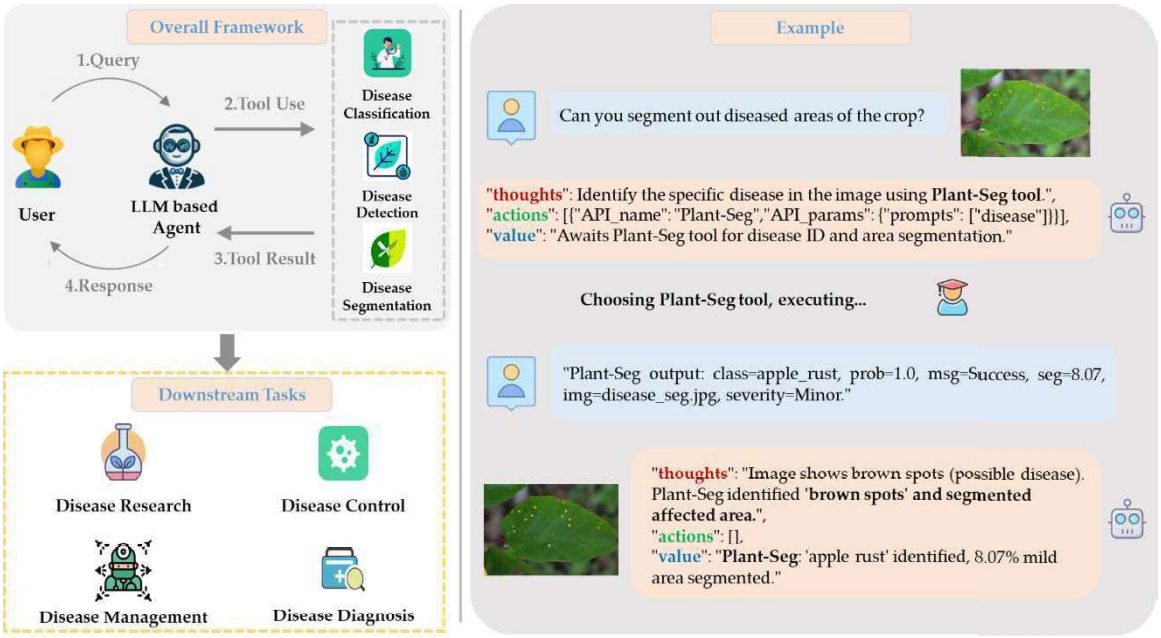
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Plant Disease Diagnosis Agent: A Multimodal Large Language Model-Powered AI System for Automatic Plant Disease Diagnosis

L. QIN, X. WU, X. DONG, H. WANG, T. YANG and Q. WANG*
*Corresponding Author: qiwang@gzu.edu.cn

Multimodal large language models (MLLMs) have achieved remarkable progress across various domains, excelling in tasks such as question answering, segmentation, and detection. However, their performance in multitask operations, particularly for specialised applications like plant disease diagnosis, remains limited. Existing large-scale plant disease models are often restricted to narrow task scopes, lacking the capability for expert-level diagnostics. To address these challenges, a novel MLLM-driven plant disease AI system was designed to deliver accurate, expert-grade diagnostic services. Our system integrated four key modules: a data preprocessing module, a decision-making module, a multifunctional action module, and a result aggregation module. By fine-tuning on over 400,000 multimodal samples from the Agri-LLaVA dataset-comprising domain-specific agricultural images and corresponding textual descriptions, the system gained domain-specific knowledge for accurate decision-making. It intelligently selected and orchestrated specialised diagnostic tools, enabling multidimensional analysis and comprehensive result synthesis. Experimental results on over 1,000 samples from our self-constructed dataset showed a diagnostic accuracy of 91.33%, surpassing GPT-4 and Agri-LLaVA. Compared to existing methods, our system achieved notable improvements in diagnostic accuracy and reliability. By adapting to diverse crop species and varying real-world farming conditions, the system ensures reliable disease diagnosis across different agricultural environments, contributing to the advancement of smart agriculture.

KEYWORDS: AI agent, Multimodal large language models, Plant disease diagnosis



State Key Laboratory of Public Big Data, College of Computer Science and Technology, Guizhou University, Guiyang, Guizhou, 550025, China

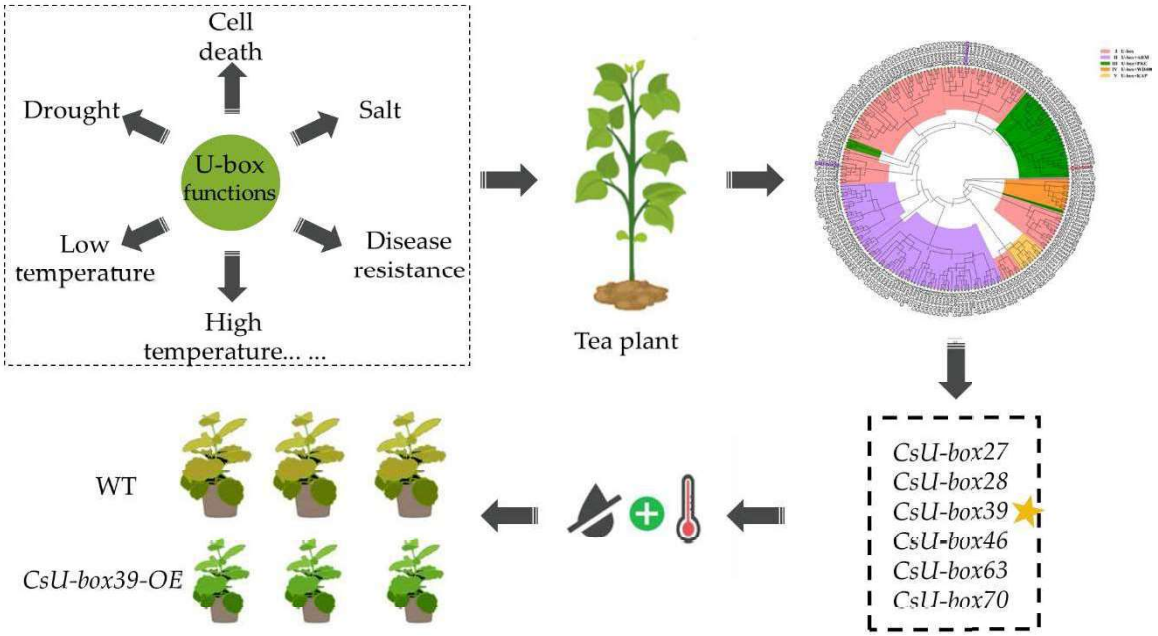
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Genome-wide Profiling and Stress-responsive Functional Study of U-box E3 Genes in Tea Plant Using Transgenic Tobacco

S. LI[1,2], G. ZHAO[1,2], Q. ZHANG[1,2] and L. JIN[1,2*]
*Corresponding Author: linhong_j@126.com

Plant U-box genes play pivotal roles in essential survival mechanisms, functioning as critical regulators of growth, reproductive development, and stress adaptation processes. Through genome-wide analysis of tea (*Camellia sinensis)*, 92 *CsU-box* genes containing conserved U-box domains were systematically identified. Phylogenetic classification segregated these genes into five distinct subfamilies, a categorisation corroborated by subsequent gene structure analyses. Comprehensive expression profiling utilising the Tea Plant Information Archive (TPIA) database revealed tissue-specific patterns across eight tea plant organs and differential regulation under abiotic stresses and phytohormone treatments. Seven candidate *CsU-box* genes (*CsU-box27/28/39/46/63/70/91*) were selected for validation through qRT-PCR under PEG-induced drought and thermal stress conditions. Experimental results demonstrated strong concordance between transcriptional activation patterns and transcriptome predictions. *CsU-box39* was subsequently selected for functional characterisation *via* heterologous expression in transgenic tobacco models. Systematic phenotypic and physiological evaluations of CsU-box39-overexpressing transgenic lines demonstrated its positive regulatory role in drought stress tolerance mechanisms. This investigation establishes a foundational framework for elucidating *CsU-box* gene functions in tea plants while providing a theoretical basis for developing molecular breeding strategies to enhance stress resilience in perennial crops.

KEYWORDS: Abiotic stress, *Camellia sinensis*, Gene expression, Heterologous expression, U-box gene



Acknowledgement: Financial assistance by National Key Research and Development Program of China (2024YFE0214300)

[1]State Key Laboratory of Green Pesticide, [2]Center for R and D of Fine Chemicals, Guizhou University, Guiyang, 550025, China

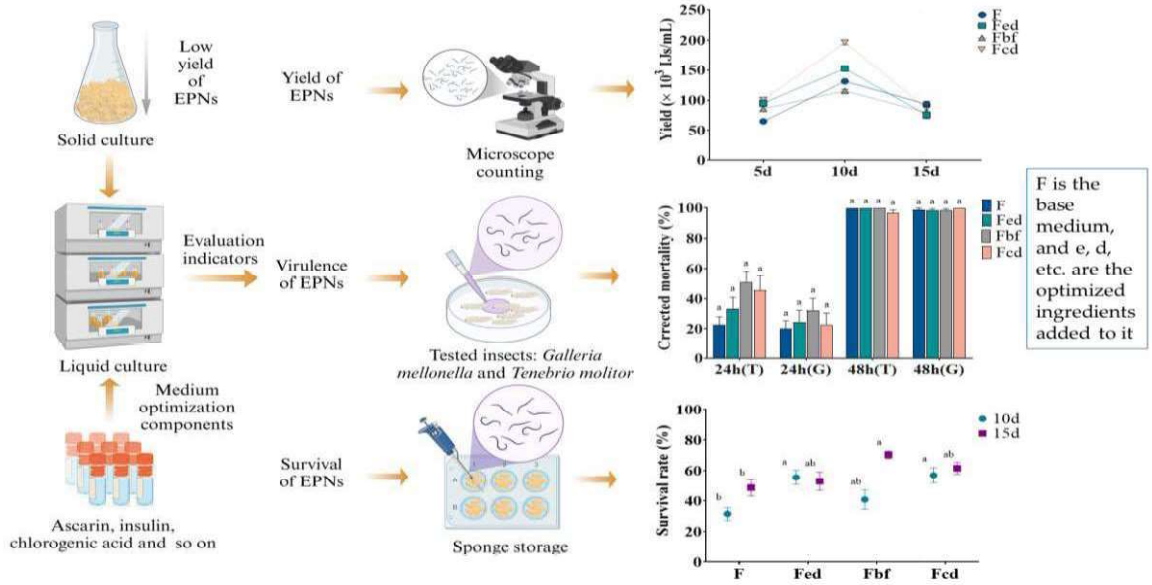
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Formula Optimisation of Liquid Medium for Culturing the Entomopathogenic Nematode *Steinernema carpocapsae* Strain All (Rhabditida: Steinernematidae)

J. Y. TIAN, G. Y. ZHAO, X. ZHOU, F. HU, K. M. SHAO, S. M. DASSANAYAKA and L. H. JIN*
*Corresponding Author: lhjin@gzu.edu.cn

The successful commercialisation of entomopathogenic nematodes (EPNs) as a bio-pesticide product depends on the industrial mass production of viable infective juveniles (IJs) at a low cost. This study focused on enhancing the yield of the EPNs *Steinernema carpocapsae* strain All and reducing its production costs. An optimal basal medium was screened among several basal media, and several optimised components were included in the selected optimal basal medium. The optimal medium formulation was obtained by evaluating the yield, virulence, and survival rates of EPNs at different times. The results showed that when isopropylstilbene was added to the basal medium with insulin, the yield of EPNs increased from 13.14 × 10^4 IJs/mL to 19.63 × 10^4 IJs/mL. At 30 days of low-temperature storage, the EPNs survival rate increased from 31.42% (basal medium) to 56.83% (optimal medium), demonstrating a prolonged shelf life. The virulence of EPNs was measured before and after 30 days of storage on sponges. The virulence against *Tenebrio molitor* (Coleoptera: Tenebrionidae) and *Galleria mellonella* (Lepidoptera: Pyralidae) was 90 and 86.67% (before) and 93.33 and 94.44% (after), respectively, when insects were treated at 48 hours. Long-term cryogenic storage does not affect the virulence of EPNs. The yield with the individual optimisation components added to the optimal basal medium was lower than when the components were combined, indicating that there may be a synergy between the two components. The results provide practical technology for the low-cost commercial production of these EPNs and promote field applications.

KEYWORDS: Entomopathogenic nematodes, Survival rate, Virulence, Yield



Acknowledgements: This research was supported by National Key Research and Development Program of China (2024YFE0214300); Central Government Guides Local Science and Technology Development Fund Projects (Qiankehezhongyindi (2024) 007).

State Key Laboratory of Green Pesticide, Center for R and D of Fine Chemicals of Guizhou University, Guiyang, 550025, China

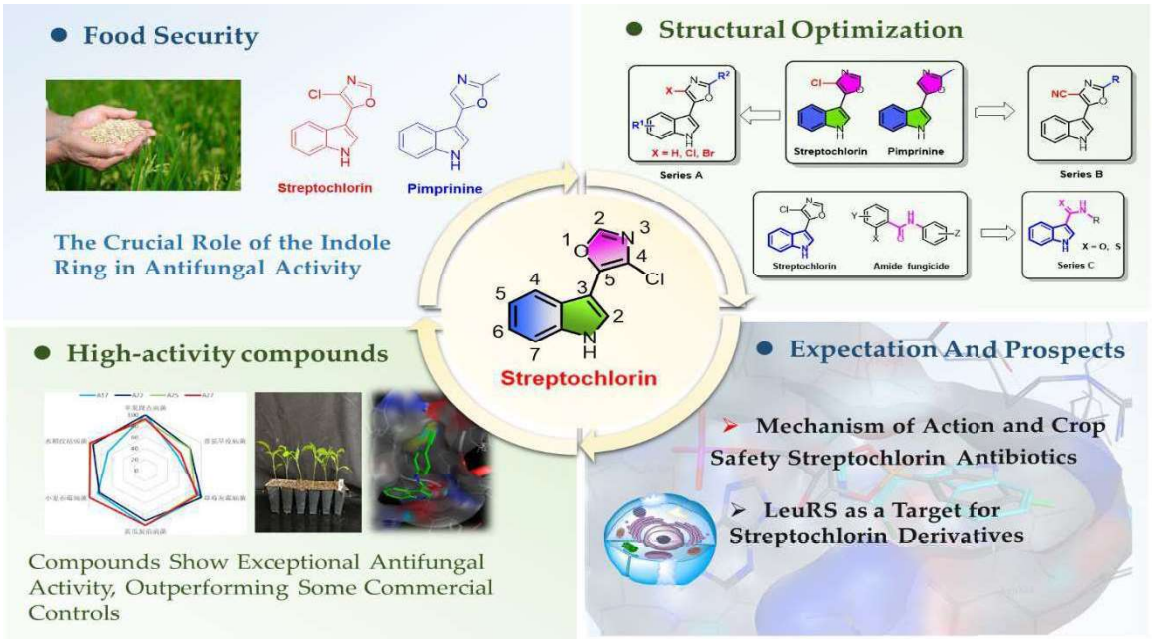
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Study on Lead Optimisation and Antifungal Activity of Natural Product Streptochlorin

F. DUAN and M. ZHANG*
*Corresponding Author: mzzhang@njau.edu.cn

Natural products are essential resources in the development of new pesticides, as structural optimisation often leads to environmentally friendly and highly active candidate compounds. This study builds upon our previous findings regarding streptochlorin, a natural indole known for its significant antifungal activity. By retaining its core indole scaffold, over 1,000 streptochlorin derivatives were successfully constructed and synthesised across three series, and their fungicidal activity against six common plant pathogenic fungi was evaluated *in vitro.* The bioassay results revealed that most of the target compounds exhibited significant fungicidal activity at a concentration of 50 μg/mL, particularly highlighted compounds I-6 and T27, which demonstrated impressive fungicidal effects that were notably superior to the positive controls. Subsequent research will focus on chloronitrile fungicide molecules, with an emphasis on exploring their specific mechanisms of action, crop safety, and the targeting capability of LeuRS as a target for streptochlorin derivatives. This research is vital for ensuring the effectiveness of streptochlorin fungicides while also guaranteeing their safety in agricultural applications. Overall, this work provides novel high-activity molecular scaffolds for the development of green pesticides, contributing to the sustainable transformation and advancement of the global pesticide industry and agricultural economies.

KEYWORDS: Fungicidal activity, Green pesticides, Lead optimisation, Streptochlorin



Acknowledgements: Financial assistance by National Key Research and Development Program of China (2023YFD1700500), and the National Natural Science Foundation of China (22177051)

College of Sciences, Nanjing Agricultural University, Nanjing, 210095, China

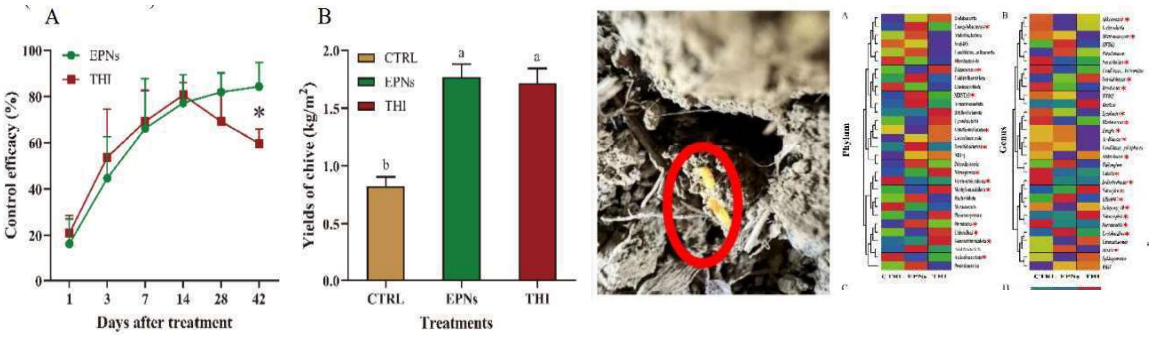
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Application of Entomopathogenic Nematode Modified Root-associated Microbial Community in Controlling Chive Gnats (*Bradysia odoriphaga*)

G. ZHAO[1], R. TANG[2], W. GUO[3], X. ZHOU[1], F. HU[1], D. DASSANAYAKA[1], W. M. W. W. KANDEGAMA[1,4] and L. JIN[1]*
*Corresponding Author: lhjin@gzu.edu.cn

Entomopathogenic nematodes (EPNs) represent evolutionarily specialised insect parasites with established applications in sustainable pest management. While their efficacy against soil-dwelling pests is well documented, the cascading impacts of EPN interventions on rhizosphere microbiome assembly and functionality remain poorly understood. This study investigated the tripartite interactions among *Steinernema feltiae* SN, the economically significant pest *Bradysia odoriphaga*, and soil microbial communities in chive agroecosystems. Field trials demonstrated *S. feltiae* SN achieved 84.31% pest control efficacy at 42 days post-application, significantly enhancing crop yield compared to untreated controls. High-throughput sequencing revealed EPN applications maintained alpha-diversity indices and amplicon sequence variant (ASV) richness in rhizosphere microbial communities, yet significantly altered beta-diversity patterns. Treated soils showed decreased relative abundances of Actinobacteriota, Chloroflexi, Verrucomicrobiota, Entotheonellaeota, and Glomeromycota, but enrichment of Firmicutes, Patescibacteria, Desulfobacterota, MBNT15, Campylobacterota, and Deferribacterota at phylum level. Redundancy analysis (RDA) identified significant positive correlations between EPN biocontrol performance and bacterial genera *Ellin6067* and *Lactobacillus*, alongside fungal genera *Gibberella*, *Hypocrea*, *Cylindrocarpon* and *Acaulium.* Functional predictions revealed twenty differentially represented secondary KEGG pathways highlighting EPN-induced shifts toward microbial traits associated with environmental adaptation and virulence mechanisms. These findings demonstrate EPNs selectively restructure microbial networks toward pest suppression synergies without compromising diversity, offering mechanistic insights for microbial-informed sustainable agriculture.

KEYWORDS: Biological control, Diversity and composition, Nematode, Rhizosphere microorganisms



[1]*State Key Laboratory of Green Pesticide Guizhou University, Guiyang, 550025, China;* [2]*Guangdong Key Laboratory of Animal Conservation and Resource Utilization, Guangzhou, 510260, China;* [3]*Shandong Key Laboratory for Green Prevention and Control of Agricultural Pests, Jinan, 250100, China;* [4]*Department of Horticulture and Landscape Gardening, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka, Makandura, Gonawila, 60170, Sri Lanka*

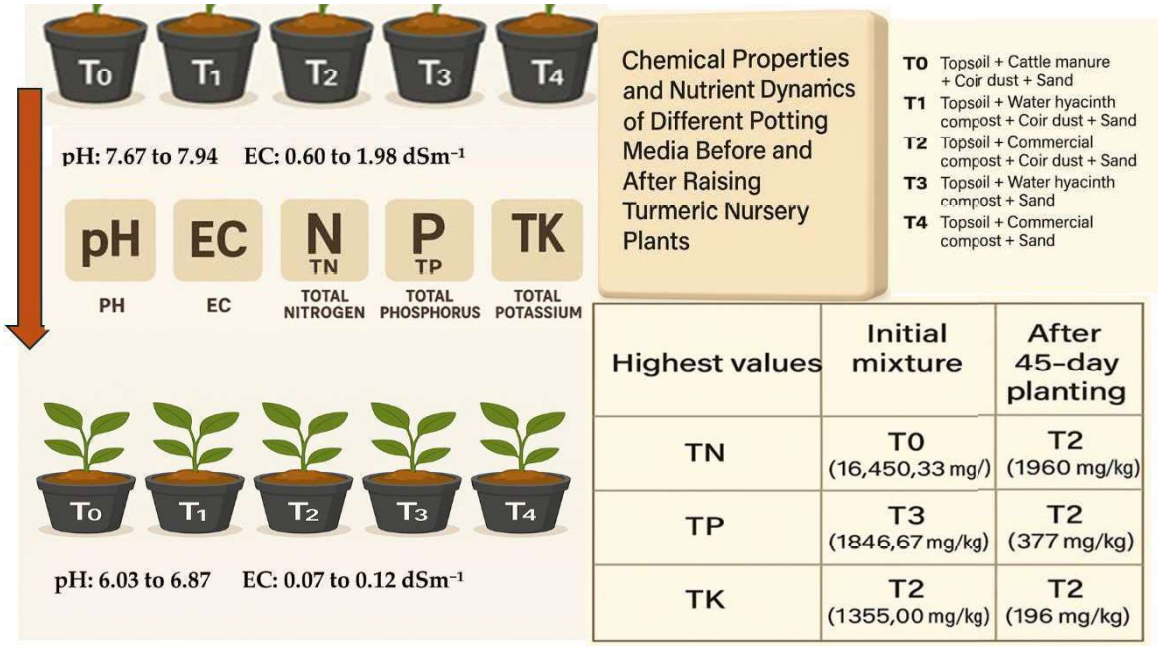
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Chemical Properties and Nutrient Dynamics of Different Potting Media Before and After Raising Turmeric Nursery Plants

W. M. C. S. JAYAWEERA[1], S. R. AMARASINGHE[2] and A. L. RANAWAKE[3*]
*Corresponding Author: lankaranawake@hotmail.com

This study assessed the nutrient dynamics of different potting mixtures after raising turmeric nursery plants for 45 days. Five treatments tested in the experiment were T0 (topsoil + cattle manure + coir dust + sand), T1 (topsoil + water hyacinth compost + coir dust + sand), T2 (topsoil + commercial compost + coir dust + sand), T3 (topsoil + water hyacinth compost + sand), and T4 (topsoil + commercial compost + sand) mixed in equal proportions. The potting mixtures were evaluated for pH, EC, total nitrogen (TN), total phosphorus (TP), and total potassium (TK) before planting rhizome seeds and 45 days after the experiment, when the nursery plants were suitable for transplanting. Before the experiment, pH values were slightly alkaline (7.67 to 7.94), and after the experiment, pH ranged from 6.03 to 6.87 in each treatment. EC ranges were 0.60-1.98 dSm^{-1} and 0.07-0.12 dSm^{-1} before and after the experiment, respectively. Significantly the highest TN (16,450.33 mg/kg), TP (1846.67 mg/kg), and TK (1,355.00 mg/kg) contents were recorded by T0, T3, and T2, respectively, at the initial stage. After the experiment, among all the treatments, T2 recorded the highest TN (1960 mg/kg), TP (377 mg/kg) and TK (196 mg/kg). However, the highest N and P usage and the most significant nutrient depletion during the plant growth were recorded by T0, followed by T3. The results concluded that T0 (topsoil + cattle manure + coir dust + sand 1:1:1:1) was the most effective in supporting plant nutrient uptake, while T2 (topsoil + commercial compost + coir dust + sand 1:1:1:1) showed better nutrient retention.

KEYWORDS: Compost, Nursery, Nutrients, Potting media, Turmeric



Highest values	Initial mixture	After 45-day planting
TN	T0 (16,450,33 mg/)	T2 (1960 mg/kg)
TP	T3 (1846,67 mg/kg)	T2 (377 mg/kg)
TK	T2 (1355,00 mg/kg)	T2 (196 mg/kg)

[1]Faculty of Graduate Studies, University of Ruhuna, Sri Lanka; [2]Department of Soil Science, Faculty of Agriculture, University of Ruhuna, Sri Lanka; [3]Department of Agricultural Biology, Faculty of Agriculture, University of Ruhuna, Sri Lanka

ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

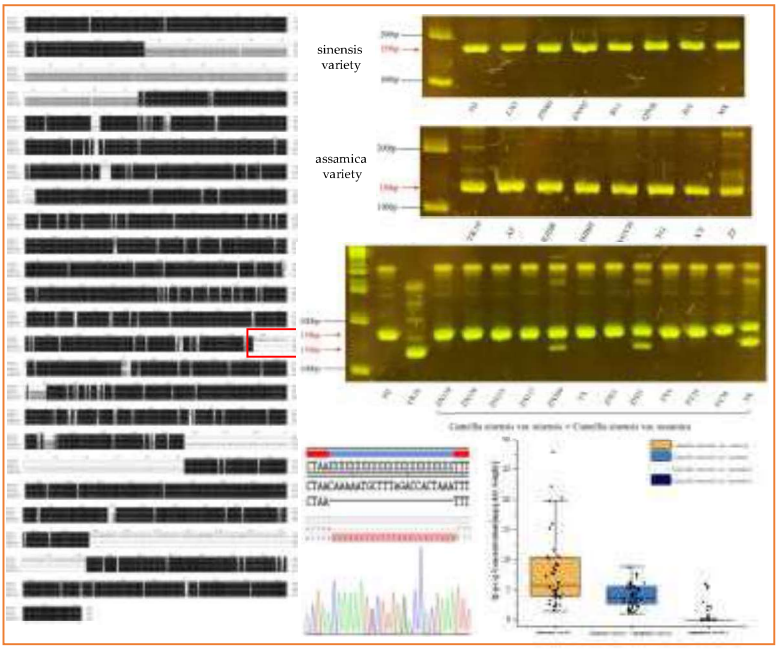
Varietal Innovations and Seeds

An InDel in the Promoter of *CsFGT* Determines Quercetin Tri-glycoside Content in Different Germplasm of *Camellia sinensis*

W. ZHANG, Z. FANG, X. ZHENG, J. YE and J. LU*
*Corresponding Author: jllu@zju.edu.cn

Flavonol glycosides have many prominent benefits to human health and significant contributions to the growth and development of the tea plant, as well as the color and taste of tea infusion. Differential accumulation of the quercetin 3-*O*-β-D-glucopyranosyl-(1→3)-α-L-rhamnopyranosy-(1→6)-β-D-glucopyranoside (Q-g-r-g) had been revealed in different germplasm belonging to *Camellia sinensis*, variety *sinensis* and variety *assamica*. A gene *CsFGT* encoding the enzyme responsible for biosynthesis of Q-q-r-g from rutin had been mined previously. In this study, the promoter of the *CsFGT* was cloned from various germplasm belonging to *sinensis*, *assamica* and their hybrids. After a comprehensive comparison, many variations were observed, including two InDel loci and multiple Single Nucleotide Polymorphism loci. However, only a 23-bp InDel locus harboring a MYB binding site in the promoter region of the *CsFGT* has been verified to be associated with the content of Q-g-r-g. The deletion of this locus would lead to downregulate *CsFGT* expression and Q-g-r-g content in tender leaves of the germplasm. Using the InDel locus flanked sequence, a molecular marker was developed to predict the Q-g-r-g accumulation potential of the germplasms. This molecular marker can be used for early identification of flavonoid glycoside profiles in different germplasms.

KEYWORDS: *Camellia sinensis*, Flavonol glycosides, Molecular marker



Acknowledgement: This work was supported by the National Natural Science Foundation of China (No. 32272763)

Tea Research Institute, Zhejiang University, Hangzhou 310058, China

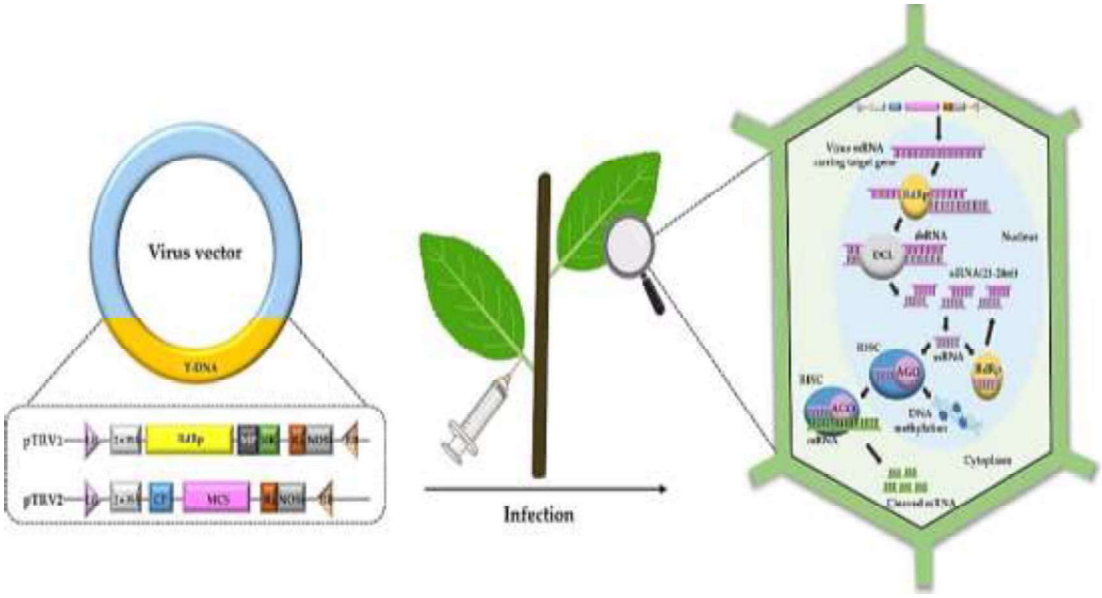
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Establishment of Virus-induced Gene Silencing System in Tea Plant and Its Application in Gene Function Exploration

N. CHI, X. ZHENG, D. ZHAO, Y. LIANG and J. LU*
*Corresponding Author: jllu@zju.edu.cn

Tea plant (*Camellia sinensis* L.) is an important upland crop worldwide. Recently, the publication of numerous genomic and transcriptomic datasets related to tea plant has significantly advanced our understanding of the molecular regulatory mechanisms underlying key traits. However, compared with other important cash crops, lack of efficient genetic transformation systems in tea plant has hindered progress in the functional characterization of genes. Virus-induced gene silencing (VIGS) is a simple and effective transient transformation tool, characterizing gene function by suppressing its expression. VIGS originates from the natural defence mechanism of plants against viral infections. When plants are infected by viral vectors carrying exogenous gene fragments homologous to the target gene of the host, infection and proliferation of the virus trigger an immune response, generating the RNA-induced silencing complex (RISC). The RISC specifically interacts with homologous viral RNA in the cytoplasm, leading to its degradation and cleavage of the endogenous target gene through post-transcriptional gene silencing, and possibly initiating the siRNA-dependent DNA methylation of the target gene. Compared to gene knockout and antisense suppression, VIGS offers many advantages, including easy operation, low cost, and high throughput, without sterile system establishment and mutant screening. This tool has been successfully applied in studying the functions of genes such as protochlorophyllide oxidoreductase, caffeine synthase and phytoene desaturase in tea plant. Continuous improvement and efficient application of this tool will facilitate to elucidate the functions of the important genes and the regulatory mechanism of the key traits, thereby enhancing the efficiency of genetic improvement in tea plant.

KEYWORDS: Gene function analysis, Tea plant, Virus-induced gene silencing



Acknowledgement: Financial assistance by the Zhejiang Science and Technology Major Program on Agricultural New Variety Breeding-Tea Plant through the grant No. 2021C02067-6

Tea Research Institute, Zhejiang University, Hangzhou 310058, China

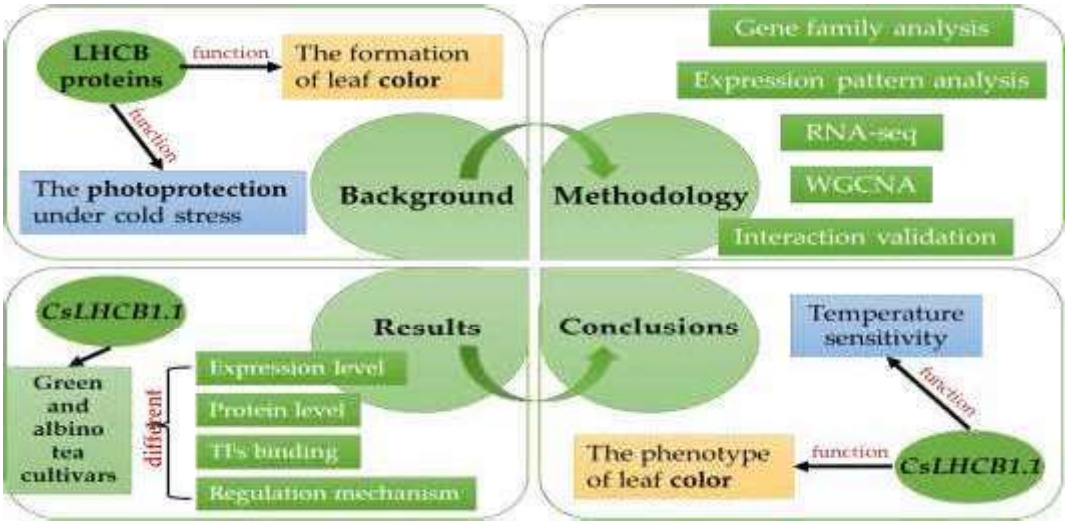
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

The *CsLHCB1.1* is Responsible for Temperature Sensitivity and Leaf Color Phenotype in Albino Tea Plant

J. J. YE, J. L. LU, Y. R. LIANG and X. Q. ZHENG*
*Corresponding Author: xqzheng@zju.edu.cn

The light-harvesting chlorophyll a/b-binding (LHCB) protein complexes in photosystem II play a crucial role in the formation of thylakoid structures and the photosynthetic process. These complexes are key to leaf coloration and photoprotection, especially under low-temperature stress during leaf development. This study aimed to investigate the properties of the *CsLHCB* gene family and identify key members potentially involved in leaf color variation and the response to low-temperature stress. Additionally, we explored the regulatory mechanisms by comparing green and albino tea cultivars. Through phylogenetic analysis, we identified 20 candidate *CsLHCB* genes, all of which contained the conserved chlorophyll A-B binding protein domain, suggesting their functional roles. Notably, *CsLHCB1.1* exhibited high expression levels and strong sensitivity to temperature, indicating its likely involvement in responding to low-temperature stress. Reduced accumulation of *CsLHCB1.1* may contribute to the development of albino leaves, as albino tea cultivars showed lower expression levels of this gene and were more temperature-sensitive. Transcription factors (TFs) co-expressed with *CsLHCB1.1* under varying temperature conditions were selected using weighted gene co-expression network analysis (WGCNA). Various experiments identified key candidate TFs with transcriptional regulatory activity. The results demonstrated differential TF expression patterns in different cultivars in response to temperature changes, highlighting distinct regulatory mechanisms in gene expression between green and albino cultivars. This study provides valuable insights for future research into the role of *CsLHCB1.1* and the mechanisms underlying albinism in tea plants.

KEYWORDS: Albino tea plant, *CsLHCB1.1*, Gene family identification, Low temperature, Regulation mechanism



Acknowledgements: Financial assistance by the Ningbo Municipal Bureau of Science and Technology in the Major Project for Science and Technology Innovation of Modern Seed Industry 2025 through the project number: 2019B10022, and by the earmarked fund for CARS-Tea through CARS-19

Tea Research Institute, Zhejiang University, Hangzhou 310058, China

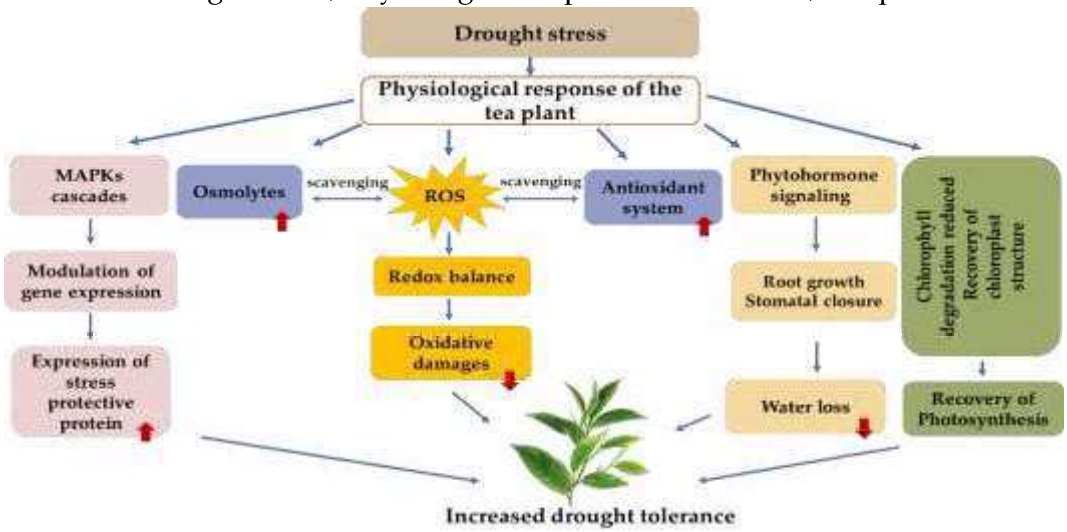
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Physiological Response Mechanisms of the Tea Plant (*Camellia sinensis* L.) under Drought Stress

X. H. ZHANG, L. Y. HUANG, J. L. LU, Y. R. LIANG and X. Q. ZHENG*
*Corresponding Author: xqzheng@zju.edu.cn

Drought has been one of the environmental changes affecting plant growth lifecycle. Understanding the physiological changes of tea plants under drought stress is crucial for taking measures to improve tea plant resilience and productivity. This review systematically summarizes the physiological mechanisms of tea plants to adapt to drought stress, including osmotic regulation, phytohormone action, antioxidant defence, photosynthesis, proteostasis, and gene expression regulation. Tea plants accumulate osmotic regulators, such as proline, to maintain cellular turgor and osmotic balance. Endogenous phytohormones, particularly abscisic acid (ABA) and jasmonic acid (JA) play vital roles in activating stress responses through intricate signalling pathways. The antioxidant defence system mitigates oxidative damage by scavenging reactive oxygen species (ROS) that accumulate under drought stress. Drought stress reduces the photosynthetic electron transport capacity of tea plants, leading to reduced chlorophyll content or chlorophyll degradation. Consequently, the absorption, transfer, and conversion of light energy are affected. At the molecular level, drought tolerance-associated genes, such as *CsSnRK2.5*, *CsCuAO1*, *CsHDZ3*, and *CsSCL6-4*, exhibit significant expression differences under drought stress, potentially regulating stress responses. This review discusses the physiological response mechanisms involved in drought stress and addresses two timely questions: which physiological indicators are higher in the hierarchy of response to drought stress, and whether these physiological indicators are indicative for the screening of drought tolerance breeding indexes in tea plants. Therefore, this review proposes indicators for developing and breeding drought-tolerant varieties of tea plants.

KEYWORDS: Drought stress, Physiological response mechanisms, Tea plant



Acknowledgements: Financial assistance by the Zhejiang Science and Technology Major Program on Agricultural New Variety Breeding-Tea Plant through the grant ID: 2021C02067-7-2 and the Ministry of Agriculture and Rural Affairs of China through the grant ID: CARS-19

Tea Research Institute, Zhejiang University, Hangzhou 310058, China

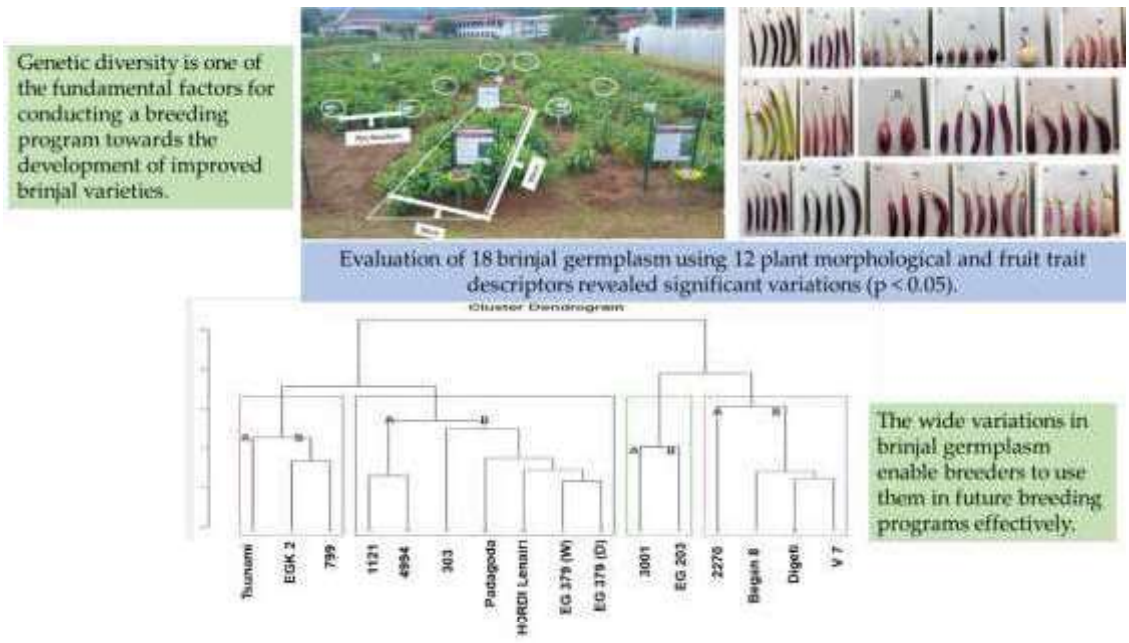
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Characterization and Evaluation of Brinjal (*Solanum melongena* L.) Germplasm for Yield, Quality, and Resistance to Bacterial Wilt

A. G. S. K. PREMADASA[1], M. G. S. P. PATHIRANA[2*], T. L. C. N. KUSALANI[2],
H. M. S. N. HERATH[2] and N. V. T. JAYAPRADA[1]
*Corresponding Author: mgsppathirana@gmail.com

Brinjal is the most widely grown vegetable in Sri Lanka. Lack of improved brinjal varieties to meet the diverse demand in the market is a key issue. Diversity of germplasm is a critical factor for conducting a breeding programme. The study was conducted during *Yala* 2024 to characterize 18 brinjal germplasm for the identification of potential donors in future breeding programmes. The experiment was designed as a Randomized Complete Block Design with three replicates. Germplasm was characterized using 12 descriptors. Yield and other important agronomic data were observed. Bacterial wilt incidence was recorded. Data were analyzed using R-based statistical software PBTools and STAR. Significant variations of plant morphological and fruit trait descriptors ($P < .05$) were observed. Plant height (at the onset of flowering) varied between 17-42 cm. The number of primary branches ranged from 1 to 6. The number of days to flowering was between 39-53 days after transplanting. Yield and fruit traits, including single fruit weight, length, shape, colour, and volume, varied widely. Genotypes EG 203 and 2270 exhibited higher fruit yields ($P < .05$). Food qualities like cooking time (60-347 seconds), browning time (38-353 seconds), and moisture content (88-92%) were also highly variable. Genotype V7 had the shortest cooking time (60 seconds; $P < .05$) and the longest time for browning (353 seconds; $P < .05$). Genotypes Began 83001, V7, EG 379 (W), and 2270 were resistant to bacterial wilt, while TSUNAMI, 303, and 799 were highly susceptible. The wide variations observed among tested germplasm enable it to be used in future breeding programmes.

KEYWORDS: Bacterial wilt, Brinjal, Diversity, Germplasm



[1]Faculty of Technology, University of Colombo, Colombo, Sri Lanka; [2]Horticultural Crops Research and Development Institute (HORDI), Gannoruwa, Sri Lanka

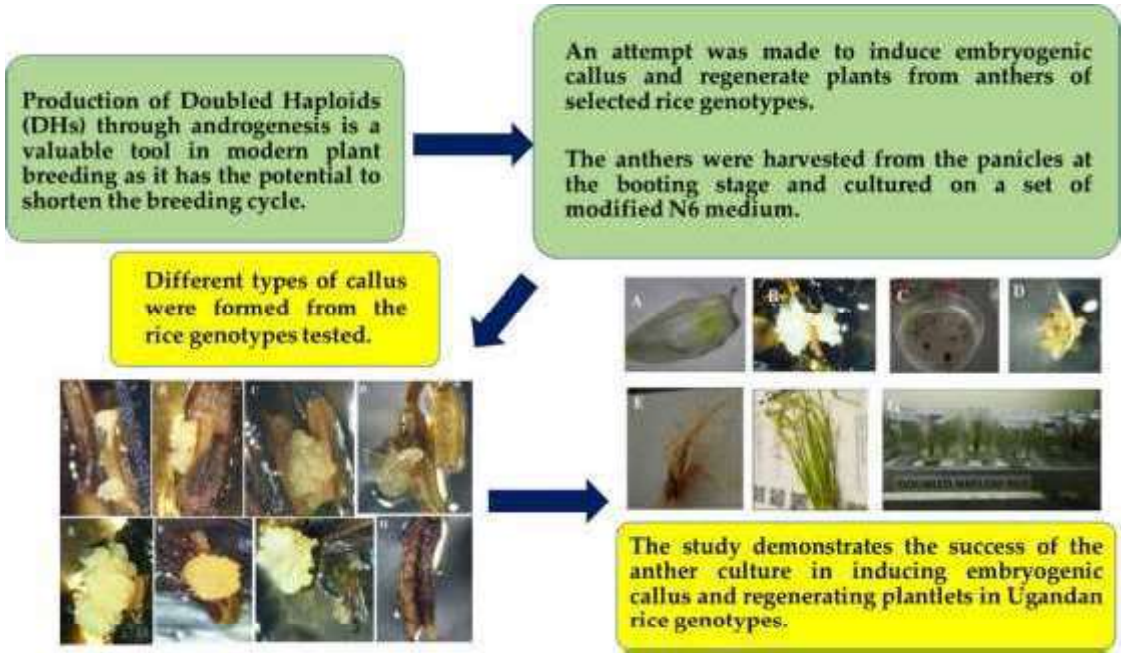
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Potential of Callus Induction and Plant Regeneration of Ugandan Rice Genotypes through Anther Culture

M. BUTTIBWA[1, 2*], M. EYOKIA[1], J. K. BAGUMA[1], H. WAGABA[1], J. LAMO[1] and A. TUGUME[2]
Corresponding Author: kaayamary1@gmail.com

Production of Doubled Haploids (DHs) through androgenesis is a valuable tool in plant breeding due to their potential to shorten the breeding cycles, fix agronomic characters in a homozygous state, and increase the selection efficiency of useful recessive agronomic traits in rice. This study aimed to induce embryogenic callus and regenerate plants from anthers of six breeding rice genotypes Kinyl, India, Hybrid3, NET47, S1P3R1, and 6(SET58-P5R1). Panicles with mature florets containing microspores at mid- to late-uninucleate stages were subjected to cold stress (4 °C) for 8 days. After surface-sterilization, anthers were extracted and cultured on N6 medium modified with varying concentrations of maltose (0%, 2%, 3%, and 6%) and supplemented with 2.5 mg/ L 2,4-D, 0.5 mg/L kinetin (KN), and 2.5 mg/L naphthaleneacetic acid (NAA). Induction of embryogenic callus and plant regeneration was dependent on the rice genotype, types and concentration of exogenous hormones, and their interactions. Embryogenic callus was successfully induced in anthers derived from genotypes 6(SET58-P5R1) and NET47. Genotype 6(SET58-P5R1) had 33% callus induction compared to NET47 (6.6%). Plant regeneration rate was highest, at 9.1%, in 6(SET58-P5R1) treated with 0.5 mg/L BAP, 0.5 mg/L NAA, and 1.5 mg/L kinetin, compared to zero response in India and Kinyl. This is the first time that callus induction and plant regeneration have been reported in Ugandan rice genotypes. These findings are insightful in the development of haploids and pure or double-haploid lines for hastened development of rice varieties with desired traits in rice breeding programs.

KEYWORDS: Androgenesis, Callus induction, Cold stress, Embryogenic callus, Plant regeneration



[1] *National Crops Resources Research Institute (NaCRRI), Namulonge, P. O. Box 7084, Kampala, Uganda;*

[2] *Department of Biological Sciences, College of Natural Sciences, Makerere University, P.O. Box 7062, Kampala, Uganda*

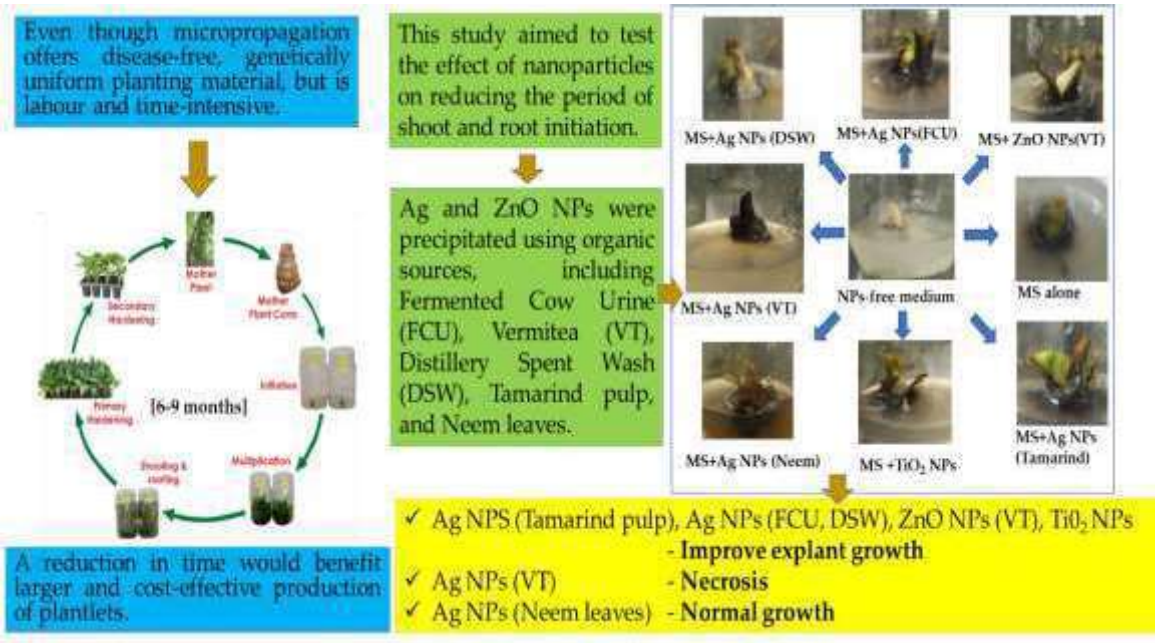
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Micropropagation of Banana (*Musa* spp.) using Nanoparticles: A Sustainable Approach for Clonal Propagation

R. ANASOOYA*, N. THIRUCHCHELVAN and G. MIKUNTHAN
*Corresponding Author: anasooyaratnasabapathy@gmail.com

Banana (*Musa* spp.) is an essential fruit crop for global food security and economic development. Propagation through suckers is in efficient, therefore, micropropagation offers a solution by producing disease-free, genetically uniform planting material. This study aimed to test the effect of nanoparticles (NPs), such as silver (Ag NPs), zinc oxide (ZnO NPs), and titanium dioxide (TiO_2 NPs) on reducing the period of shoot and roots initiation. Ag and ZnO NPs were precipitated using organic sources, including Fermented Cow Urine (FCU), Vermitea (VT), Distillery Spent Wash (DSW), Tamarind pulp, and Neem leaves. TiO_2 NPs were sourced from the Department of Physics, University of Jaffna. Nanoparticles, at a concentration of 1 mg/L, were incorporated into Murashige and Skoog (MS) medium with growth regulators (2.25 mg/L 6-benzylaminopurine, 0.2 mg/L indole-3-acetic acid). Results revealed that Ag NPs precipitated from Tamarind pulp improved explant development, reduced necrosis, and enhanced explant survival compared to other treatments. Ag NPs precipitated from Neem leaves showed a response like the NPs-free MS medium, whereas those from VT led to a necrotic effect on the explant at the tested concentrations. Ag NPs precipitated from FCU, DSW and ZnO NPs from VT and TiO_2 NPs improved explant growth compared to NPs-free MS medium; however, no shoot formation was observed. This study highlights the potential of nanoparticles as bio-enhancers for initial explant development. Further research will optimize nanoparticle concentrations.

KEYWORDS: Banana (*Musa* spp.), Nanoparticles, Organic sources, Shoot induction, Tissue culture



Department of Agricultural Biology, Faculty of Agriculture, University of Jaffna, Jaffna, Sri Lanka

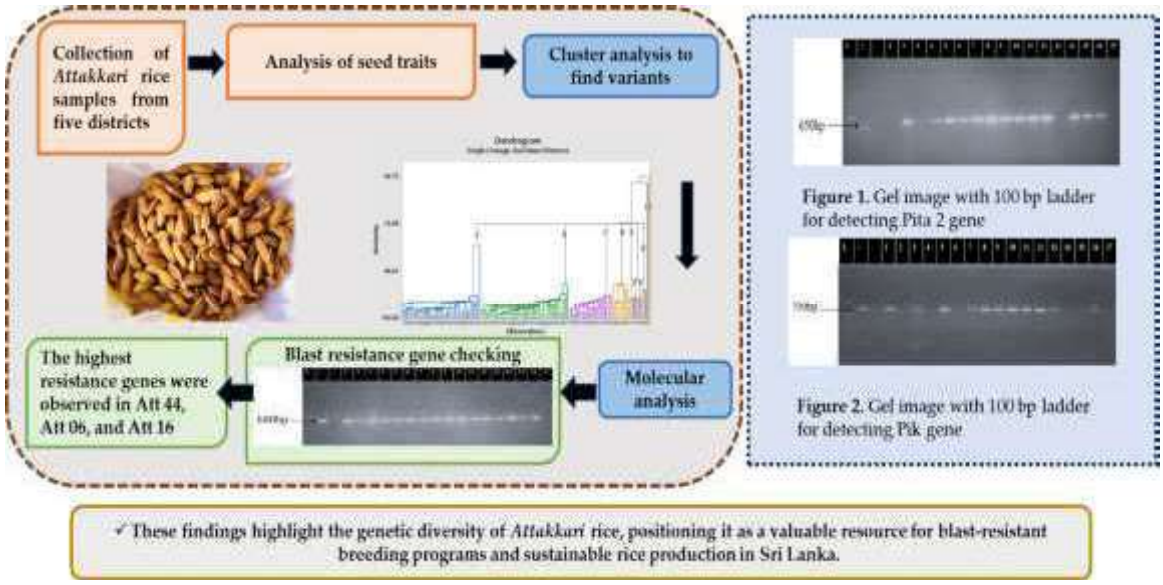
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Detection of Rice Blast Resistance Genes in *Attakkari* Rice Cultivar

A. KISHANTHAN[1*], S. TERENSAN[1], K. GAJAPATHY[2] and A. PONNEGIPPRENTHIRARAJA[3]
*Corresponding Author: ananthsathusanan@gmail.com

Attakkari rice, a traditional cultivar from the Northern region of Sri Lanka, is known for its high yield and desirable traits. However, it is susceptible to rice blast disease, making it not recommended by the Department of Agriculture. Despite this, it remains widely cultivated, necessitating an assessment of its genetic diversity for blast resistance. This study aimed to identify blast resistance genes in *Attakkar*i rice. A total of 117 samples were collected from five districts, and seed characteristics such as colour, size, shape, weight, and quality were analyzed using microscopic observation and image sensing techniques. To evaluate blast resistance, selected morphotypes were compared with an improved line (*Attakkari* × AR-9-3), reference samples from Rice Research Station (RRS), Paranthan, Sri Lanka (*Maha* and *Yala* seasons), and CO 10, which shares genetic and phenotypic similarities with *Attakkari*. *Pachchaperumal* served as a positive control. PCR was conducted to detect ten blast resistance genes: Pita-2, Piz, Pizt, Pik, Pikh, Pib, Pikp, Pi1, Pi5, and Pikm. Agarose gel (1%) electrophoresis was used for analysis. Results revealed significant variation in the blast resistance genes among morphotypes, with three to nine genes detected. The highest resistance was seen in Att 44, Att 06, and Att 16, each possessing nine resistance genes. Other morphotypes showed fewer genes, indicating varying resistance levels. The improved line also displayed strong resistance, suggesting its potential for breeding programs. The most frequent resistance genes included Pita-2, Pik, Pikh, Pib, Pi1, Pi5, and Pikm, emphasizing the genetic diversity and potential for breeding durable blast-resistant rice cultivars.

KEYWORDS: *Attakkari* rice, Blast resistance genes, Breeding programs, *Magnaporthe oryzae*, Sustainable production



Acknowledgement: Financial assistance by (University Research Grant, University of Jaffna) through the grant ID URG/SEIT/2022/01)

[1]Department of Agricultural Biology, Faculty of Agriculture, University of Jaffna, Sri Lanka; [2]Department of Zoology, Faculty of Science, University of Jaffna, Sri Lanka; [3]Rice Research Station, Paranthan, Sri Lanka

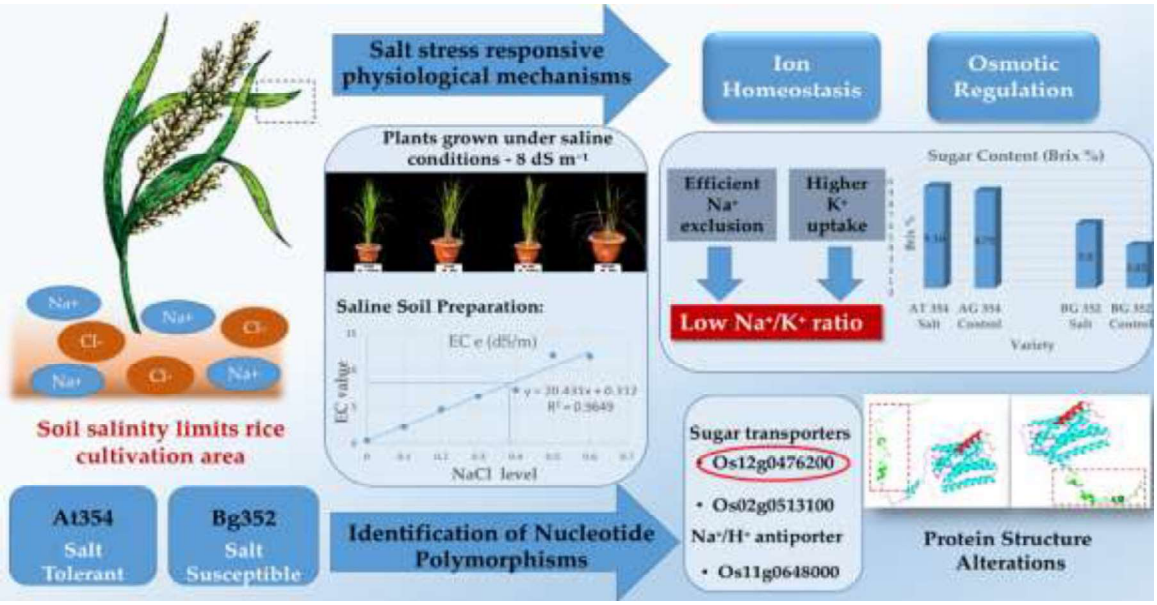
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Exploring Nucleotide Variants Related to Salt Tolerance Mechanisms in Two Different *Indica* Rice Varieties

L. P. M. KUMARASIRI, R. P. P. S. PATHIRANA, S. M. AMATH and N. S. KOTTEARACHCHI*
*Corresponding Author: nisha@wyb.ac.lk

Soil salinity is one of the major constraints that limit the expansion of rice (*Oryza sativa L.*) cultivation in Sri Lanka, since mostly grown rice cultivars are susceptible to soil salinity. Susceptibility or tolerance of rice to salinity is a coordinated action of multiple stress-responsive physiological mechanisms, such as ion homeostasis and osmotic regulation. This study evaluated the physiological mechanisms by quantifying the concentrations of Na^+, K^+ and soluble sugars in plants grown under saline conditions with an electrical conductivity of 8 dSm^{-1}. The findings indicated a remarkably higher accumulation of K^+ ($P < .05$) and sugars ($P < .01$) in the salt-tolerant At354 variety compared to the salt-susceptible Bg352 under salinity stress. A lower Na^+ content ($P < .001$) was observed in At354 than Bg352, showing a lower Na^+/K^+ ratio within the salt-tolerant variety, confirming that salt-tolerant varieties have efficient Na^+ exclusion mechanisms and maintaining higher K^+ uptake to keep the Na^+/K^+ ratio low. As salt tolerance is known as a complex quantitative trait controlled by multiple genes, this study examined nucleotide variants within genes associated with Na^+/K^+ homeostasis and osmotic regulation between the two *indica* rice varieties by comparing whole genomes, with reference to *Nipponbare*. Interestingly, few genes were found with missense mutations, such as Os12g0476200 and Os02g0513100 (involved in sugar transport function) and Os11g0648000 (Na^+/H^+ antiporter). Notably, structural analysis of Os12g0476200 (SWEET11) revealed distinct protein structure alterations in At354 due to a two-base pair deletion. However, further research is needed to clarify the exact relationships between the mutations and the physiological function.

KEYWORDS: Ion homeostasis, Nucleotide variation, Osmotic regulation, Rice, Salinity



Acknowledgement: The authors acknowledge the NRC 16-16 grant of the National Research Council, Sri Lanka, for giving financial assistance to sequence the whole genomes of two rice varieties

Department of Biotechnology, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka, Makandura, Gonawila (NWP), 60170, Sri Lanka

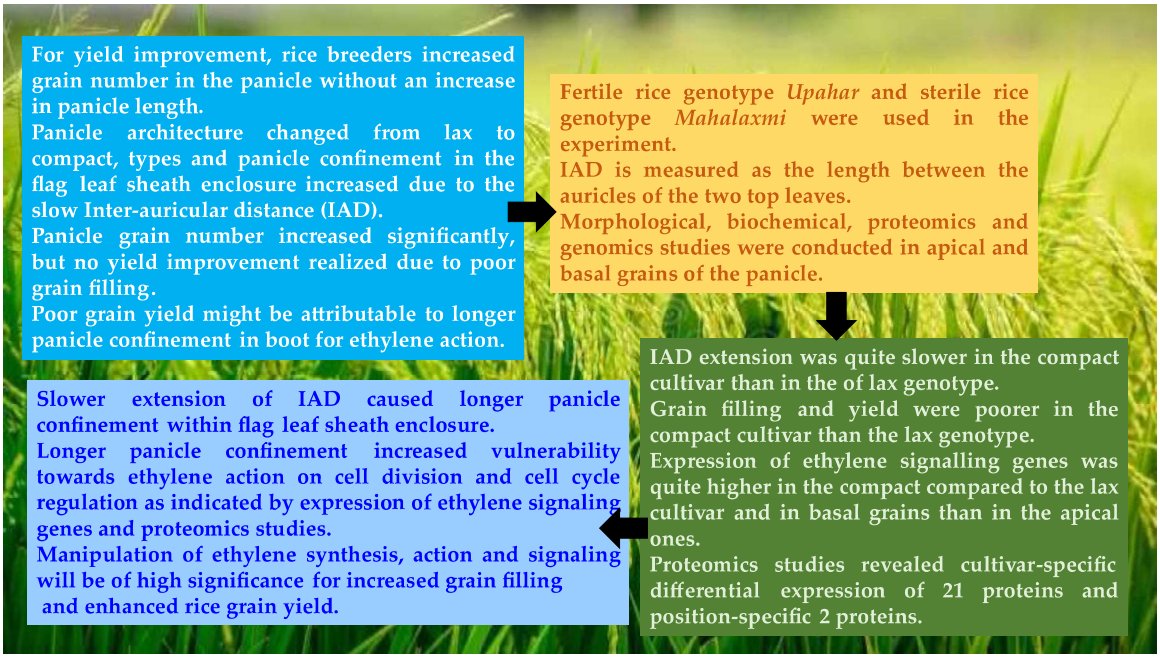
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Unravelling the Mystery of Grain Filling: A Molecular Approach for Manipulation of Yield Enhancement in Rice for Boosting Farmers' Economy

E. KARIALI
Corresponding Author: ekamberk@gmail.com

An increase in the spikelet numbers without much increase in panicle length is associated with poor grain filling in the basal region of the panicle. As a result of such an increase in spikelet numbers, plants are compelled to increase their panicle secondary branching to accommodate more grains, resulting in compact panicle architecture. This type of panicle architecture is further associated with a slower increase in Inter-auricular distance (IAD) and longer duration of panicle confinement within the flag leaf sheath enclosure, enabling the panicle towards vulnerable action of ethylene leading to poor grain filling and reduced yield. Attempts have been made to understand the reasons for differential grain filling in rice by measurement of IAD and expression pattern of genes encoding ethylene signalling pathway and starch synthesizing enzymes. Proteomic analysis revealed that the apical (superior) and basal (inferior) spikelets of compact cultivar *Mahalaxmi* differentially expressed 21 proteins, mostly involved in cell division and cell cycle regulation, that were also expressed in lax-panicled cultivar *Upahar*. However, only two of these proteins were differentially expressed between the apical and basal spikelets in *Upahar*, indicating differential metabolic activities in the apical and basal spikelets. Further, the poor grain filling in *Mahalaxmi*, especially in the basal spikelets, might be the result of higher ethylene production and up-regulation of ethylene signalling genes compared to apical spikelets. Hence, understanding the genomics and proteomics approaches can provide insight into differential grain filling and will be of immense help for yield enhancement in rice for boosting the economy of farmers.

KEYWORDS: Ethylene signalling, Proteomics, Rice, Spikelets, Yield



School of Life Sciences, Sambalpur University, Odisha, India, 768019

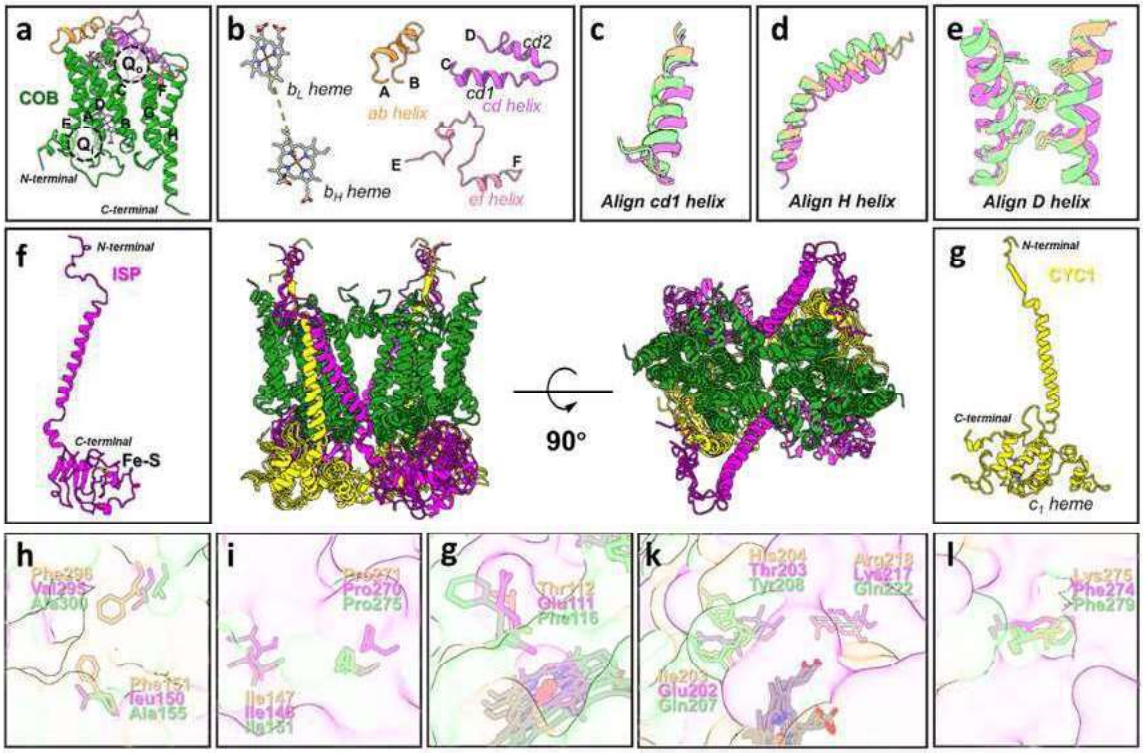
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Cryo-EM Reveals Eukaryotic CIII Subunit Dynamics and Catalytic Efficiency

Q. CHEN, H. LIN and Y. YE*
*Corresponding Author: yeying@mail.ccnu.edu.cn

Mitochondrial complex III (CIII) is central to oxidative phosphorylation, yet species-specific structural determinants of its catalytic efficiency remain unclear. Here, we resolve cryo-EM structures of CIII from *Saccharomyces cerevisiae* (2.50 Å), *Arachis hypogaea* (3.02 Å), and *Sus scrofa* (2.88 Å), revealing conserved catalytic cores and divergent auxiliary subunits. We identify a gatekeeper residue, Phe296 in yeast COB, whose conformational dynamics regulate substrate binding via π-π interactions, correlating with yeast CIII's superior catalytic efficiency (kcat/Km = 0.362 $\mu M^{-1}s^{-1}$). Plant CIII uniquely retains metallopeptidase activity through a zinc-binding motif (HXXEHX76E) absent in yeast and mammals, linking structural evolution to functional divergence. Molecular dynamics simulations demonstrate Phe296's gating mechanism, with closed-state dominance (95% occupancy) prolonging substrate retention. These findings establish subunit-specific adaptations as key drivers of CIII efficiency across eukaryotes, offering insights for targeting respiratory disorders and engineering bioenergetic systems.

KEYWORDS: Catalytic efficiency, Cryo-EM structures, Mitochondrial complex III, Structural adaptations



Central China Normal University, Wuhan, Hubei Province, China

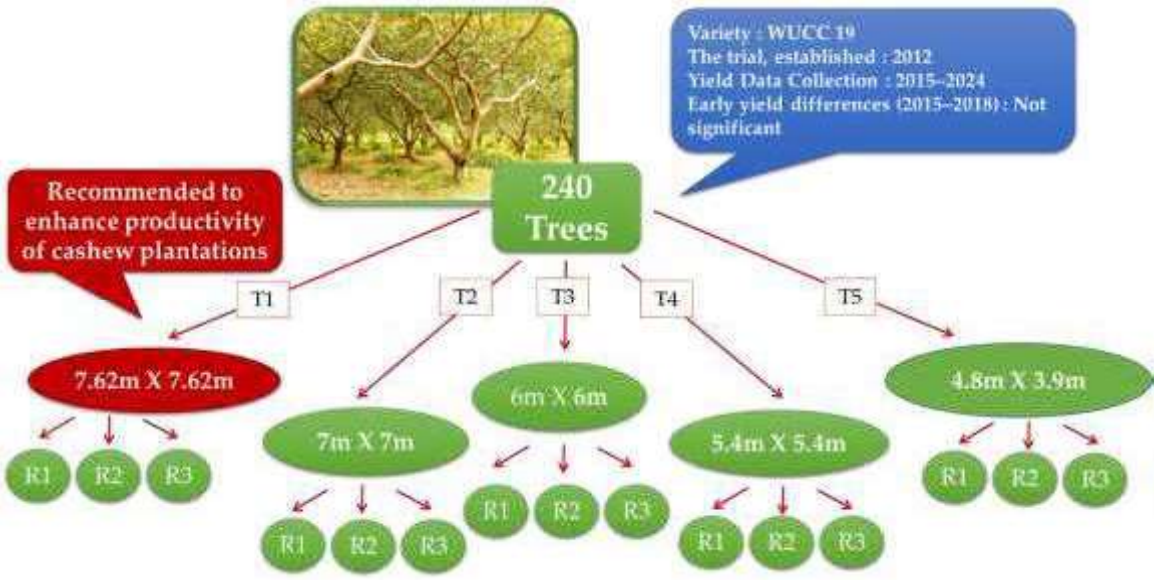
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Optimal Planting Density for Sustainable Cashew (*Anacardium occidentale* L.) Production in the Dry Zone (DL3) of Sri Lanka

H. M. A. S. JAYAWARDANA[1*], P. M. A. P. K. WIJETUNGE[1], H. L. A. N. T. LIYANARACHCHI[1], S. J. B. A. JAYASEKARA[2], D. P. S. T. G. ATTANAYAKA[2], D. C. ABEYSINGHE[3] and W. WIJESURIYA[4]
*Corresponding Author: h.m.a.srikantha@gmail.com

Cashew (*Anacardium occidentale* L.) is a vital cash crop in Sri Lanka, supporting farming communities and the national economy. It thrives in the dry zone under arid and semi-arid conditions. However, average yields remain below global benchmarks, necessitating research into agronomic practices to enhance productivity. Planting density significantly influences cashew yield by affecting canopy development, resource competition, and tree health. This study evaluated the impact of different planting densities on cashew yield in DL3, Sri Lanka. The trial, established in 2012, tested five densities: 7.62 m x 7.62 m (T1), 7 m x 7 m (T2), 6 m x 6 m (T3), 5.4 m x 5.4 m (T4), and 4.8 m x 3.9 m (T5). A Randomized Complete Block Design with three replicates was used. Annual per-tree yield data (2015-2024) were analysed using ANOVA and Duncan's Multiple Range Test. Results showed that planting density significantly affected yield as trees matured. From 2015-2018, yield differences were not significant. However, from 2019 onwards, lower densities (T1 and T2) consistently produced higher nut yields than denser spacing (T4 and T5; $P < .0001$). In 2024, T1 recorded the highest yield, while T5 had the lowest ($P < .0001$). High-density planting increased resource competition, reducing productivity in later years. Findings highlight the importance of optimizing planting density to maximize per-tree yield and ensure sustainable cashew production. Lower densities, such as 7.6 m x 7.6 m, are recommended to enhance productivity in the dry zone, supporting the economic growth of Sri Lanka's cashew-growing regions.

KEYWORDS: Cashew, Nut yield, Planting density



[1]Sri Lanka Cashew Corporation, 1334, Old Kotte Road, Rajagiriya, Sri Lanka; [2]Horizon Campus, KCM Drive, Malabe, Sri Lanka; [3]Department of Plantation Management, Wayamba University of Sri Lanka, Makandura, Gonawila, Sri lanka; [4]Rubber Research Institute of Sri Lanka, Dartonfield, Agalawatta, Sri Lanka

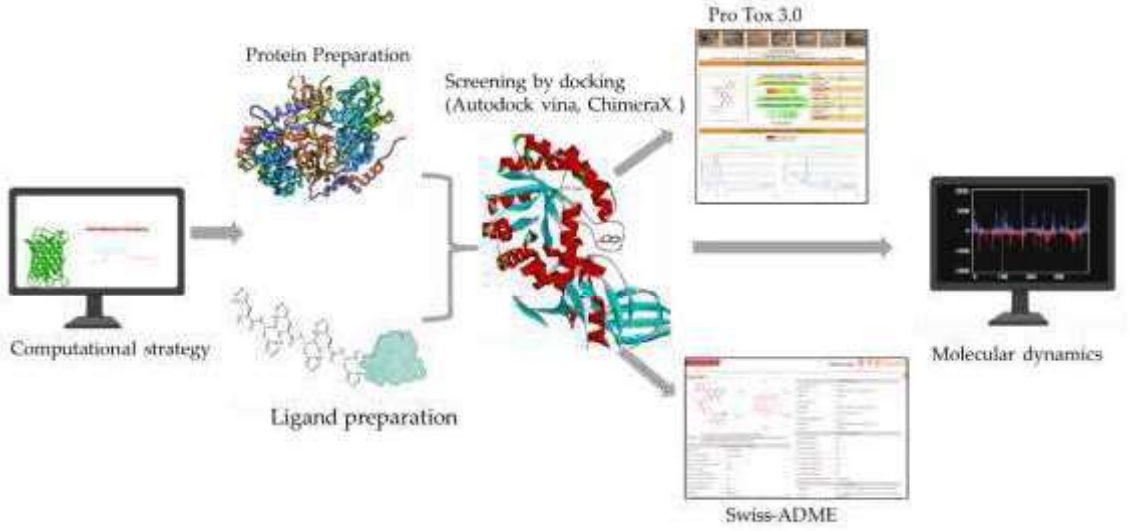
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Exploring the Binding Interactions of Potential Bioactive Agents in *Aegle marmelos* Against *Leishmania*: A Molecular Docking and ADME-Tox Study

P. KAVITHTHIRA[1] and T. D. FERNANDO[2]*
*Corresponding Author: kavikavithra98@gmail.com

Leishmaniasis is a neglected tropical disease caused by leishmania parasites and remains a major global public health issue despite the availability of treatments. Drug resistance and toxicity pose limitations, making the search for new therapeutic agents an absolute necessity. Therefore, this study investigates the binding interactions of thirty bioactive compounds from *Aegle marmelos* against five types of ornithine decarboxylase (ODC) receptors using AutoDock Vina to evaluate the inhibition potential. Furthermore, pharmacokinetics and toxicity analyses were conducted using SwissADME and ProTox-3.0 web servers, respectively. According to docking analysis, the bioactive compounds rutin, ellagic acid, and chlorogenic acid exhibited high binding affinities (8.1-9.5 kcal/mol) with all the above receptors. When compared to binding affinities of currently available drugs (4.8-7.4 kcal/mol), these compounds showed significantly higher binding affinities with all five ODC receptors. Additionally, these bioactive compounds formed strong hydrogen bond interactions with the amino acid residues of the receptors. However, pharmacokinetic analysis revealed that rutin violated three of Lipinski's Rule of Five (Ro5), whereas ellagic acid and chlorogenic acid complied with Ro5. Rutin and chlorogenic acid displayed high LD50 values (5000 mg/kg). Additionally, rutin, ellagic acid, and chlorogenic acid exhibited very poor blood-brain barrier (BBB) permeability, indicating that they are unlikely to have central nervous system effects. These findings suggest that the bioactive compounds in *Aegle marmelos* may play a role in inhibiting ODC receptors and have significant potential for use in the treatment of leishmaniasis. However, further *in vitro* and/or *in vivo* studies are required to validate their therapeutic efficacy.

KEYWORDS: ADME-Tox, *Aegle marmelos*, Leishmaniasis, Molecular docking, Ornithine decarboxylase



[1]*Department of Bioprocess Technology, Faculty of Technology, Rajarata University of Sri Lanka, Mihintale, Sri Lanka;* [2]*Department of Food Technology, Faculty of Technology, Rajarata University of Sri Lanka*

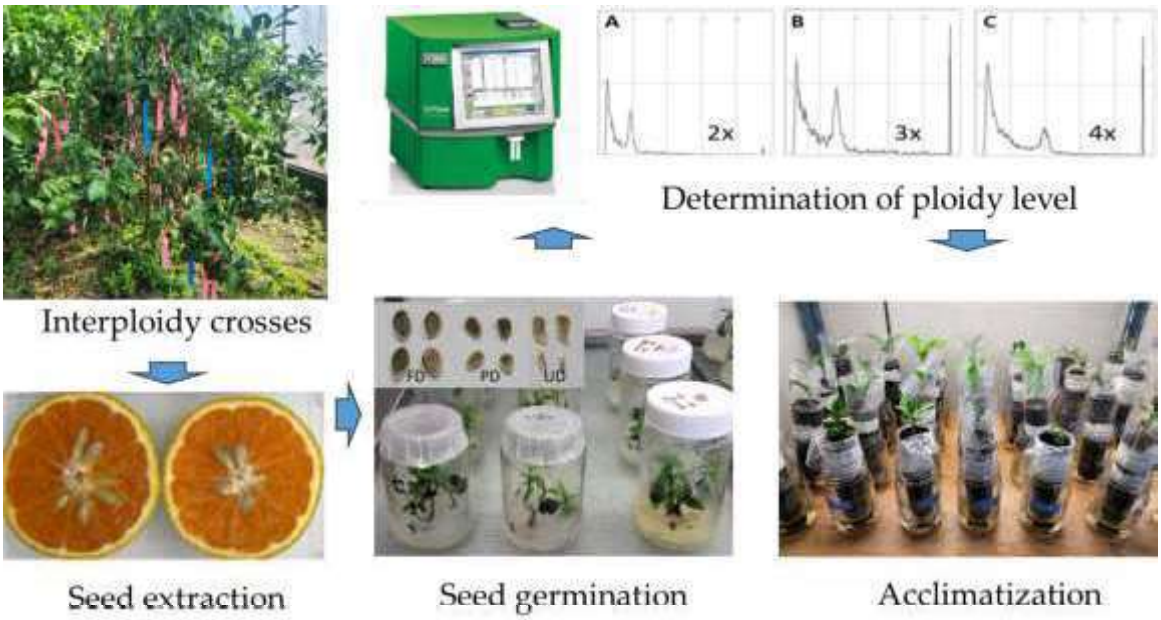
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Response of Interploidy Crosses on Seed Formation and Ploidy Levels of Progeny in Citrus

K. J. SONG*, E. U. OH and S. HAN
*Corresponding Author: kwansong@jejunu.ac.kr

One of the most critical factors determining citrus fruit quality is seedlessness. Seedlessness can be obtained through non-fertilization and parthenocarpy. Non-fertilization is ensured by ovule sterility even though it is cross-pollinated with fertile pollen. Therefore, developing triploid cultivars with gamete sterility is required to produce constant seedless fruits in the citrus industry. The progenies of the crosses were evaluated for the occurrence of triploidy and polyploidy progeny in the interploidy crosses conducted among tetraploids and diploids artificially during the flowering season. The fruit sets and seed formation were recorded at the fruit maturing stages. The seeds were germinated through tissue culture, and the ploidy levels of germinated progeny were measured by flow cytometry. The fruit set ratio was similar, from 25.3% to 38.9% among the interploidy crosses. The seed formation, classified as fully developed, partially developed, and underdeveloped, was affected by cross combinations, including tetraploid-diploid, diploid-tetraploid, and diploid-diploid. The ploidy levels of partially developed and underdeveloped seed origin progeny were primarily triploid or tetraploid. However, those of fully developed seed origin progeny varied depending on cross combinations. The results indicated that polyploid occurrence in citrus might be associated with interploidy cross combinations and genotypes.

KEYWORDS: Seed development, Seedless, Tetraploid, Triploid



Acknowledgement: This work was supported by Korea Institute of Planning and Evaluation for Technology in Food, Agriculture and Forestry, funded by MAFRA (RS-2025-02221924)

Horticultural Science Major, SARI, Jeju National University, Jeju 63243, Korea

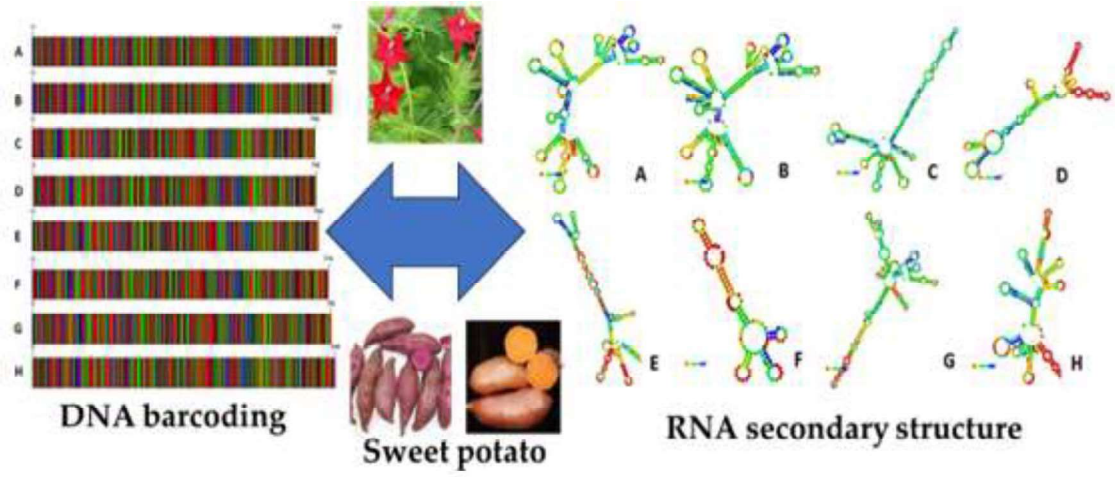
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Insights into DNA Barcoding and RNA Secondary Structure Predictions: Probing Genetic Discrimination among Wild and Cultivated Species of Various Horticultural Crops

M. R. SAHOO
Corresponding Author: manas.sahoo@icar.gov.in

DNA barcoding is emerging as a robust tool for identifying and understanding genetic divergence among plant species and their wild relatives. DNA barcoding discriminates the plant species using 400-800 bp short gene sequences as standardized by the Consortium of Barcode of Life (CBoL)-Plant Working Group. The universal DNA barcode genes at conserved chloroplast-plastid regions, including *matK*, *KimmatK*, *rbcL*, *ycf*, *psbA-trnH*, are often used as a candidate marker for genetic discrimination studies. The present study focused on the genetic divergence studies among the cultivated and wild species of various crops such as *Eryngium* sp., *Solanum* sp., *Ipomoea* sp., *Colocasia* sp., *Alocasia* sp., *Xanthosoma* sp. The efficacy of DNA barcode primers in genetic discrimination varied from species to species. The *matK* gene in the plastidial region efficiently delaminates the medicinal *Eryngium* sp. However, *Colocasia* sp. revealed distinct sequence lengths and accurate genotypic discrimination at the *ITS2* barcode region. The *KimmatK* provided better species discrimination than the nuclear *ITS2* in species divergence studies among thirteen *Solanum* wild relatives. Similarly, in sweet potato genetic discrimination studies, among the chloroplast-plastid barcode markers, *MatK* was more efficient (95-100%) in amplification and sequencing than *KimmatK* (90%) and *rbcL* (90-95%). Among the ribosomal nuclear regions (*ITS2* and *ITS4*), *ITS4* demonstrated polyphyletic phylogeny and could be a reliable marker for genetic divergence studies. Our study encourages the use of DNA barcode tools for species discrimination and genetic divergence studies to augment future breeding strategies for introgressing crop wild relatives.

KEYWORDS: Crop divergence, DNA barcoding, Genetic discrimination, Molecular phylogeny, RNA secondary structure predictions



Species discrimination in eight sweet potato crop wild relatives

ICAR- Central Tuber Crops Research Institute, Thiruvananthapuram 695 017, Kerala, India

ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Farmer Survey Reveals Gaps in Cassava Value Chain in Uganda

M. BUTTIBWA[1]*, B. F. NAMAKULA[1], H. WAGABA[1], S. ONYANGO[2], M. T. ASIO[3], N. OJARA[4] AND D. KILALO[2]
*Corresponding Author: kaayamary1@gmail.com

Cassava is a key crop in Uganda, crucial for food security, income, and rural development. However, limited information is available on its value chain, particularly on access to quality planting materials, farmer participation in seed production, value addition, market access, and digital platform utilization. To fill this gap, information was gathered through a survey conducted in Lira, Apac, Kwania, and Dokolo districts involving 121 farmers through focus group discussions, key informant interviews, and observations. Farmers cultivated NAROCAS 1, NASE 14 (improved), and BAO (local) varieties, sourcing planting materials mainly from their communities and research organizations. Most of the farmers (83.3%) engaged in cassava seed production for an average of 8 years, with 4.8 acres planted under improved varieties. However, only 66.7% had training in seed bulking techniques. The average cassava landholding was 2.5 acres, with yields ranging from 0.8 to 20 tons/ acre (average 7.1 tons/ acre). Cassava was processed into fresh tubers, chips, flour, and brews, mainly using grinding machines. While 83.3% of farmers had access to machines, high private ownership costs were challenging. Only 35.5% had training on cassava processing. Additionally, 83.3% lacked contracts with processing or marketing companies, and post-harvest handling was hindered by limited storage and high transport costs. Farmers relied on NGOs and government officers for information, but digital literacy was low (8.3%), indicating the need for digital training. These findings highlight the need for improved access to quality planting materials, value addition support, and digital platforms to enhance cassava cultivation and market opportunities.

KEYWORDS: Cassava value chain, Focused group discussion, Improved varieties, Land races

Information on gaps in the cassava value chain, particularly in access to quality planting materials, seed production, value addition, market access, and digital utilization, is scant.

To identify above gaps, a survey was carried out in Lira, Apac, Kwania, and Dokolo districts involved 121 farmers through focus group discussions, key informant the interviews, and observations.

Characteristic	Summary statistics	Men	Women
	Total (%)	%	%
Cassava seed production	83.3	35.8	47.5
Time in seed production (years)			
Average	8	8	8
Minimum	3	3	3
Maximum	14	14	14
Awareness of Certified seed	83.3	35.8	47.5
Land planted with certified seed (acres)			
Average	4.8	3.4	4.0
Minimum	1	1	1.5
Maximum	10	10	10

The findings are critical for utilization in a focused approach to

1) enhance availability of healthy cassava materials to farmers,
2) improve value addition processes and
3) improve market opportunities through use village knowledge hubs and digital platforms for a high value cassava chain.

[1]*National Crops Resources Research Institute (NaCRRI), Namulonge, P.O. Box 7084, Kampala, Uganda;* [2]*Department of Plant Science and Crop Protection, University of Nairobi, Kenya P.O. Box 30197-00100;* [3]*Ministry of Agriculture, Animal Industry and Fisheries, PO Box 102, Entebbe Plot 16-18, Lugard Avenue, Entebbe, Uganda;* [4]*Divine Organic Foods, Kampala Office Plot 59, Ntinda Road, Lira Office Plot 4, Lufura close Industrial Area, Uganda*

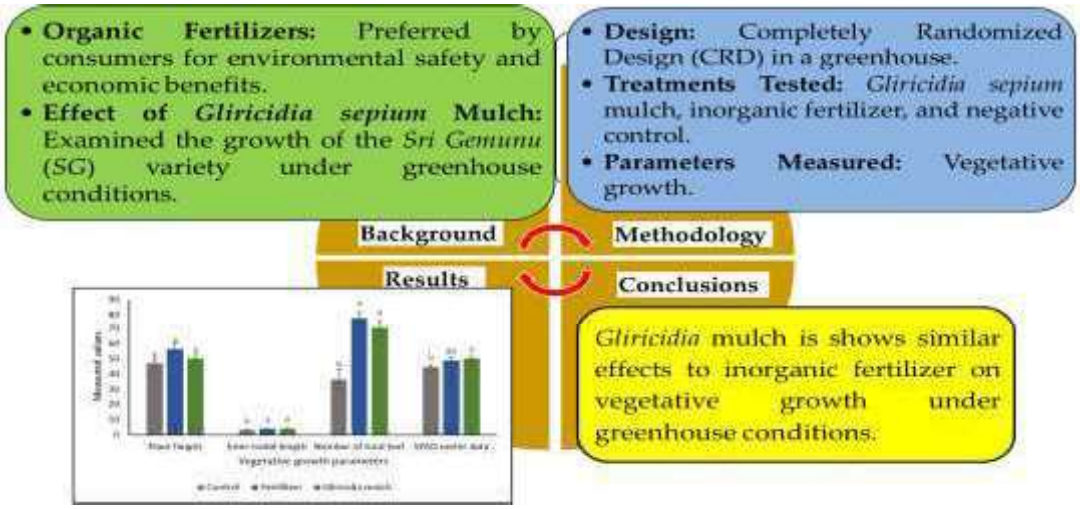
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Effect of *Gliricidia sepium* (Jacq.) Mulch on the Vegetative Growth of Cinnamon (*Cinnamomum verum*) Variety *Sri Gemunu* under Greenhouse Conditions

P. K. D. SANDAMINI[1], R. A. A. K. RANAWAKA[2] and S. GEEKIYANAGE[3*]
*Corresponding Author: sudarshanee@agbio.ru.ac.lk

Shifting from inorganic fertilizers to organic fertilizers in Ceylon cinnamon (*Cinnamomum verum*) cultivation would benefit consumer preferences, environmental safety, and the country's economy. Therefore, this study aimed to determine the effects of *Gliricidia sepium* mulch on the growth of the cinnamon variety *Sri Gemunu* (*SG*) under greenhouse conditions. A pot experiment was conducted using six-month-old vegetative-propagated plants. *Gliricidia sepium* mulch with 250 g per pot was compared with the negative control and recommended inorganic fertilizer, with five replicates each. The potting medium was topsoil, cow dung, coir dust, and soil in a 1:1:1:1 ratio. Growth parameters, including plant height (cm), internodal length (cm), leaf number, and Soil Plant Analysis Development (SPAD) chlorophyll meter, were measured after six months. Data were analyzed using ANOVA, followed by Duncan's multiple range test. Plant height did not differ significantly between treatments. Inter-nodal length was significantly lower in the control (3.00 ± 0.27) compared to fertilizer (4.06 ± 0.16) and *Gliricidia* mulch (3.89 ± 0.25) treatments ($P < .05$), which were similar to each other. Total leaf number was significantly lower in the control (36.20 ± 6.49) than in the inorganic fertilizer (77.06 ± 4.60) and *Gliricidia* mulch (70.60 ± 5.07). SPAD meter data for the *Gliricidia* mulch (49.98 ± 1.55) was significantly higher than the control (44.52 ± 1.37), while the fertilizer treatment (48.78 ± 1.96) was similar in other treatments ($p < .05$). These results indicate that *Gliricidia sepium* mulch is an effective organic alternative to inorganic fertilizers for *Cinnamomum verum*.

KEYWORDS: Cinnamon, *Gliricidia sepium* mulch, Inorganic fertilizer, Vegetative parameters



Acknowledgement: Financial assistance by Sri Lanka Council for Agricultural Research Policy through the grant ID NARP/24/UR/AG/03

[1]Faculty of Graduate Studies, University of Ruhuna, Matara, Sri Lanka; [2]Department of Cinnamon Development, Karandeniya, Sri Lanka; [3]Department of Agricultural Biology, Faculty of Agriculture, University of Ruhuna, Mapalana, Kamburupitiya, Sri Lanka

ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

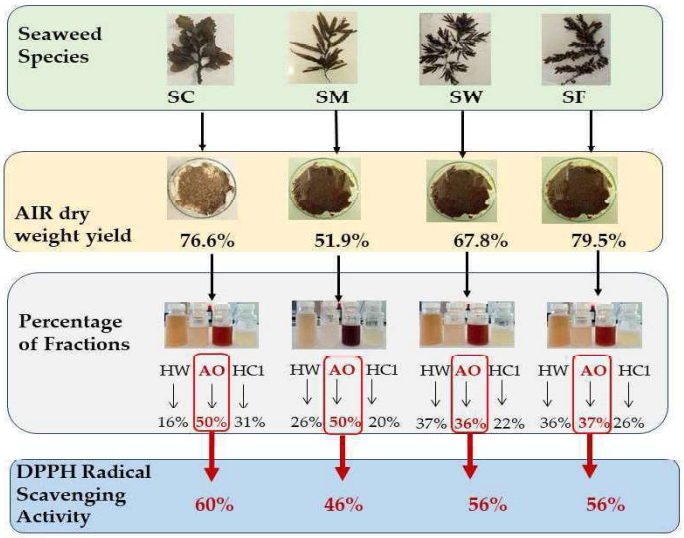
Innovative Food Processing Technologies

Fractionation of Polysaccharides from Brown Seaweeds (*Sargassum*) Species in Sri Lanka and Evaluation of Antioxidant Activity

H. J. R. NIMESHA[1]*, M. G. G. AWANTHI[1] and P. S. JAYASINGHE[2]
*Corresponding Author: roshaninime@gmail.com

Seaweeds are well-known producers of bioactive polysaccharides. Particularly, genus *Sargassum* dominates as the most prevalent seaweed type in Sri Lanka, but little is known about the importance of polysaccharides with bioactivities. The present study investigated the potential antioxidant activity of 4 main species: *Sargassum crassifolium* (SC), *Sargassum fluitan* (SF), *Sargassum muticum* (SM), and *Sargassum wightti* (SW) in Sri Lanka. Prepared alcohol-insoluble residue (AIR) was sequentially treated with hot water (HW) at 85°C for 2 h, 0.25% ammonium oxalate (AO) at 85°C for 1 h, 4% potassium hydroxide (KOH), and 24% KOH to produce HW, AO, (hemicellulose) HC-I and HC-II fractions respectively. Total sugar, polyphenol and antioxidant activity by the 2, 2 – Diphenyl – 1-picryhydrazyl (DPPH) assay were evaluated. The results show that AO fractions, predicted to be alginate, were the most abundant, comprising nearly 50% of the total cell wall fractions in SC and SM, while SF and SW contributed 37% and 36% respectively. HW fractions of SC, SF, SM and SW were 16%, 36.1%, 26% and 37% respectively, suggesting the presence of fucoidan and other water-soluble polysaccharides. The highest DPPH activity was observed in AO fractions, with SC showing the highest activity at 60%, followed by SF, SW at 56% and SM at 46%. This activity in HW ranged from 14% to 26%. The HW fraction of all species exhibited the highest polyphenol content, with SW and SM at 4% and SF and SC at 2.5%, while AO fractions were 1–1.4%. This study suggests that polysaccharides extracted from *Sargassum* species show substantial antioxidant properties, providing a sustainable alternative to synthetic antioxidants.

KEYWORDS: Antioxidant activity, Brown seaweeds, Fractionation, Polysaccharides *Sargassum*



[1] *Department of Agricultural Engineering and Environmental Technology, Faculty of Agriculture, University of Ruhuna, Sri Lanka;* [2] *National Aquatic Resources Research and Development Agency, Crow Island, Colombo 15, Sri Lanka*

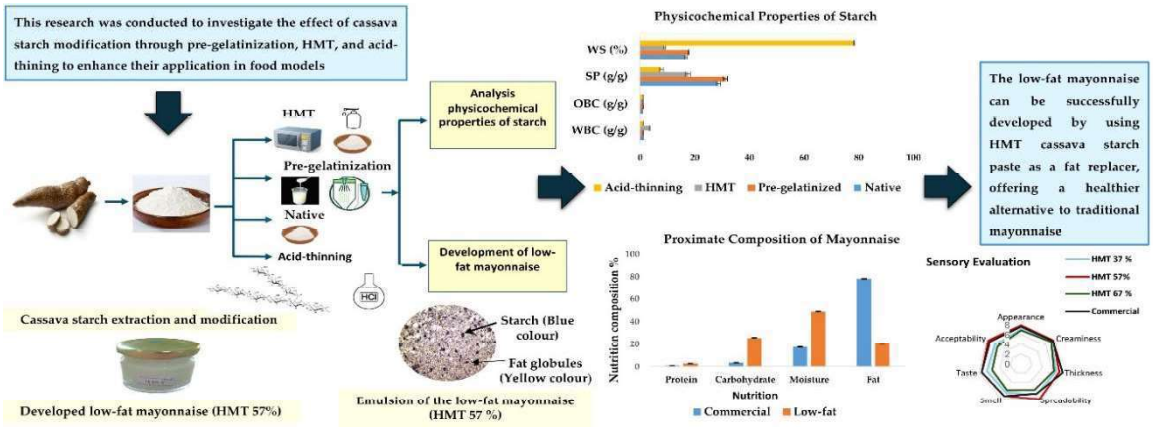
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Characterization of Chemically and Physically Modified Cassava Starch and Their Applications in Food Models

D. M. P. K. G. N. D. DISSANAYAKE[1], R. A. A. RANATHUNGA[2*], P.A. B. N. PERUMPULI[1] and H.M.N.D.B. HENNAYAKE[2]
*Corresponding Author: raaranathunga@gmail.com

This research study was conducted to characterize physically and chemically modified cassava starch to enhance their application in food models through pre-gelatinization, heat-moisture treatment (HMT), and acid-thinning techniques. The granular morphology and physicochemical properties of native and modified cassava starch were analysed. The resultant native and modified cassava starch pastes (20% w/v) were used as fat replacers in low-fat mayonnaise (LFM). The HMT added low-fat mayonnaise was selected through sensory and physicochemical properties. Then, LFM was prepared from HMT starch paste at selected levels of 37%, 57%, and 67% to replace sunflower oil. The physicochemical properties of starch showed that HMT starch has a higher water-binding capacity (3.43±0.01 g/g). The pre-gelatinized starch exhibited higher oil binding capacity (1.08±0.04 g/g) and swelling power (31.29±0.76 g/g) while the acid-thinned starch showed higher solubility (78.26±0.08%) than native starch. All developed LFM showed high emulsion stability, suggesting the potential use of modified cassava starch as a fat replacement. The HMT 57% mayonnaise showed superior physicochemical properties and a similar sensory score compared to commercial mayonnaise. The selected mayonnaise contains 48.67±0.48% moisture, 20.22±0.37% fat, 2.70±0.05% protein, and 25.49±0.46% carbohydrate, offering a lower caloric value (292.73 Kcal/100 g). The developed LFM could be stored under room temperature conditions for two months without adding artificial preservatives. The LFM can be successfully developed by using HMT cassava starch as a fat replacer, offering a significant economic boost to the Sri Lankan economy by stimulating food production using modified cassava starch and reducing reliance on imported mayonnaise, promoting healthier dietary habits.

KEYWORDS: Acid-thinned, Heat moisture treatment, Low-fat mayonnaise, Physicochemical parameters, Pre-gelatinized



Acknowledgement: Authors wish to acknowledge financial assistance by the Ministry of Agriculture for project climate resilient green technological improvement for food crop production to ensure food security in Sri Lanka.

[1]Department of Food Science and Technology, Faculty of Agriculture, University of Ruhuna, Sri Lanka; [2]Food Research Unit, Department of Agriculture, Gannoruwa, Peradeniya, Sri Lanka

ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

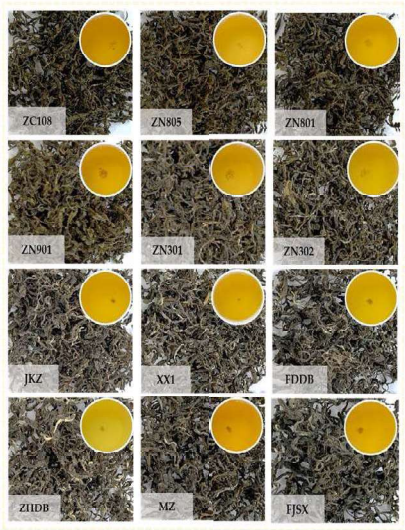
Suitability Evaluation of Different Tea Cultivars (*Camellia sinensis* (L.) Kuntze) for Manufacturing Pingyang Huangtang

S. WU, S. HU, X. ZHENG, Y. LIANG and J. LU*
*Corresponding Author: jllu@zju.edu.cn

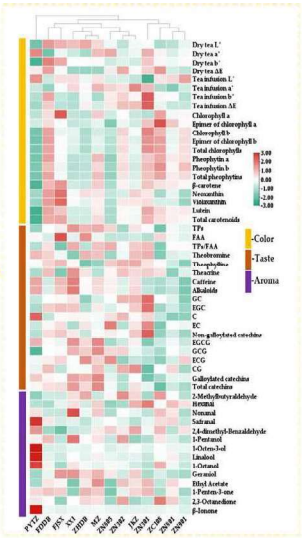
Pingyang Huangtang (PYHT) tea is a famous yellow tea in Zhejiang Province, known for its sweet aroma and mellow taste. At present, only 'Pingyang Tezao' and local tea cultivars are typically used for manufacturing PYHT, thus, introduction of suitable new cultivars is of great significance to alleviate the flood peak of harvesting and improve the product quality. Using 'Pingyang Tezao' as control, twelve tea cultivars including 'Zhongcha 108', 'Zhenong 805', 'Zhenong 801', 'Zhenong 901', 'Zhenong 301', 'Zhenong 302', 'Jiukengzao', 'Xiaoxiang 1', 'Fuding Dabai, 'Zhenghe Dabai', 'Mei Zhan' and 'Fujian Shuixian' were selected to manufacture PYHT according to a same processing protocol. The sensory quality, colour difference attribute, profile of non-volatiles and volatiles were compared for these tea samples. These teas all exhibited typical sensory attributes of yellow tea, with "yellow appearance, infusion and infused leaves" and "sweet and mellow flavours". The content of polyphenols and free amino acids (FAA) ranged from 18.12% to 25.17%, and from 3.77% to 6.27%, respectively, resulting in TPs/FAA from 3.60 to 5.97 which was closely related to the taste attribute. 2,4-Dimethylbenzaldehyde, 1-octanol, β-ionone, linalool, geraniol, hexanal, nonanal, 2-methyl butyraldehyde, safranal, 1-pentanol, 1-penten-3-one, ethyl acetate, 2,3-octanedione and 1-octen-3-ol were the main contributors to the overall aroma although these volatiles possessed different odours. The combined analysis showed that 'Zhongcha 108', 'Zhenong 801' and 'Jiukengzao' were more suitable for manufacturing PYHT tea. These findings provide a new basis for cultivar improvement and application in PYHT industry.

KEYWORDS: Aroma and taste attributes, *Camellia sinensis*, Cultivar, Manufacturing suitability, Yellow tea

The process and manufacturing parameters of Pingyang Huangtang



The sensory evaluation of Pingyang Huangtang manufactured by different tea cultivars



The non-volatiles and key volatiles of Pingyang Huangtang manufactured by different tea cultivars

Acknowledgement: Financial assistance by Zhejiang Science and Technology Major Program on Agricultural New Variety Breeding-Tea Plant through No. 2021C02067-6.

Tea Research Institute, Zhejiang University, Hangzhou 310058, China

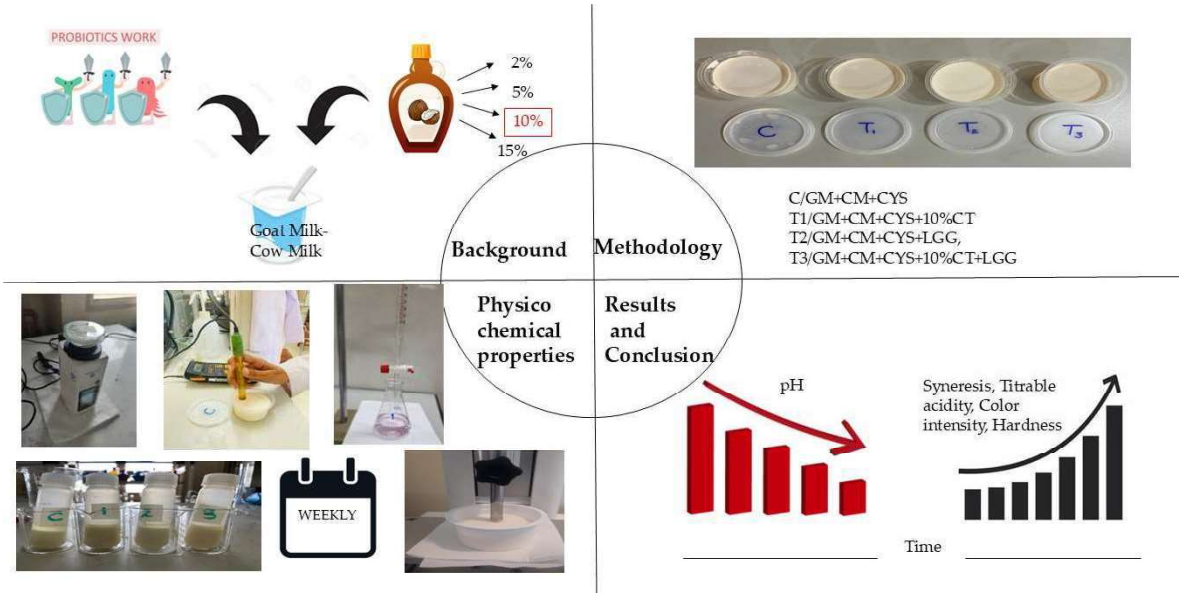
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Physicochemical Characterization of a Goat Milk-Cow Milk Blended Yoghurt Supplemented with Probiotics and Coconut (*Cocos nucifera*) Treacle During Refrigerated Storage

H. M. S. W. K. HERATH and D. M. D. RASIKA*
*Corresponding Author: diland@wyb.ac.lk

The aim of this research is to evaluate the impact of the probiotic *Lacticaseibacillus rhamnosus* GG (LGG) and coconut (*Cocos nucifera*) treacle (CT) on physicochemical properties (pH, titratable acidity, texture, colour characteristics and syneresis) of a probiotic yoghurt made of goat milk-cow milk blend (mixed in 1:1 ratio) over 21 days of refrigerated storage. A pilot test was performed by incorporating different treacle levels (2%, 5%, 10% and 15%) to find the most preferable incorporation level of treacle for the consumers. Since the 10% incorporation level received the highest preference, it was selected for product development. Four formulations of yoghurts: 1) Yoghurt fermented with conventional yoghurt starters (CYS) which served as the control, 2) Yoghurt fermented with CYS and supplemented with CT, 3) Yoghurt fermented with a combination of CYS and LGG, and 4) Yoghurt fermented with a combination of CYS and LGG, and supplemented with CT. Products were analysed in weekly intervals. Redness (a^*), yellowness (b^*) and chroma(C^*), significantly increased while pH, lightness (L^*), and whiteness were dramatically decreased on the addition of CT. The pH of the products decreased over time while syneresis, titratable acidity, colour intensity and hardness increased over time. According to the results, goat milk cow milk blend (1:1 ratio) is an ideal medium for LGG and the addition of *Cocos nucifera L.* treacle at 10% (v/v) may improve the physicochemical qualities, and nutritional value of fermented goat milk cow milk blend elevating their overall quality.

KEYWORDS: Blended milk, *Cocos nucifera* treacle, Cow milk, Goat milk, LGG



Acknowledgement: This research was partially funded by Fonterra Brands Lanka Pvt Ltd., Sri Lanka

Department of Livestock & Avian Sciences, Faculty of Livestock Fisheries & Nutrition, Wayamba University of Sri Lanka, Makandura, Gonawila 60170, Sri Lanka

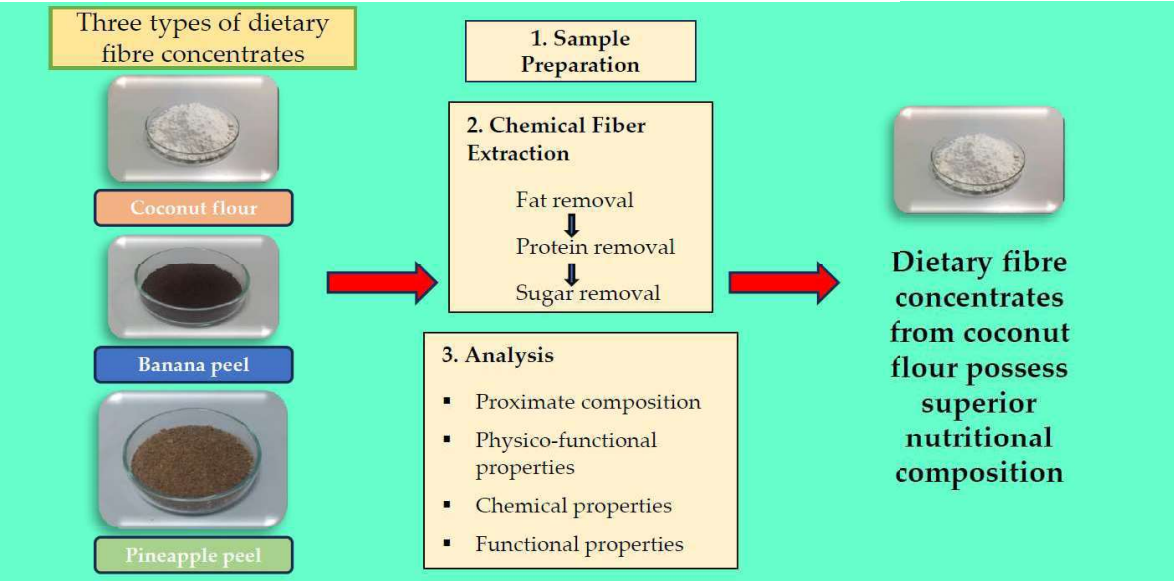
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Quality Parameters of Dietary Fibre Concentrates Obtained from Coconut Kernel Residue, Banana Peels and Pineapple Peels

E. N. T. KULARATHNA[1], B. G. R. R. BANDARA[2*], G. S. N. FERNANDO[1] and L. L. W. C. YALEGAMA[2]
*Corresponding Author: ranahansibandara@gmail.com

Dietary fibre, which is resistant to digestion plays a crucial role in controlling blood sugar, preventing colon cancer, and lowering the glycaemic index. Coconut flour, banana peels, and pineapple peels are often considered food waste and are rich sources of dietary fibre. Therefore, this study aimed to fractionate dietary fibre concentrates and evaluate the functional properties of dietary fibre extracted from different sources. Dietary fibre concentrates from coconut flour, banana peel, and pineapple peel were extracted using a chemical extraction method involving three key steps: fat removal, protein removal, and sugar removal. Proximate composition, physico-functional properties, functional properties, and chemical properties of dietary fibre concentrates extracted from different sources were evaluated using standard methods. The study revealed that dietary fibre concentrates from coconut flour exhibited a high crude fibre content of 34.97±0.95% (dry matter basis) and a total dietary fibre content of 80.11±1.36% (dry matter basis), while demonstrating 81.67±0.88% water absorption capacity and 80.42±1.48% oil absorption capacity. Dietary fibre concentrates from banana peel showed the highest bulk density of 0.722±0.01 g/mL and a packed density of 0.811±0.03 g/ml. Furthermore, dietary fibre concentrates from pineapple peel exhibited strong antioxidant properties, with a radical scavenging activity of 88.08 ± 4.47% and total phenolic content of 42.92 ± 3.80 mg/g. the study concludes that dietary fibre concentrates from coconut flour possess superior nutritional composition compared to other tested sources, offering valuable insights into their potential as an effective and beneficial dietary fibre source for food industry applications.

KEYWORDS: Chemical extraction, Dietary fibre concentrates, Physico-functional properties



[1] *Department of Food Science & Technology, Faculty of Agriculture, University of Ruhuna, Sri Lanka;* [2] *Coconut Research Institute, Lunuwila, Sri Lanka*

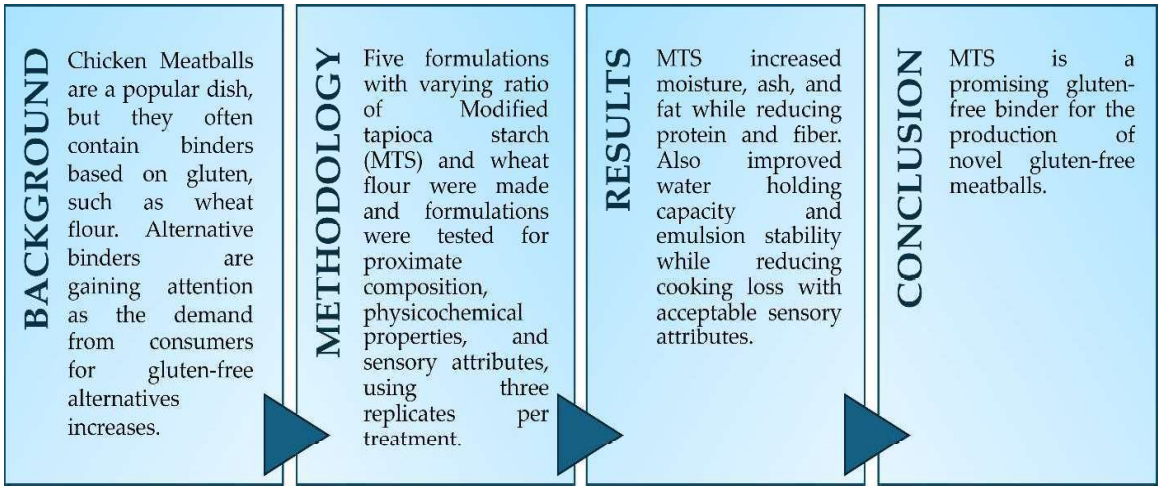
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Application of Modified Tapioca Starch as a Binder in the Development of Gluten-Free Chicken Meatballs

M. V. C. INDUMINI[1], A. GUNARATNE[2] and L. A. C. GUNATHILAKA[3*]
*Corresponding Author: induminichamika086@gmail.com

Meatballs are a popular food, often containing gluten-based binders like wheat flour. There is an increasing consumer demand for gluten-free products. Acetylated distarch adipate (E1422), a type of modified tapioca starch (MTS), is a food additive with specific thickening, binding, and emulsifying properties. The study aimed to develop gluten-free chicken meatball formulations using MTS as a binder and to evaluate their proximate composition, physicochemical properties, and sensory attributes. The treatments were designed (Control- 100% wheat flour), (T1 - 75% wheat flour + 25% MTS), (T2 -50% wheat flour + 50% MTS), (T3 -25% wheat flour + 75% MTS) and (T4 - 0% wheat flour + 100% MTS) with three replicates per treatment. Each formulation was tested for proximate compositions (moisture, ash, protein, fat, and fibre), physiochemical properties (pH, water holding capacity, cooking loss, emulsion stability and texture profiles) and sensory attributes (colour, odour, texture, tenderness, taste, meatiness, saltiness and overall acceptability). Results revealed that increasing MTS significantly increased moisture, ash, and fat contents ($P < .05$) while reducing protein and fibre levels. Higher MTS levels (T3 and T4), improved water holding capacity and emulsion stability while reducing cooking loss. Textural attributes (hardness, adhesiveness, springiness, cohesiveness, gumminess, chewiness, and chewing index) increased slightly in MTS enriched samples. Sensory evaluation exhibited that T3 and T4 had the highest scores for taste, texture, meatiness, and overall acceptability. This study demonstrated that MTS is a promising alternative for gluten-free meatballs. Further studies are needed to evaluate the shelf life and commercial viability of these formulations.

Keywords: Meatballs, Modified tapioca starch, Proximate composition, Physicochemical properties, Sensory attributes



Acknowledgement: Financial assistance by Gills International Pvt Ltd., Katunayake, Sri Lanka

[1]Faculty of Agricultural Sciences, Sabaragamuwa University of Sri Lanka, Sri Lanka; [2] Gills International Pvt Ltd, Katunayake, Sri Lanka

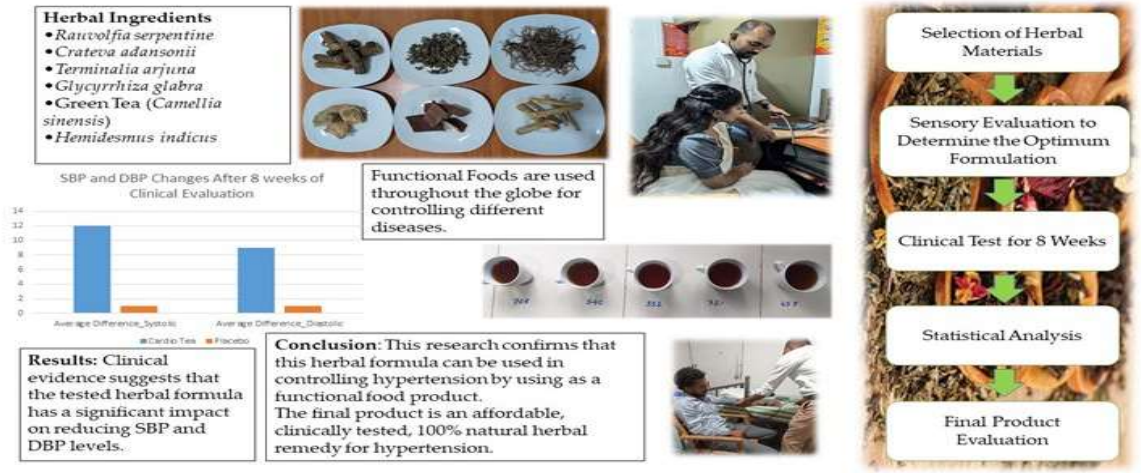
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Formulation and Clinical Evaluation of a Herbal Tea with Hypotensive Benefits Using *Rauvolfia serpentine*, *Crateva adansonii* and *Terminalia arjuna* as Key Ingredients

R. N. RANGIKA[1,2], B. W. G. V. V. BOKANDA[2*], K. M. N. P. K. BANDARA[2], S. S. DARVIN[2], M. D. K. KARUNARATHNE[2], W. M. B. WIMALAKEERTHI[2] and K. M. S. K. A. DEHIDENIYA[1]
*Corresponding Author: vidurafiverr2015@gmail.com

Hypertension is a global health concern, contributing to approximately 7.5 million deaths annually. The chance of cardiovascular diseases and stroke becomes high if systolic/diastolic blood pressure (SBP/DBP) is above 140/90 mmHg. Although different pharmaceutical products are prevalent for hypertension, the increasing preference for natural remedies has heightened the demand for functional foods including herbal teas due to their minimum side effects. This study was aimed to develop a hypotensive herbal tea using *Rauvolfia serpentina*, *Crateva adansonii*, and *Terminalia arjuna* as key ingredients, complemented by *Glycyrrhiza glabra*, Green Tea (*Camellia sinensis*), and *Hemidesmus indicus* to enhance efficacy, taste, and marketability. The formulation, based on traditional Ayurveda knowledge and scientific evidence, achieved a balance between efficacy and sensory appeal, with the final version determined through a sensory test conducted with 30 semi-trained panellists. Ensuring the consistent infusion quality, tea bag particle size was standardized using a 40-gauge stainless steel mesh. A randomized, double-blind, placebo-controlled clinical trial involving 60 hypertensive individuals (30 in the test group and 30 in the placebo group) was conducted consecutively for 8 weeks by providing a daily herbal tea. Participants represented age groups between 18 to 60 and both genders. The test group exhibited a significant reduction in SBP by an average of 12 mmHg and DBP by 9 mmHg, compared to negligible changes in the placebo group ($P < .05$). This herbal tea's affordability, scalability, and clinically validated hypotensive effects present it as a cost-effective alternative to pharmaceutical treatments, appealing to health-conscious consumers while enhancing its economic viability.

KEYWORDS: Cardiovascular health, Clinical trial, Functional foods, Hypertension



Acknowledgement: Financial assistance by Beam Hela Osu Lanka (Pvt) Ltd., Sri Lanka

[1]Department of Biosystems Technology, Faculty of Technological Studies, Uva Wellassa University of Sri Lanka; [2]Beam Hela Osu Lanka (Pvt) Ltd. 456, Avissawella Road, Miriswatta, Puwakpitiya, Sri Lanka

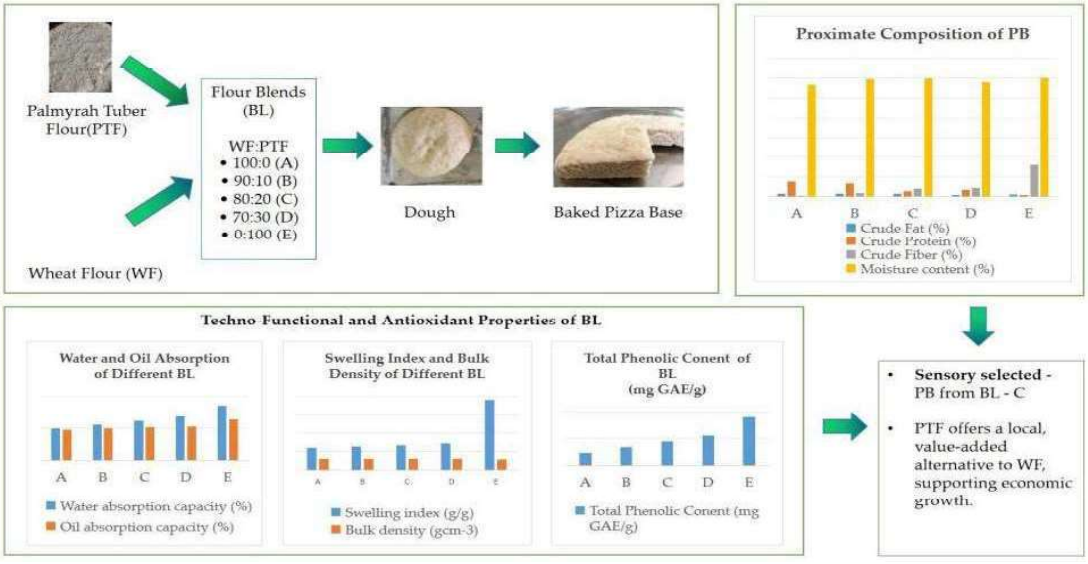
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Physicochemical, Techno-Functional and Antioxidant Properties of Palmyrah (*Borassus flabellifer* L.) Tuber Flour and Wheat (*Triticum aestivum*) Flour Blends and Their Applicability in Pizza Base

R. S. AKSHANA[1*], P. BALAKRISHNA[1], K. ROBIKA[2], J. W. A. SAJIWANIE[1] and S. SRIVIJEINDRAN[2]
*Corresponding Author: akshanars@gmail.com

Palmyrah tuber flour (PTF) is an underutilized resource with potential as a wheat flour (WF) substitute in various food applications. This study investigates the physicochemical, techno-functional, and antioxidant properties of PTF and WF blends (BL) and their applicability in pizza base (PB) formulations. Five BL were developed by partially substituting WF with PTF at levels of 100:0(A), 90:10(B), 80:20(C), 70:30(D), and 0:100(E). The addition of PTF in the BL significantly ($P < .05$) varied physicochemical properties, including pH, titratable acidity, TSS, water activity, and colour value. As PTF substitution in BL increased, water and oil absorption capacities and swelling index increased, while bulk density and dried and wet gluten content decreased. Antioxidant properties increased with PTF addition, peaking in the 100% PTF with a total phenolic content of 1.8±0.01 mg GAE/g and a DPPH IC50 of 76.25±0.13 mg/ml. Increasing PTF in the BL significantly ($P < .05$) elevated moisture, crude fibre, ash, and mineral contents, including calcium and magnesium. Sensory evaluation revealed that the PB with an 80:20 WF:PTF ratio to be the most preferred. Water activity, pH, antioxidant activity, colour, texture, physical properties, and proximate composition of the PB were evaluated. Higher PTF substitution significantly ($P < .05$) increased crude fibre, ash, and mineral contents in PB. Shelf-life study of PB showed stability in water activity, pH, peroxide value, and microbial counts over one month. Thus, PTF is a potential alternative to WF, promoting local resource use and boosting economic growth through value-added food production.

KEYWORDS: Palmyrah tuber flour, Pizza base formulation, Physicochemical properties, Techno-functional properties, Wheat flour substitute



[1]*Sabaragamuwa University of Sri Lanka, Belihuloya, Sri Lanka;* [2]*Palmyrah Research Institute, Jaffna, Sri Lanka*

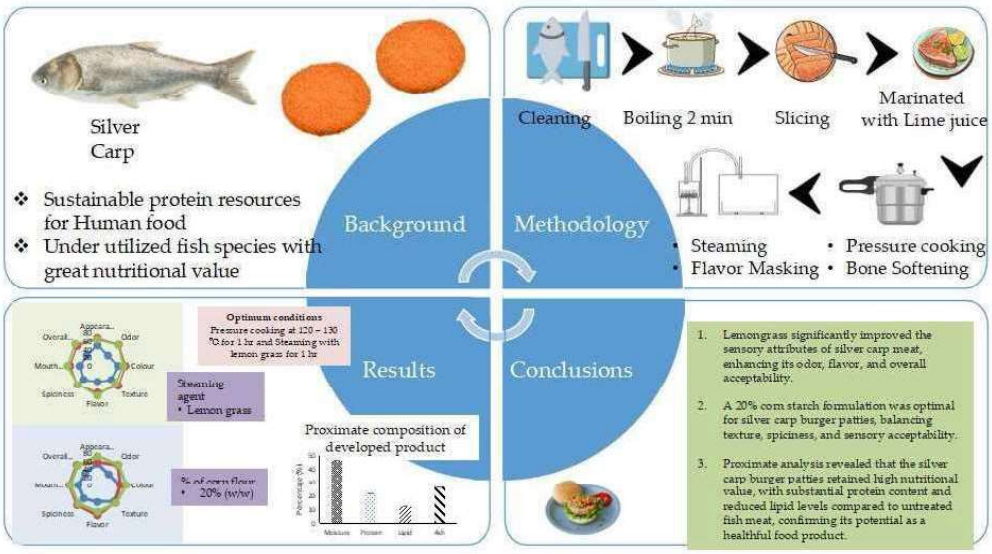
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Development of Fish Burger Patty from Silver Carp (*Hypophthalmichthys molitrix*) and Evaluation of Quality Parameters

B. G. R. T. RANASINGHE[1], R. G. SANUJA[1], G. S. N. FERNANDO[2] and J. M. S. N. RATHNAPALA[1*]
*Corresponding Author: sajanij@fmst.ruh.ac.lk

Silver carp (*Hypophthalmichthys molitrix*) is a nutritionally rich but underutilized freshwater fish which has potential for value-added products like fish patties despite its strong flavour and bony structure. This study aimed to develop a fish burger patty using silver carp flesh, employing innovative processing to minimize undesirable flavours while enhancing sensory appeal and nutritional value. Silver carp flesh was marinated with lime juice (5 ml/100 g fish) and pressure-cooked at 110–120 °C (10–15 psi) for 60 min to achieve optimal bone softness and uniform meat texture followed by grinding into 4 mm³ pieces and tempering. Sensory analysis was conducted on processed fish steamed for 60 minutes with cinnamon leaves (100 g/L; T1), lemongrass (100 g/L; T2), and a water-steamed control and evaluated by 30 semi-trained panellists. After selecting the best steaming agent, a second sensory analysis was conducted to determine the optimal corn starch percentage (10%, 20%, and 30% w/w) for burger patty. The proximate composition of raw fish, treated flesh, and selected product was determined using standard methods. Fish flesh treated with lemongrass was identified as the best treatment, and 20% (w/w) corn starch was selected for developing fish burger patty. Proximate analysis showed the final product had higher moisture (45.81±0.011%) and ash (26.41±0.01%) compared to raw fish, with consistent protein (21.91±0.01%) and reduced lipid content (11.94±0.01%). Material cost analysis revealed economic feasibility, with each patty (40 g) costing approximately 36.00 LKR. These results demonstrated the potential of silver carp as an affordable and nutritious base for value-added fish products.

KEYWORDS: Proximate composition, Sensory analysis, Silver carp, Steaming agent



[1] *Department of Fisheries and Aquaculture, Faculty of Fisheries and Marine Sciences & Technology, University of Ruhuna, Sri Lanka;* [2] *Department of Food Science & Technology, Faculty of Agriculture, University of Ruhuna, Sri Lanka*

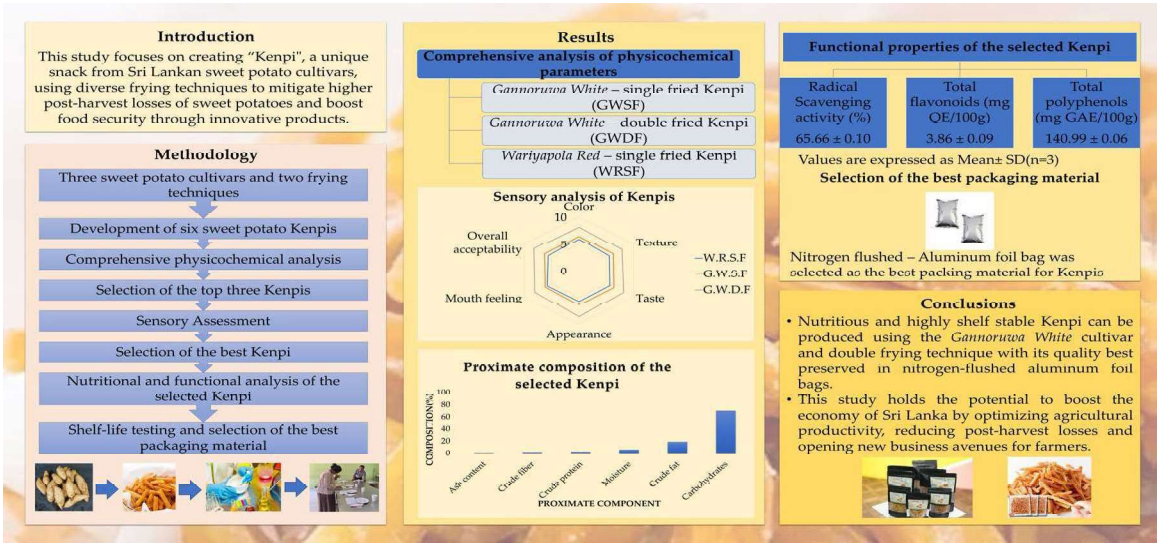
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Exploring the Influence of Selected Sri Lankan Sweet Potato Cultivars and Frying Techniques on the Development of Sweet Potato Kenpi

P. K. THUDUGALA[1], P. A. B. N. PERUMPULI[1] and H. R. P. FERNANDO[2*]
*Corresponding Author: hrpf100@gmail.com

In Sri Lanka, sweet potato is primarily consumed in boiled form, with limited culinary use and value addition, and considerable post-harvest losses are reported. To improve consumption and contribute to national food security, this study focused on developing a sweet potato crispy snack named "Kenpi" using locally grown cultivars and different frying methods. Three sweet potato cultivars (*Gannoruwa White, HORDI Malee, and Wariyapola Red*) were processed using two frying methods: single and double frying, forming six treatment combinations. All treatments were analysed for important physicochemical properties, with results showing significant differences ($P \leq .05$) among cultivars and frying methods. The three highest-performing samples; *Gannoruwa White*-single fried (GWSF), *Gannoruwa White*-double fried (GWDF), and *Wariyapola Red*-single fried were selected for sensory evaluation with 35 semi-trained panellists using a 9-point hedonic scale. GWDF achieved the highest sensory acceptability, with an index of 92.6%, and was selected for nutritional and functional analysis. It recorded 2.39±0.004% crude protein, 5.74±0.02% moisture, 18.79±0.14% crude fat, 70.42±0.12% carbohydrates, 65.66±0.10% DPPH radical scavenging activity, and 140.99±0.06 mg GAE/100g total polyphenols. Shelf-life studies were carried out using Kraft paper zip lock bags, aluminum foil bags, and nitrogen-flushed foil bags stored under cool, dry, and dark conditions. Over two months, Kenpi showed no microbial growth and minimal changes in physicochemical properties, especially in nitrogen-flushed packaging. This study strengthens Sri Lanka's economy by enhancing agricultural productivity, minimizing sweet potato wastage and promoting entrepreneurship in rural areas.

KEYWORDS: Cultivars, Frying methods, Nutritional and physicochemical properties, Shelf life, Sweet potato Kenpi



[1]*Department of Food Science and Technology, Faculty of Agriculture, University of Ruhuna, Mapalana, Kamburupitiya, Sri Lanka;* [2]*Food Research Unit, Gannoruwa, Peradeniya, Sri Lanka*

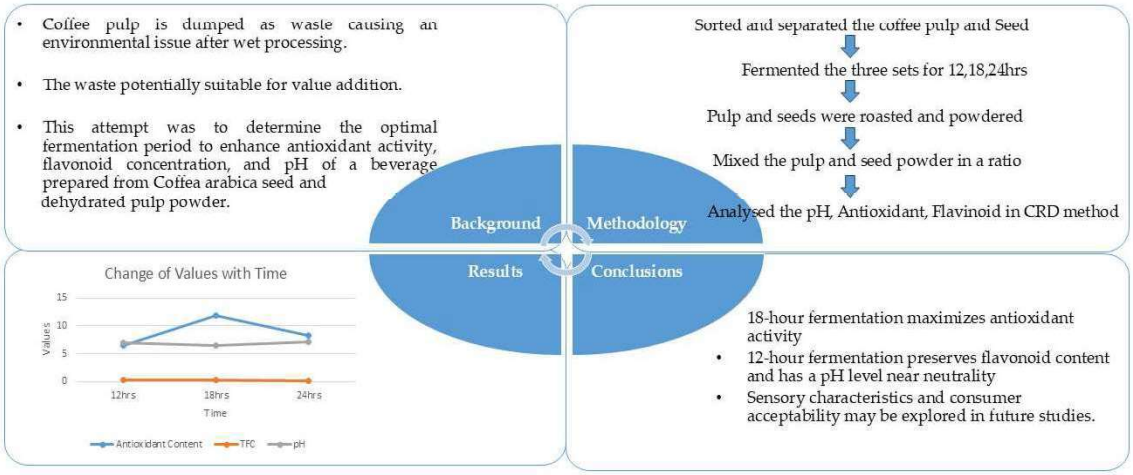
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Optimization of Fermentation Time to Enhance Antioxidant Activity, Flavonoid Content, and pH of a Beverage Developed Using *Coffea arabica* Seed and Pulp Powder

P. ABIJAH[1] and H. A. P. W. HETTIARACHCHI[2]*
*Corresponding Author: pradeepa76@gmail.com

Coffee pulp is typically dumped as waste, leading to environmental issues. It is potentially suitable for value addition. The current study was conducted to determine the optimal fermentation period to enhance antioxidant activity, flavonoid concentration, and pH of a beverage prepared from Coffea arabica seed and dehydrated pulp powder. Three batches of pulp and seeds, separated from 300 g of Coffea arabica fruit, were fermented by soaking in water for 12, 18, and 24 hours. Fermented pulp was oven-dried (45±1 °C, 20 hrs) and powdered, while the seeds were roasted (170 °C, 10±5 min) and powdered. Pulp and seed powders were blended in four ratios (5:0, 4.5:0.5, 4.0:1.0, 3.5:1.5 by weight) and brewed in 200 ml of boiling water (95± 2 °C). The beverage was analysed for antioxidant activity, total flavonoid content, and pH by using standard methodology in a Completely Randomized Block Design (CRBD) having four replicates. Results indicated that antioxidant activity increased from 12 to 18 hours of fermentation but decreased at 24 hours but remained higher than at 12 hours. The flavonoid content was highest at 12 hours and decreased at 24 hours. The pH of the drink was almost neutral at 12 hours (6.87), decreased to acidity at 18 hours (6.30), and returned to neutral at 24 hours (7.06). These findings show that 18-hour fermentation maximizes antioxidant activity, and 12-hour fermentation preserves flavonoid content and has a pH level near neutrality. Sensory characteristics and consumer acceptability may be explored in future studies.

KEYWORDS: Antioxidant, *Coffea arabica*, Coffee, Flavonoid, pH



[1]Institute for Agro Technology and Rural Sciences, University of Colombo, Sri Lanka; [2]Faculty of Technology, South Eastern University, Sri Lanka

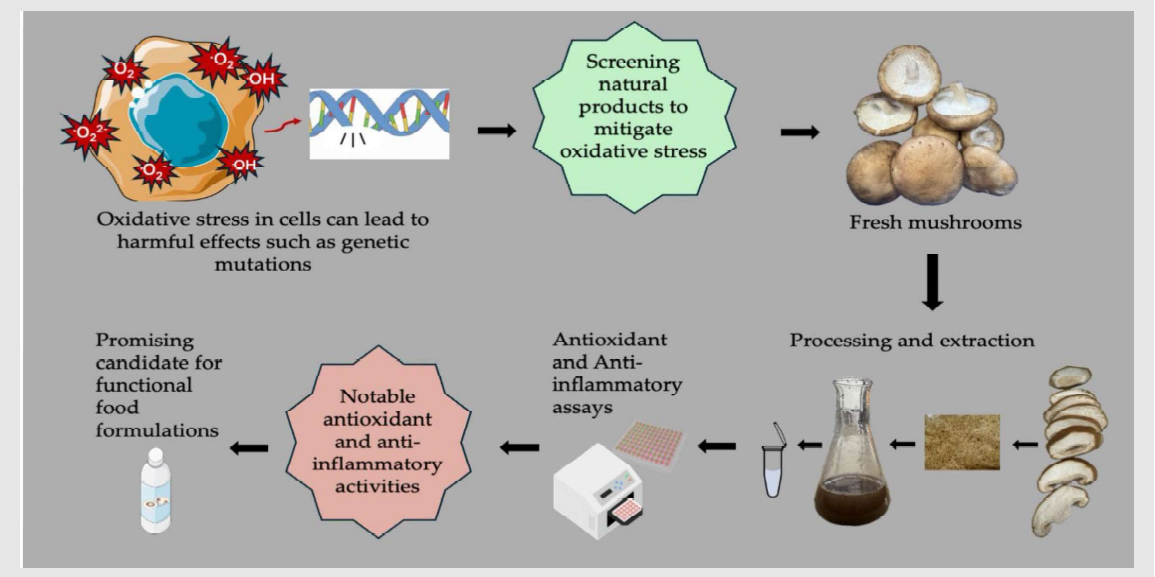
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Anti-Inflammatory and Antioxidant Activity of *Agaricus bisporus* and *Lentinula edodes*, Two Edible Mushrooms Cultivated in Sri Lanka

G. V. S. PABASARA[1], M. D. M. FERNANDO[1*] and W. K. S. M. ABEYSEKERA[2]
*Corresponding Author: dilusha@bmb.cmb.ac.lk

Oxidative stress, driven by excessive reactive oxygen and nitrogen species, plays a pivotal role in the pathogenesis of cancer, diabetes, and cardiovascular disease. To combat oxidative damage, it is critical to screen antioxidant-rich natural products. *Lentinula edodes* and *Agaricus bisporus* are two edible mushrooms that are known to offer various health benefits. However, their consumption is limited in Sri Lanka, possibly due to lack of availability and awareness. This study evaluated the antioxidant and anti-inflammatory properties of these two mushrooms to assess their medicinal potential. Fresh mushroom samples were cleaned, dried, powdered, extracted using sonication and freeze-dried to obtain crude extracts. Antioxidant activity was measured using ferric-reducing antioxidant power (FRAP) and superoxide scavenging assays, while total phenolic content (TPC) and total flavonoid content (TFC) were quantified. Anti-inflammatory activity was determined using nitric oxide (NO) inhibition assay. *Lentinula edodes* exhibited higher antioxidants (TPC: 13.68 ± 0.34 mg GAEs/g; TFC: 43.04 ± 0.60 mg EGCE/g) than *Agaricus bisporus* (TPC: 10.35 ± 0.09 mg GAEs/g; TFC: 13.18 ± 0.12 mg EGCE/g). *Lentinula edode*s demonstrated significantly high FRAP (51.56 ± 0.74 mg TEs/g), superoxide scavenging activity (IC_{50}: 0.42 ± 0.02 mg/ml), and NO inhibition (IC_{50}: 3.257 ± 0.010 mg/ml) compared to *Agaricus bisporus* (FRAP: 23.83 ± 1.25 mg TEs/g; IC_{50}: 1.38 ± 0.01 mg/ml; NO inhibition IC_{50}: 8.79 ± 0.07 mg/ml). It is concluded that *Lentinula edodes* has higher antioxidant and anti-inflammatory properties compared to *Agaricus bisporus*, highlighting its potential as a functional food ingredient.

KEYWORDS: *Agaricus bisporus*, Anti-inflammatory activity, Antioxidant activity, Edible mushrooms, *Lentinula edodes*



[1]*Department of Biochemistry and Molecular Biology, Faculty of Medicine, University of Colombo, Sri Lanka;*
[2]*Department of Agricultural Technology, Faculty of Technology, University of Colombo, Sri Lanka.*

ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Enhancing Flavour and Nutritional Value of Mandarin (*Citrus Nobilis*) Jelly Using Natural Pectin and Rambutan (*Nephelium Lappaceum L.*) Flakes

K. G. D. SAMARANAYAKE[1], G. L. R. P. LIYANAGE[1] and S. M. A. C. U. SENARATHNE[2*]
*Corresponding Author: rumeshliyanage@sjp.ac.lk

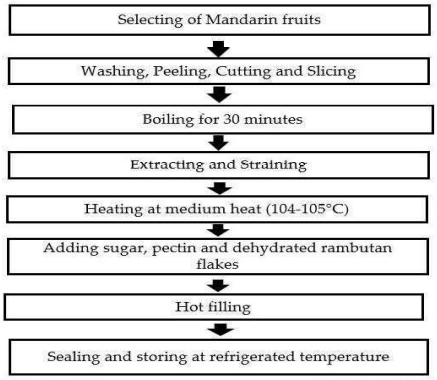
In Sri Lanka, *Jamanaran* (*Citrus nobilis*), a variety of mandarin fruit, is underutilized and faces significant post-harvest losses. To address these challenges, an innovative mandarin jelly was developed by integrating *Jamanaran* with dehydrated rambutan (*Nephelium lappaceum L.*) flakes. The formulation employed a blend of natural and synthetic pectin to offer a healthier alternative to conventional jellies. Using Taguchi's method, nine treatments were formulated by varying pectin (0–0.5%) and sugar content (40–50%). Sensory analysis by 20 semi-trained panellists identified Treatment 9 (T9), containing 0.5% pectin and 50% sugar, as the most preferred. Comparative analysis with a commercially available orange-flavoured jelly revealed significant differences in sensory attributes such as colour, aroma, texture, and overall acceptability ($p < .05$). Physiochemical analysis of the developed jelly over four months showed stable pH (3.073–3.080), total soluble solids (65.16–65.33 °Brix), and titratable acidity (1.433–1.406%). Water activity decreased from 0.853 to 0.814, vitamin C content from 74.15 mg/100 g to 73.34 mg/100 g, and moisture content from 35.04% to 33.14%, while antioxidant capacity (94.00±0.17%) and total phenolic content (805.92±144.11 mg GAE/100 g) remained significantly higher than the control. Sterilized glass bottles were utilized for packaging, and microbial analysis revealed no growth throughout the four-month storage period. This study emphasizes the ability of natural ingredients to produce a premium jelly with improved qualities, catering to consumer preferences for better food options. These inventions reduce post-harvest losses, improve underutilized foods, benefit farmers' economies, and increase national Gross Domestic Production (GDP) through food exports.

KEYWORDS: Antioxidant, Dehydrated rambutan, *Jamanaran*, Mandarin

Aim

To develop dehydrated Rambutan flakes incorporated Mandarin jelly as a nutritious and healthy substitute for existing artificially flavored jelly.

Process of preparing Rambutan incorporated Mandarin jelly






Results

Variation of physico-chemical properties of Mandarin jelly with time

Parameters	Time	
	Initial	After 3 months
Total Soluble Solid (°brix)	65.16±0.16[a]	65.33±0.16[a]
pH	3.07±0.048[a]	3.08±0.055[a]
Titratable Acidity (%)	1.433±0.003[a]	1.406±0.008[a]
Ascorbic Acid Content (mg/100g)	74.15±0.57[a]	73.34±0.89[a]
Water Activity	0.853±0.004a	0.814±0.0008 b
Moisture Content	35.04±0.71b	33.14±0.66b

The antioxidant capacity and total phenolic content values of Mandarin jelly

Parameters	Value
Antioxidant Capacity (%)	94.00±0.17a
Total Phenolic Content (mg GAE/100g)	805.92±144.11a

[1]*Department of Biosysyems Technology, Faculty of Technology, University of Sri Jayewardenepura, Homagama 10206, Sri Lanka;* [2]*Food Research Unit, Gannoruwa, Peradeniya, Sri Lanka*

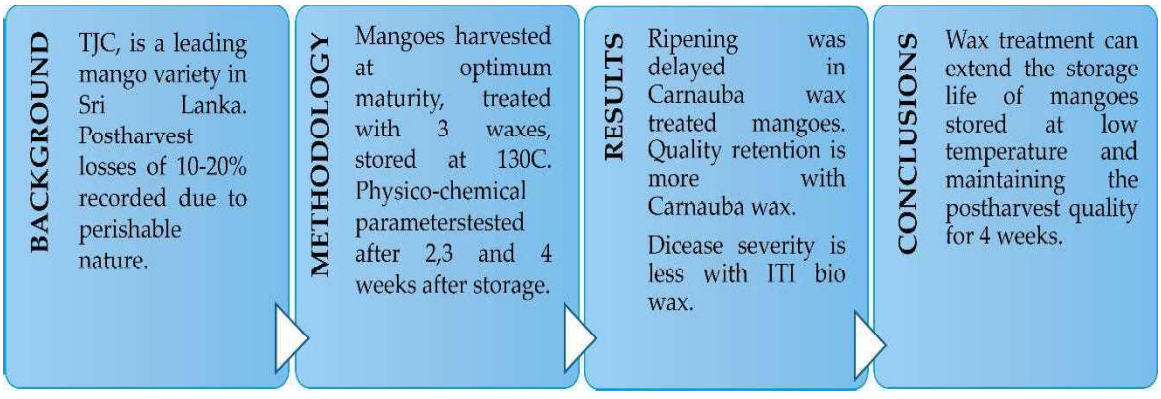
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Efficacy of Wax Coatings in Extending the Storage Life and Postharvest Quality Management in 'Tom EJC' Mangoes in Sri Lanka

T. G. M. MUTHUMAL[1,2], D. G. D. D. S. JAYARATHNE[2], P. K. DISSANAYAKE[2], D. D. P. SEWWANDI[1], J. EKMAN[3], D. K. Y. TAN[4] and I. G. N. HEWAJULIGE[1*]
*Corresponding Author: ilmi@iti.lk

'Tom EJC' (TJC), a leading mango variety in Sri Lanka has a good export potential. However, due to its perishable nature, postharvest losses of 10% – 20% are common. The objective of this study was to determine the effect of wax coatings on postharvest quality and storage life extension at low-temperature. Three wax types, Carnauba wax, Mango wax, and ITI Bio wax were tested on mangoes harvested at optimum maturity. Mangoes (wax-treated and control) mangoes were stored at 13 °C with 80% relative humidity. Quality parameters, including weight loss, peel and flesh colour, fruit firmness, pH, Total Soluble Solids (TSS), Titratable Acidity (TA), disease severity, and sensory quality were assessed after 2, 3, and 4 weeks of storage. The experiment followed a Completely Randomized Design with four treatments and three replicates. Carnauba wax treatment delayed mango ripening, retaining quality longer and reducing weight loss compared to ITI biowax and Mango wax. By week 4, carnauba wax-coated fruits remained firmer (16.18 ± 1.02 N), with higher titratable acidity (0.94 ± 0.03%) and lower TSS (18.80 ± 0.42%), while control mangoes ripened within 2 weeks. ITI biowax-treated fruits had the lowest disease severity (16.08 ± 3.06%). Significant treatment-time interactions confirmed the effectiveness of wax treatments in extending storage life. The application of wax coatings significantly enhanced consumer preference for mangoes across all sensory attributes with carnauba wax demonstrating the highest preference in most categories. This study confirms wax treatments can extend TJC mangoes' shelf life for local and export markets while reducing postharvest losses.

KEYWORDS: Bio wax, Fruit quality, Postharvest loss, Storage life extension, TJC mango



Acknowledgement: Financial assistance by FRESH, a CGIAR Research Initiative

[1]Industrial Technology Institute, 503A Halbarawa Gardens, Thalahena, Malabe, Sri Lanka; [2]Faculty of Agricultural Sciences, Sabaragamuwa University of Sri Lanka; [3]Applied Horticultural Research, 1 Central Avenue, Eveleigh, NSW. 2015, Australia.; [4]University of Sydney, Sydney, NSW 2006, Australia.

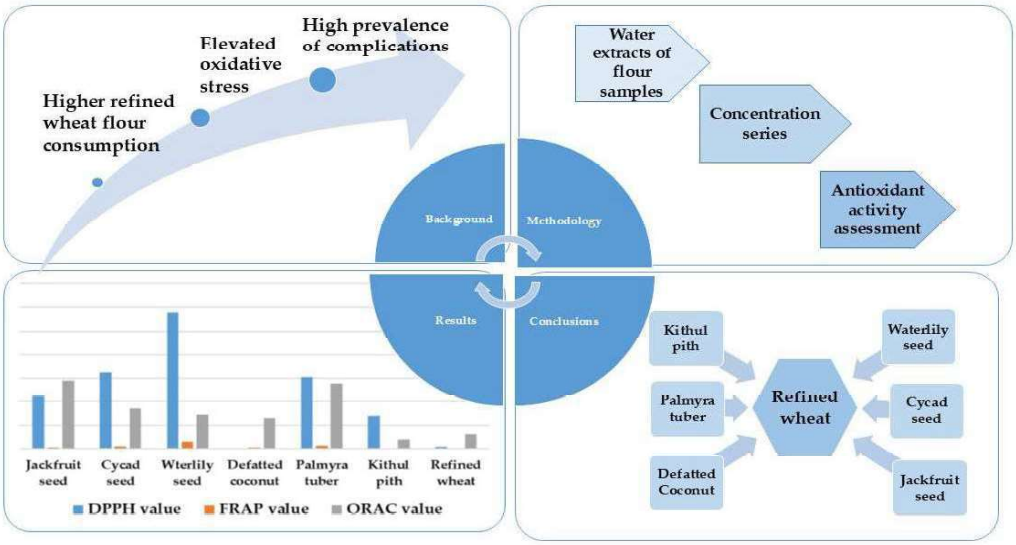
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Antioxidant Potential of Underutilized Flours: A Comparative Analysis with Refined Wheat Flour

N. S. NIRMANI[1, 2], C. JAYATHILAKE[1, 3], R. LIYANAGE[2], I. WICKAMASINGHE[1] and M. A. JAYASINGHE[1*]
*Corresponding Author: madhura@sci.sjp.ac.lk

Refined wheat flour (RWF) is a poor source of antioxidants, and its increased consumption has been linked to oxidative stress-related conditions such as Type 2 diabetes, obesity, cancer, and premature aging. Replacing RWF with underutilized flours may offer a natural alternative for managing these conditions while reducing RWF import costs in developing countries like Sri Lanka. This study evaluated the antioxidant activity of commonly available underutilized flours, including kithul pith (*Caryota urens*), palmyra tuber (*Borassus flabellifer*), defatted coconut (*Cocos nucifera*), waterlily seed (*Nymphaea lotus*), cycad seed (*Cycas circinalis*), and jackfruit seed (*Artocarpus heterophyllus*), comparing them with RWF. Since antioxidants function through diverse mechanisms, their activity was assessed using the DPPH (2,2-diphenyl-1-picrylhydrazyl) radical scavenging, FRAP (Ferric Reducing Antioxidant Power), and ORAC (Oxygen Radical Absorbance Capacity) assays. All analyses were performed in triplicate and compared using Tukey's test. The underutilized flours exhibited significantly higher ($P < .05$) DPPH and FRAP values than RWF, ranging from 0.19 ± 0.02 to 28.96 ± 0.22 µmol TE/g and from 0.15 ± 0.15 to 1.51 ± 1.51 µmol Fe^{2+}/g, respectively. ORAC values ranged from 1.98 ± 0.01 to 14.61 ± 0.41 µmol TE/g. Except for Kithul pith flour, all underutilized flours had significantly higher ($P < .05$) ORAC values than RWF. These findings indicate that the selected underutilized flours are richer in antioxidants than RWF, highlighting their potential as functional ingredients for enhancing dietary antioxidant intake. However, further research is needed to evaluate their practical applications, including health benefits and potential anti-nutritional or toxicological effects.

KEYWORDS: Antioxidant activity, Flour, Refined wheat, Underutilized



Acknowledgement: Financial assistance by University of Sri Jayewardenepura through the grant ID (ASP/01/RE/SCI/2022/22)

[1]Department of Food Science and Technology, Faculty of Applied Sciences, University of Sri Jayewardenepura, Nugegoda, Sri Lanka; [2] National Institute of Fundamental Studies, Hanthana Road, Kandy, 20000, Sri Lanka; [3] School of Medicine, Case Western Reserve University, 10900 Euclid Ave., Cleveland, Ohio, 44106, USA

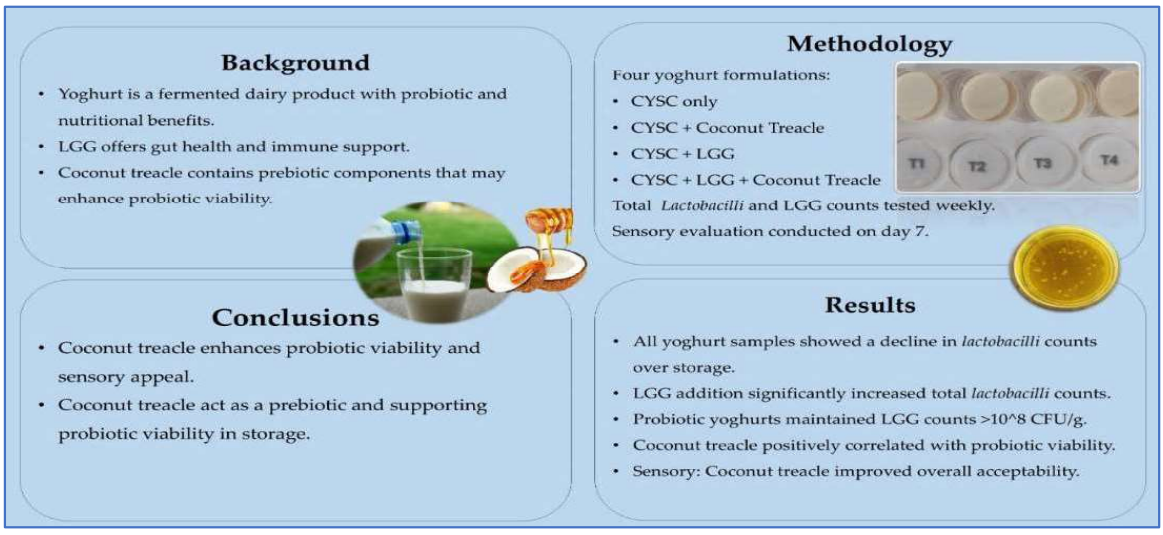
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Effect of Probiotics and Coconut Treacle on Microbial and Organoleptic Properties of Yoghurt Made from Cow and Goat Milk Blend

W. M. W. TISSERA and D. M. D. RASIKA*
*Corresponding Author: diland@wyb.ac.lk

This study aims to assess the impact of probiotic *Lacticaseibacillus rhamnosus* GG (LGG) and coconut treacle on microbial and sensory properties of yoghurt made from cow and goat milk blend over 21- days of refrigerated storage. Four experimental yoghurt samples were prepared: (i) fermented with the conventional yoghurt starter culture (CYSC) only (Treatment 1), (ii) fermented with CYSC and supplemented with coconut treacle (Treatment 2), (iii) fermented with a combination of CYSC and LGG (Treatment 3), and (iv) fermented with a combination of CYSC and LGG, and supplemented with coconut treacle (Treatment 4). Viability of *Lactobacillus bulgaricus* and LGG was evaluated at weekly intervals. Sensory attributes were tested after 7 days of refrigerated (4 °C) storage. All treatments showed declining *Lactobacilli* counts over storage. Addition of LGG significantly increased total viable *Lactobacilli* counts throughout the storage. Both probiotic yoghurts maintained viable LGG counts of >10^8 CFU/g which ensures the delivery of minimal therapeutic dose of probiotics for any health effect in the host. The addition of coconut treacle had a significant positive correlation with probiotic viability and significantly improved the sensory attributes of the plain- and probiotic plain yoghurts. Probiotic yoghurt supplemented with coconut treacle showed the highest overall acceptability (8.3 ± 1.3). Correlation analysis of sensory attributes showed that taste and mouthfeel have a significant impact on the overall acceptability. In conclusion, results showed that addition of coconut treacle into cow-and – goat milk blended yoghurt has a positive effect on probiotic viability and overall sensory properties of yoghurt.

KEYWORDS: Coconut treacle, Goat milk, *Lactobacillus rhamnosus*, Milk blends, Sensory analysis



Acknowledgement: This study was partially funded by Fonterra Brands Lanka Pvt Ltd., Sri Lanka

Department of Livestock & Avian Sciences, Faculty of Livestock Fisheries & Nutrition, Wayamba University of Sri Lanka, Makandura, Gonawila 60170, Sri Lanka

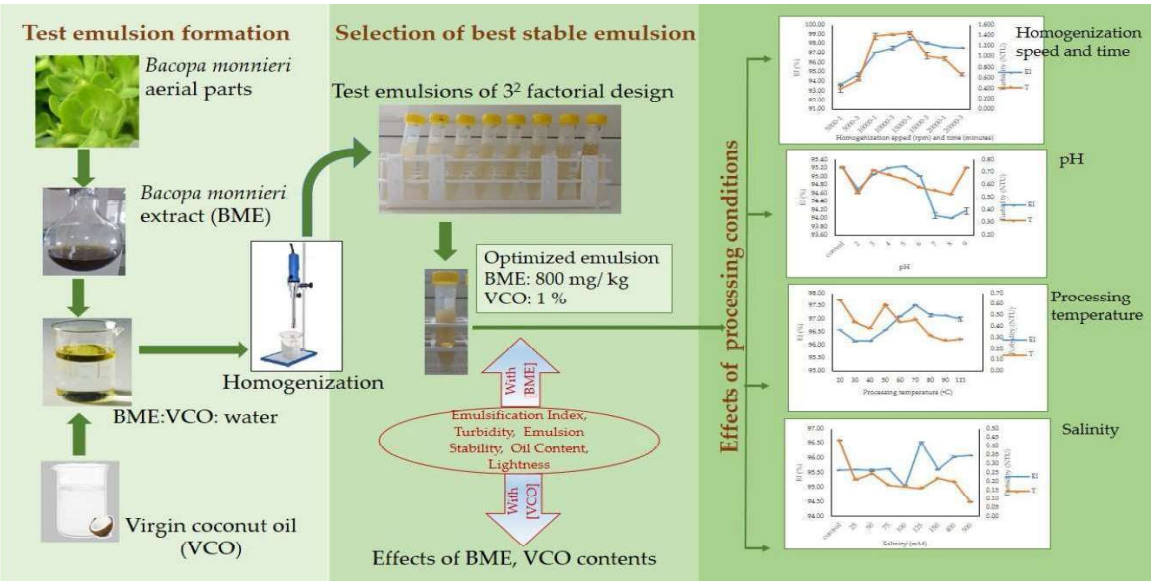
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Effects of Concentration and Processing Conditions on the Stability of *Bacopa monnieri* and Virgin Coconut Oil-in-Water Emulsion

A. M. C. U. BINDUHEWA[1], P. RANASINGHE[1], P. I. GODAKUMBURA[2*]
*Corresponding author: pahanig@sjp.ac.lk

This study was a part of an oil-in-water emulsion formulation, targeting the optimization of contents of *Bacopa monnieri* extract (BME/ active compounds) and virgin coconut oil (VCO/ oil phase) to achieve the best stability in water (continuous phase) before introducing emulsifiers. BME is neuro-protective when ingested with an oil. An organoleptically accepted range of BME was experimented. Emulsions were prepared according to a 3^2 factorial design having BME (400, 600, 800 mg/kg) and VCO (0.5, 1.0, 1.5 %) contents. Emulsification index (EI), turbidity (T), emulsion stability (ES), lightness (L), and oil content in the emulsified region (OC) were analysed. The most stable BME: VCO combination was selected via a response optimizer available in Minitab 17.1. An optimized emulsion was prepared under different processing conditions. General factorial regression showed that BME and VCO have significant main and interaction effects ($P < .05$) on EI, T, ES, OC, and L (R^2 = 99.35, 99.30, 99.97, 99.02, and 99.08, respectively). Emulsions with BME showed better stability compared to the controls having only VCO. Emulsion characteristics showed significant reduction ($p < .05$) after 24 hours of storage at 26 ± 2 °C, according to t-test. Increasing homogenization speed 5000 - 15000 rpm, applying pH 3.0 - 6.0, salinity 125-150 mM increased stability, whereas it was reduced by increasing processing temperature from 20 °C to 121 °C. Emulsions heated at 70 - 121 °C showed better stability after storage. In conclusion, the best stable emulsion contains 800 mg/kg BME and 1.0 % VCO, being differently influenced by processing conditions. The research will enhance the blooming of domestic manufacturers of natural bioactive ingredients.

KEYWORDS: *Bacopa monnieri*, Emulsion stability, Processing conditions, Response optimization



Acknowledgement: Financial assistance by the Treasury of Sri Lanka through ITI/TG/21/208.

[1]Industrial Technology Institute, 503 A, Halbarawa Gardens, Malabe, Sri Lanka; [2]Department of Chemistry, Faculty of Applied Sciences, University of Sri Jayewardenepura, Nugegoda, Sri Lanka

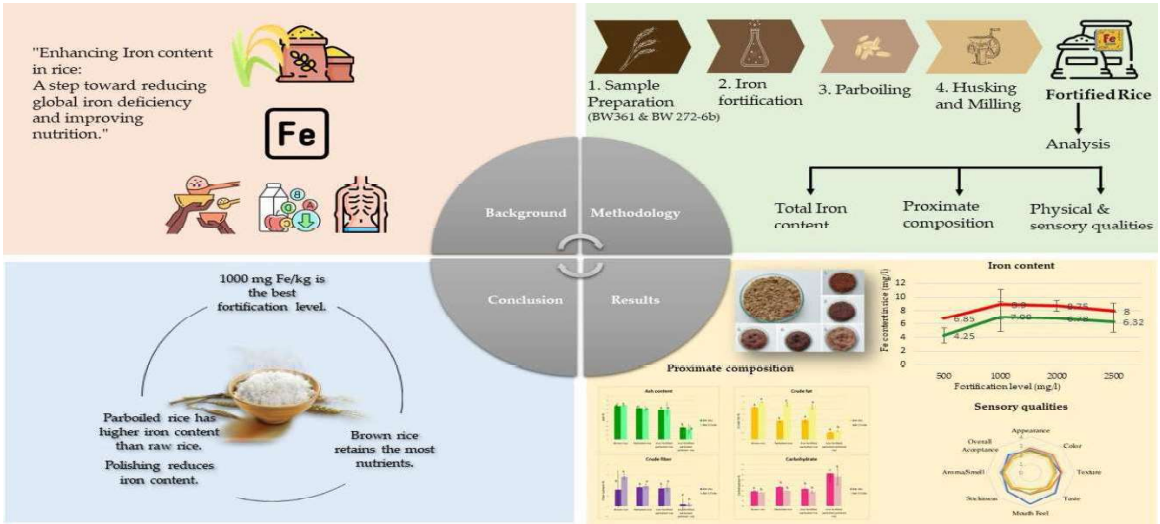
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Evaluating the Feasibility of Iron Fortification into the Rice Grains Through Parboiling Process

M. D. K. A. GUNATHILAKA[1], H. M. T. HERATH[2] and G. S. N. FERNANDO[1*]
*Corresponding Author: gsnfernando@fst.ruh.ac.lk

Iron deficiency is one of the most widespread micronutrient deficiencies in humans. Since rice is the main staple food for more than half of the global population, improving the iron content in rice is an effective way to solve this problem. Therefore, the main aim of this research was to evaluate the effectiveness of iron (Fe) fortification through parboiling process for improving Fe density in parboiled-polished rice. Two rice varieties, BW 361 and BW 272-6b, were subjected to parboiling with varying iron concentrations. The iron content, physical properties, proximate composition, and sensory attributes (using 12 trained panellists) of raw, parboiled, fortified and polished rice were analysed using standard methods. Rice grains of the selected cultivars were parboiled in deionized water containing different concentrations of ferrous sulfate ($FeSO_4$) (500–2500 mg/L). The addition of 1000 mg/L $FeSO_4$ to the parboiling water, identified as the optimal level, significantly increased the iron content in both raw and polished rice for both varieties. For BW 361, iron content increased from 6.05±0.15 to 8.90±0.15 mg/100 g (parboiled) and 4.05±0.12 to 7.08±0.13 mg/100 g (polished). BW 272-6b increased from 6.08±0.15 to 9.85±0.10 mg/100 g (parboiled) and 4.10±0.10 to 7.47±0.11 mg/100 g (polished), demonstrating significant enhancement through iron-fortified parboiling process. Fortified parboiled rice exhibited improved milling efficiency (72.3% for BW 272-6b and 70.9% for BW 361), higher yield, and reduced breakage. Parboiling preserved protein and minerals, and maintained acceptable sensory quality in appearance, texture, and flavour. The results suggest that parboiled rice demonstrates significant potential for iron fortification, offering an effective step toward retaining nutritional value and combating global iron deficiency.

KEYWORDS: Iron deficiency, Iron fortification, Parboiling, Rice



[1]Department of Food Science and Technology, Faculty of Agriculture, University of Ruhuna, Sri Lanka; [2]Food Technology Section, Modern Research and Development Complex, Industrial Technology Institute, Halbarawa Gardens, Malabe, Sri Lanka

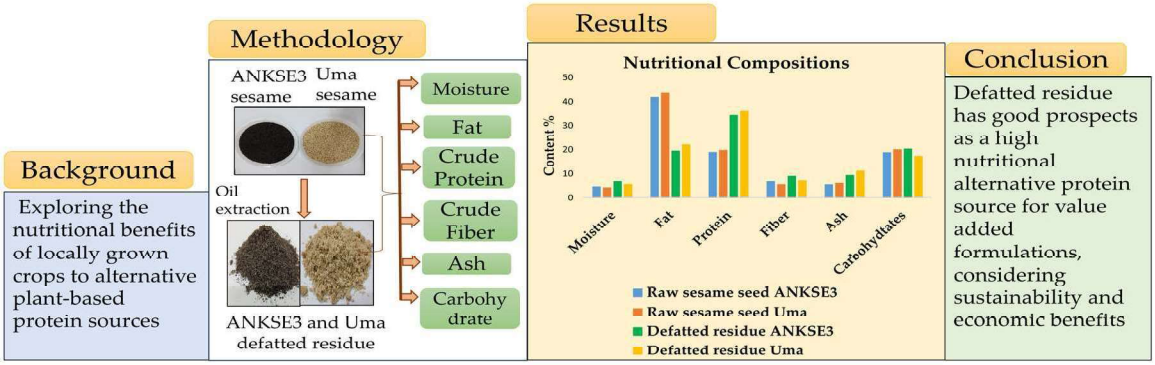
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Effect of Oil Extraction on Proximate Composition of Sesame Seeds of Two Varieties: *Uma* and ANKSE3

M. F. F. SAZNA[1,2*], H. F. FAHMIDHA[1], T. MADUJITH[2] and J. M. N. MARIKKAR[1]
*Corresponding Author: saznafariz1015@gmail.com

Plant-based protein has become a trend among researchers and environmental activists due to rising concerns about human health and environmental sustainability. Hence, identifying alternative plant-based protein sources and exploring the nutritional benefits of locally grown crops has been a focus of research. Sesame is a high-demand oil crop globally but remains less popular in Sri Lanka. This study compared the nutritional benefits of raw and defatted residue (DR) of Sri Lanka's sesame cultivars, namely *Uma* and ANKSE3 by analysing their proximate composition. Moisture, crude fat, crude protein, ash, crude fibre, and carbohydrate contents of ground samples were determined using AOAC methods. The major constituent of raw sesame regardless of cultivar was fat (42.01-43.75%), followed by carbohydrates (18.93-20.16%) and protein (18.99-19.84%). In DR, notable changes were observed in protein, moisture, fibre and ash contents. The protein (34.45-36.1%) content was the highest in the DR of both cultivars. The second most dominant constituent of ANKSE3 was carbohydrate (20.41%), followed by fat (19.59%). In contrast, fat (22.2%) was the second dominant constituent in *Uma*, followed by carbohydrate (17.37%). The DR of ANKSE3 reported the highest fibre content (9.1%), while *Uma* reported the highest ash (11.32%) content. The moisture content of both raw sesame and DR ranged from 4.77% to 4.36% and 6.96% to 5.76%, respectively. This study demonstrated that defatting drastically altered proximate parameters, with minimal impact from cultivar differences. The defatted residues of sesame have good prospects as a high nutritional alternative protein source for value added formulations, considering sustainability and economic benefits.

KEYWORDS: ANKSE3, Defatted residue, Proximate composition, Sesame, *Uma*



Acknowledgement: Financial assistance by National Institute of Fundamental Studies, Sri Lanka

[1]National Institute of Fundamental Studies, Hanthana Road, Kandy, Sri Lanka; [2]Postgraduate Institute of Agriculture, University of Peradeniya, Sri Lanka

ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Development of Butterfly Pea Flower-Enriched Cosmetic Formulation for Industrial Application

K. P. A. K. WEERASIRI[1], G. D. LIYANAARACHCHI[2] and N. S. KOTTEARACHCHI[1*]
*Corresponding Author: kottearachchins@yahoo.com

The use of cosmetics in modern lifestyles has become a widespread practice due to their beneficial effects on skin refreshment, cleansing, and anti-aging. However, the inclusion of hazardous substances in synthetic cosmetics has led to an increasing demand for herbal cosmetic products. In this regard, the present study aimed to develop a herbal cosmetic formulation utilising the medicinal properties of *Clitoria ternatea*, commonly known as the butterfly pea flower. *Clitoria ternatea* is a twining leguminous plant belonging to the family Fabaceae and has been reported to exhibit beneficial effects, such as increased skin hydration, preventing hyperpigmentation, photoaging and antimicrobial effects. The study analysed the 2,2-diphenyl-1-picrylhydrazyl free radical scavenging activity and total polyphenol activity of the butterfly pea flower. Furthermore, thin-layer chromatography was conducted to separate the compounds of flower extract. In the development of the herbal formulation base, three different concentrations of ceto stearyl alcohol were used to develop three formulations and the best formulation was selected based on the stability of the formulations which were examined using photo-stability, exposure to cyclical temperature and centrifugal separation tests by measuring pH, colour, and viscosity. The best formulation was enriched with the herbal extract and it showed acceptable quality in certain parameters. However, further experiments need to be done with the herbal formulation to use it as an herbal cosmetic product at commercial level. The successful formulation using *Clitoria ternatea* could grow the herbal cosmetics sector, encouraging sustainable agriculture, strengthening local industries and promoting economic growth.

KEYWORDS: Antioxidant, Butterfly Pea Flower, Clitoria, Cosmetics, Formulation

Conclusion

- Dark blue multi petal variety: Highest DPPH free radical scavenging activity and total phenolic content
- Dark blue-multi petal variety
- Dark blue-single petal variety
- Light blue single petal variety

  Identical chemical composition
- F3 base formulation: Stability of pH, colour and viscosity with time ⟶ Chosen base formulation
- No microbial contamination in all tested formulation after incorporating with three flower extracts accordance with SLS standard 1489:2016
- Incorporating three flower extracts to the F3 formulation affected its viscosity over time and further studies are necessary to understand the impact of these changes.

[1]*Department of Biotechnology, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka, Makandura, Gonawila (NWP), 60170, Sri Lanka;* [2]*Industrial Technology Institute, Research and Development Centre, Herbal Section, Thalahena, Malabe*

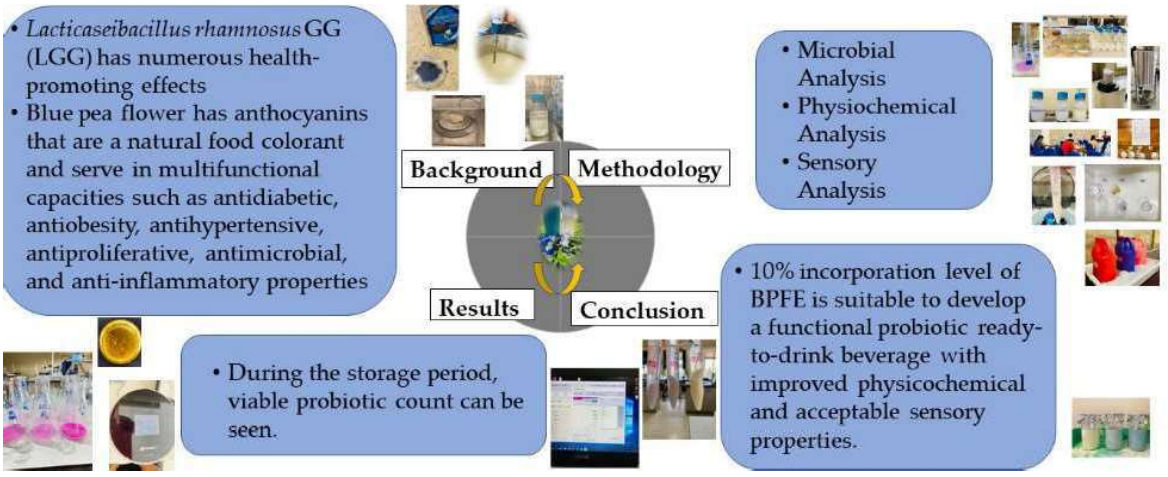
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Development and Evaluation of a Dairy-based Ready-to-Serve Beverage Supplemented with Probiotics and Blue Pea Flower (*Clitoria ternatea*) Extract

N. P. M. S. WEERASEKARA and D. M. D. RASIKA*
*Corresponding Author: diland@wyb.ac.lk

This study aimed to evaluate the impact of blue pea flower extract (BPFE) on probiotic viability, physicochemical, and sensory properties of a ready-to-drink cow milk-based beverage over 21 days of refrigerated storage. Cow milk was supplemented with BPF extract at concentrations of 0%, 10%, and 20% (v/v) and fermented with a mixed starter containing probiotic *Lacticaseibacillus rhamnosus* GG (LGG) and conventional yogurt starter. Physicochemical and microbiology analyses were performed at weekly intervals. Sensory analysis was performed after one-day storage using a panel of untrained panellists (n=37). During shelf life, redness (*a**), yellowness (*b**), chroma (*C**), and pH decreased, while hue, lightness (*L**), microbial viability, sedimentation, and whiteness index (WI) increased. Viscosity gradually increased during storage but decreased in all three treatments after 21 days. After 21 days of storage, all fermented milk samples containing blue pea flower (BPF) showed significantly higher ($P < 0.05$) LGG counts than the ones without BPFE. The product containing 20% blue pea flower (BPF) exhibited the highest viability count at the end of storage, reaching 7.67×10^7 CFU/ml. Throughout storage, all products, including the control, maintained viable probiotic counts of greater than 7 log CFU/ml. There was a dose-dependent decrease in the mean scores of all sensory attributes tested. However, the decrease of the 10% BPFE beverage and the one without BPFE was not significant. Results conclude that BPFE does not have any detrimental effect on the probiotic LGG during storage and a 10% incorporation level of BPFE is suitable to develop a functional probiotic ready-to-drink beverage with improved physicochemical and acceptable sensory properties.

KEYWORDS: Beverage, Blue pea flower, Dairy, Probiotic, Ready-to-serve, *rhamnosus*



Acknowledgement: This research was partially funded by Fonterra Brands Lanka Pvt Ltd., Sri Lanka

Department of Livestock & Avian Sciences, Faculty of Livestock Fisheries & Nutrition, Wayamba University of Sri Lanka, Makandura, Gonawila 60170, Sri Lanka

ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

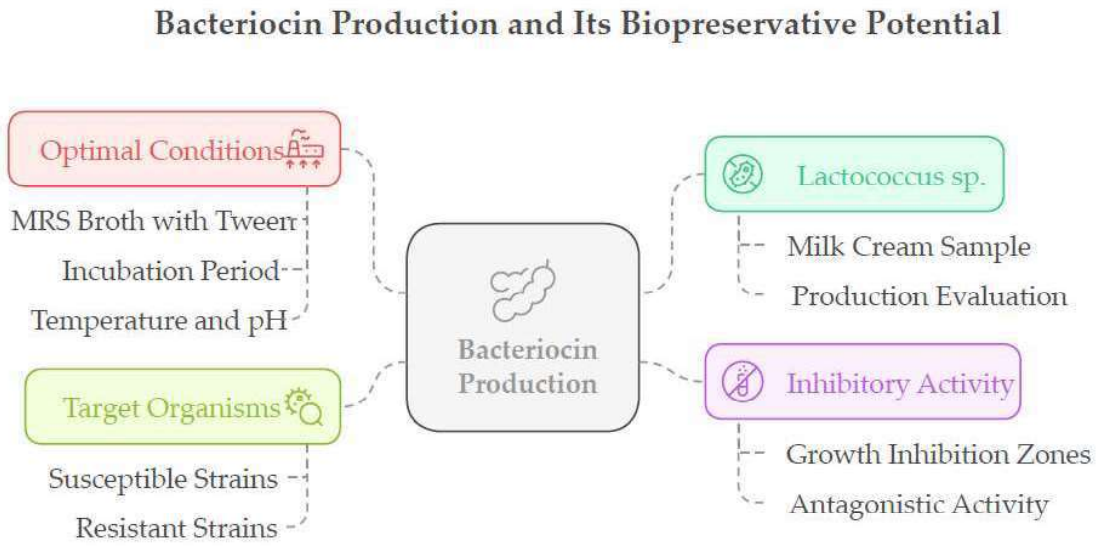
Evaluation of Bacteriocin Production from *Lactococcus* sp. and Their Potential as Biopreservatives

C. GUPTA
Corresponding Author: cgupta@amity.edu

With the rise of bacterial antibiotic resistance and the growing demand for products with fewer chemicals, there is a pressing need to explore new alternatives to reduce the overuse of therapeutic antibiotics. In this context, bacteriocins offer a natural and food-grade solution to inhibit the growth of harmful bacteria, aligning with health-conscious consumer preferences and community acceptance. In a recent study, the production of bacteriocins by *Lactococcus sp*. isolated from a milk cream sample was evaluated for its inhibitory activity against various test organisms. The bacteriocin-producing strain *Lactococcus sp.* was tested for its antagonistic activity against the bacteriocin-sensitive strain *Lactococcus lactis subsp. lactis* (MTCC-3038), with the presence of clear zones of growth inhibition around the bacteriocin producer's colony indicating inhibitory activity. Optimal fermentation conditions for bacteriocin production were determined, with the use of MRS broth containing 1.5% Tween resulting in the highest production levels. After evaluating different incubation periods, it was found that 24 hours of growth at a temperature of 35 °C and a p of 7.0 yielded the best production results. Sensitivity tests rev ealed that *Salmonella typhi, Staphylococcus aureus, Bacillus subtilis*, and *Bacillus polymyxa* were susceptible to the bacteriocin, while *Escherichia coli* and *Salmonella paratyphi* were resistant. The activity of the bacteriocin produced by *Lactococcus sp.* was measured at 3900 AU/mL. This study highlights the potential of bacteriocins as a natural and effective means of preserving food products, offering a promising alternative to traditional chemical preservatives.

KEYWORDS: Bacteriocin, Fermentation, Food Biopreservation, *Lactococcus sp.*

Acknowledgement: Financial assistance by (DSIR, New Delhi) through the grant ID (TDUPW-11011/1/2024-IRD-DSIR)



Amity Institute of Herbal Research & Studies, Amity University Uttar Pradesh, Sector-125, Noida-201313, India

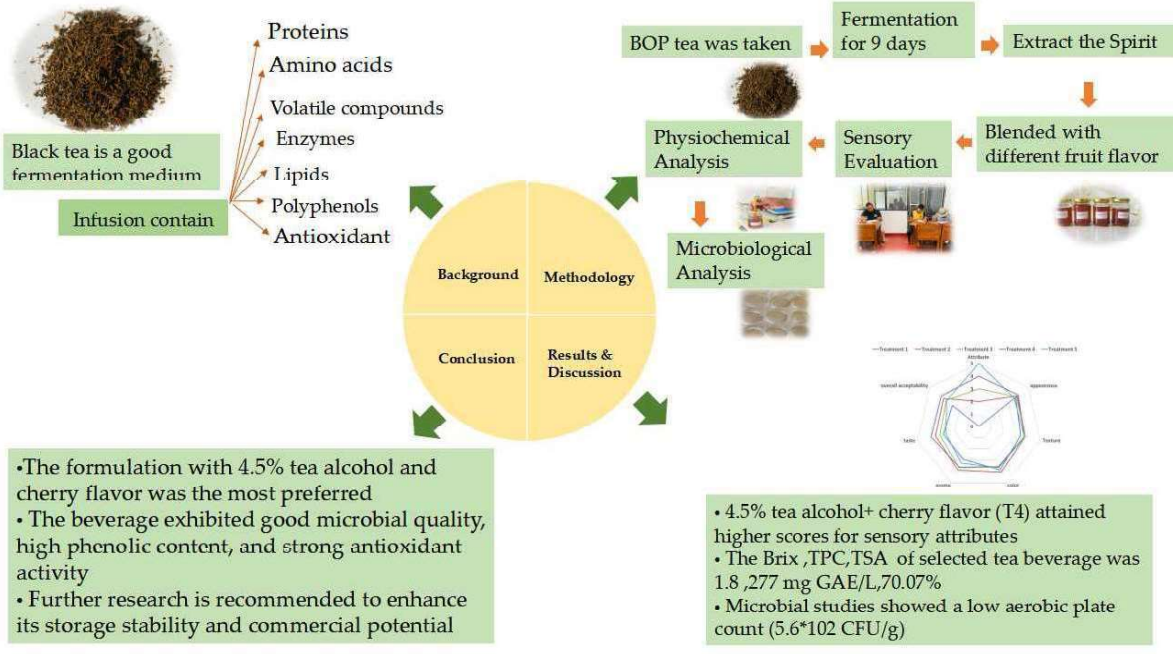
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Formulation and Development of an Alcoholic Tea Beverage Using Tea Leaves (*Camellia sinensis* L.)

H. A. S. WIJEWICKRAMA, K. C. KAUSHALYA*, E. G. S. M. PREMACHANDRA,
U. S. WIJEWARDHANA and P. B. D. JEEWANTHI
*Corresponding Author: chathurick2008@gmail.com

Black tea is a good fermentation medium as the infusion contains proteins, amino acids, volatile compounds, lipids, enzymes, and polyphenols. Microbial fermentation of black tea leads to value addition in terms of taste, flavour, and healthiness. This study investigates the possibility of combining the richness and complexity of alcohol with the fine flavours of tea leaves to create a unique alcoholic beverage. The alcoholic tea beverage was produced using BOP (Broken Orange Pekoe) and brewed using sugar and yeast inoculum (*Saccharomyces cerevisiae)*. After 9 days of fermentation process alcoholic spirit was steam distilled. The pH value and Brix value of the resulting beverage was 4.5 and 1.2, respectively. Five formulations; Treatment 1 (T1); 4.5% TA, T2; 4.5% TA+ Guava, T3; 4.5% TA+ Peach, T4;4.5% TA+ Cherry, T5%; TA+ Black current) were prepared using Tea Alcohol (TA) and artificial fruit flavours. The sensory acceptability of alcoholic beverages was determined by 30 semi-trained panellists for appearance, texture, colour, aroma, taste, and overall acceptability. The tea beverage made of 4.5% TA+ cherry flavour (T4) attained the highest scores for sensory attributes. The selected tea beverage was analysed for Total Phenolic Content (TPC) and Radical Scavenging Activity (RSA) by the Folin-Ciocalteu method and DPPH method respectively. The Brix, TPC, and RSA of the selected tea beverage were 1.8, 277 mg GAE/L, and 70.07%, respectively. The findings of microbial studies showed low aerobic plate count (5.6×10^2 CFU/g) in tea-based alcoholic beverages, which indicates good microbial quality. Further research is suggested to develop this procedure while increasing storage ability.

KEYWORDS: Alcoholic beverage, Black tea, Fermentation, Flavour, Sensory attributes



Institute for Agro Technology and Rural Sciences, University of Colombo, Hambantota, Sri Lanka

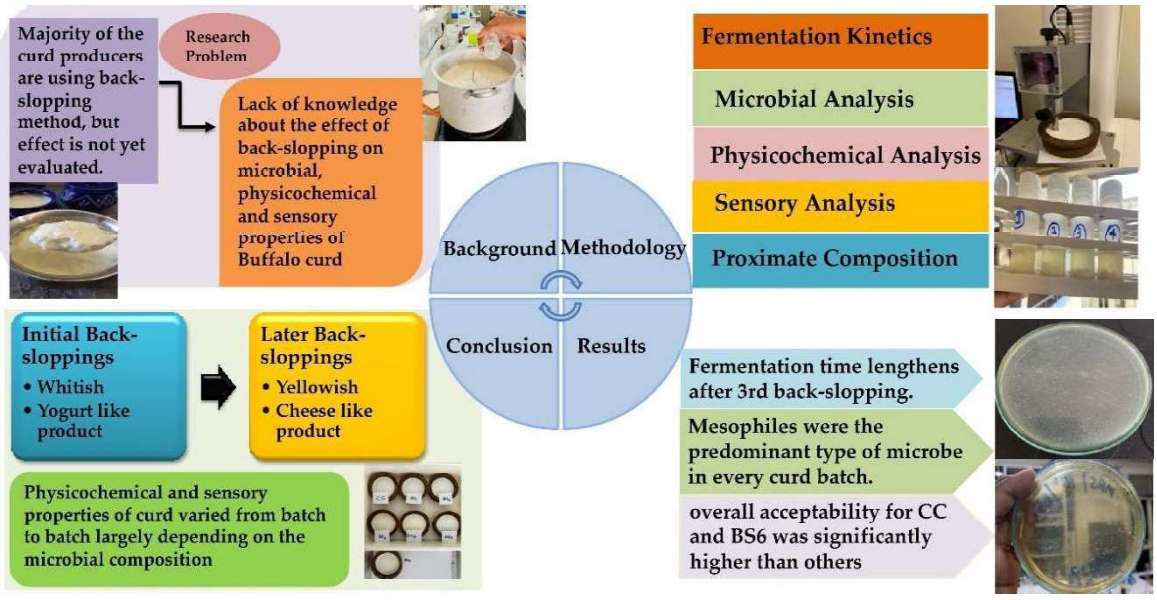
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Effect of Backslopping on Quality Attributes of Buffalo Milk Curd

D. K. S. KALPANI and D. M. D. RASIKA*
*Corresponding Author: diland@wyb.ac.lk

Curd preparation at the cottage level mostly uses a portion of previously prepared curd (*Muhum*) for fermentation, known as backslopping. This study aimed to investigate the effect of backslopping on microbial, physicochemical, and organoleptic properties of buffalo milk curd. The first curd batch (CC) was prepared using the commercial starter culture, White-Daily 80 (Chr. Hansen, Denmark). Subsequent batches were prepared by innoculating 5% of the previously prepared curd. Microbial counts, pH decline, syneresis, colour, texture, moisture, lactose content, and sensory properties were analysed in every batch. Total mesophilic and Lactobacilli counts were comparatively highest in 3rd backslopping (BS3). Mesophiles were the predominant type of microorganisms in all batches compared to Lactobacilli. 1st backslopping (BS1) had the highest mean hardness, chewiness, and gumminess in textural parameters but the highest mean cohesiveness was observed in BS6. The lowest lactose content was reported in BS3 which was 1.67% and was significantly lower than in all other batches ($P < .05$). Using pH drop, it was discovered that commercial culture, 1st, 2nd, and 3rd backslopping batches took 4 hours for fermentation but 4th, 5th, and 6th backslopping batches required an additional hour to coagulate. In sensory analysis, overall acceptability for CC and BS6 was significantly higher than others. Analysis of sensory profiles revealed that initial backsloppings yield a product that is whitish and more yoghurt-like which was then shifted to a more yellowish and cheese-like product during later backsloppings. Results conclude that the physicochemical and sensory properties of curd prepared from backslopping varied from batch to batch which largely depended on the microbial composition in the respective product.

KEYWORDS: Buffalo Curd, Backslopping, Dairy, Lactobacilli, Physicochemical



Department of Livestock & Avian Sciences, Faculty of Livestock Fisheries & Nutrition, Wayamba University of Sri Lanka, Makandura, Gonawila 60170, Sri Lanka

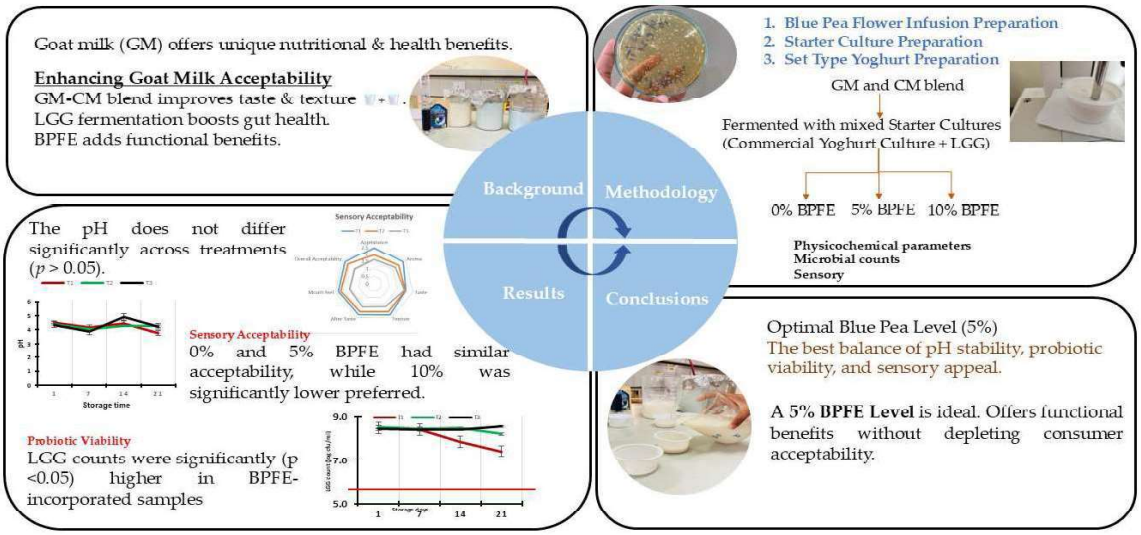
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Physicochemical, Microbial and Organoleptic Evaluation of Yoghurt Made of Cow and Goat Milk Blend Supplemented with Probiotics and Blue Pea Flower Extract

R. G. M. VIHANGI and D. M. D. RASIKA*
*Corresponding Author: diland@wyb.ac.lk

Functional dairy foods are gaining popularity due to their health benefits, including those from goat milk (GM). Blending with cow milk (CM), probiotic fermentation, and plant additives helps improve acceptance of dairy foods. This research aimed to develop a functional set-type yoghurt using a CM-GM blend while incorporating blue pea flower extract (BPFE) and probiotic *Lacticaseibacillus rhamnosus GG* (LGG). Three formulations were prepared using the CM-GM milk blend with varying levels of BPFE (0%, 5%, and 10%, v/v). The products were fermented with a mixed starter culture containing the conventional yoghurt starter and LGG. Physicochemical properties were analysed weekly for 21 days, while sensory evaluation was done on day 7. Post-acidification remained statistically insignificant ($P > .05$), throughout storage. The addition of BPFE significantly decreased the whiteness (L^*) while significantly increasing the greenness ($-a^*$) and blueness ($-b^*$) in a dose-dependent manner. BPFE levels significantly influenced probiotic viability. All yogurt samples maintained LGG counts above the minimum therapeutic threshold (≥ 6 log CFU/ml) with shelf life. However, 0% exhibited a sharp decline in LGG viability, with counts dropping to 7.43 log CFU/ml by day 21. In contrast, 10% demonstrated the highest probiotic survival (8.58 log CFU/ml, $P < .05$). A moderate negative correlation was observed between LGG and syneresis ($r = -0.502$, $P < .05$). Sensory evaluation indicated that higher BPFE levels negatively affected acceptability. BPFE enhances yoghurt functionality and probiotic survival, but levels above 5% may reduce consumer acceptability. The 5% BPFE incorporation level best balances functional benefits and sensory appeal.

KEYWORDS: *Lacticaseibacillus rhamnosus*, Blue pea flower, Probiotic, Set yogurt, Symbiotic



Acknowledgement: This research was partially funded by Fonterra Brands Lanka Pvt Ltd., Sri Lanka

Department of Livestock & Avian Sciences, Faculty of Livestock Fisheries & Nutrition, Wayamba University of Sri Lanka, Makandura, Gonawila 60170, Sri Lanka

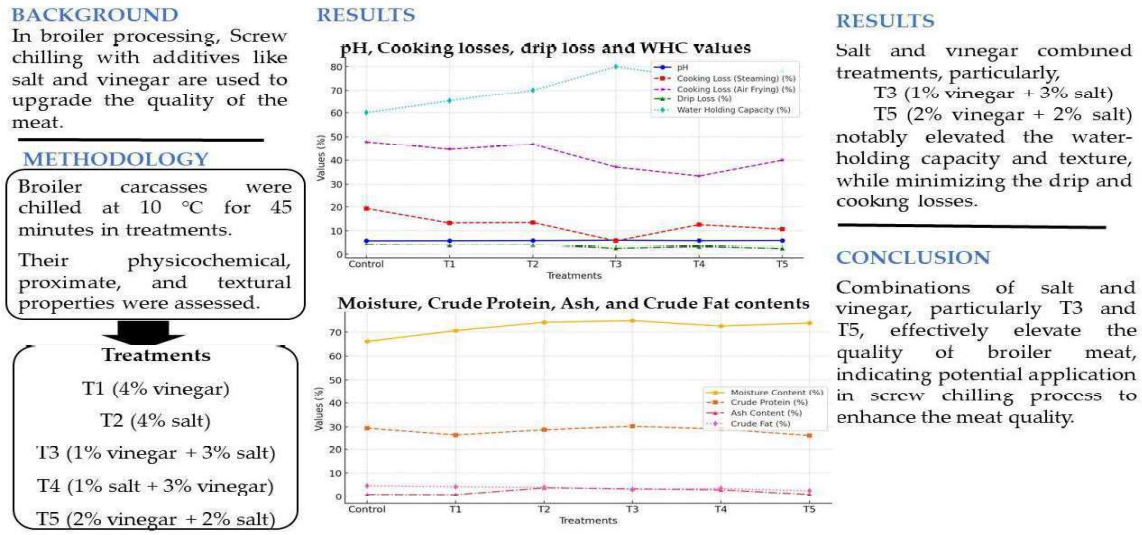
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Examining the Effect of Vinegar and Salt in the Screw Chiller on Broiler Meat Quality

K. V. G. KANNANTHUDAWA[1*], D. M. A. GUNARATHNE[1], M. C. N. JAYASOORIYA[2] and M. P. SENANAYAKE[3]
*Corresponding Author: veenadhigayeshi@gmail.com

Screw chilling in broiler processing is a technologically important event in assuring meat quality, safety, and preservation. Screw chilling involves submerging carcasses in cold water. The carcass quality can be elevated by adding additives like salt and organic acids in this process. This study assessed the proximate, physicochemical, and textural properties of broiler meat in chill baths treated with varying concentrations of vinegar and salt. The treatments comprised, a control (ice water slurry), T1 (4% vinegar), T2 (4% salt), T3 (1% vinegar + 3% salt), T4 (1% salt + 3% vinegar), and T5 (2% vinegar + 2% salt). The proximate composition, water-holding capacity (WHC), cooking loss, drip loss, pH, texture profile analysis (TPA) and colour were estimated. All treatments were exhibited notably lesser drip and cooking losses compared to the control. T3 showed the lowest drip loss (5.92%) and cooking loss (5.76%) and the highest WHC (23.7%). Other combined treatments (T4 and T5) also showed improved WHC and lower drip and cooking losses. In general, salt and vinegar combinations improved the moisture retention and protein levels while lowering the fat content. Ash compositions were elevated by salt rich treatments. Enhanced hardness, cohesiveness, adhesiveness, gumminess, and chewiness in combination treatments were apparent. Colour parameters, redness (P = .0011) and yellowness (P = .0492), were significantly affected by salt and vinegar. Overall, T3 (1% vinegar + 3% salt) showed the most improved quality attributes indicating the best treatment for screw chilling process.

KEYWORDS: Meat quality, Salt, Screw chilling, Vinegar, Water-holding capacity



[1]*Department of Livestock Production, Faculty of Agricultural Sciences, Sabaragamuwa University, Sri Lanka;* [2]*Department of Food Science and Technology, Faculty of Applied Sciences, Sabaragamuwa University, Sri Lanka;* [3]*Quality Assurance Department, JP Poultry (Pvt) Ltd., Badalgama, Sri Lanka*

ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Urban Consumers' Perception Towards Healthy Snacks (Jackfruit Chips) in Homagama Area, Sri Lanka

G. S. ELAPATHA[1], K. G. S. S. PREMARATHNA[2], P. A. M. PATHMASIRI[2], M. A. T. SANDARUWAN[2] and W. H. P. SANDAMALI[3*]
*Corresponding Author: poorni.sandamali25@gmail.com

Nowadays, consumers seek nutritious, healthy and novel snacks such as jackfruit chips, which have emerged as an alternative to fried unhealthy snacks due to its unique combination of natural sweetness, antioxidants, vitamins, and fibre content. This study aims to investigate consumer preferences and the factors influencing the purchase intentions of jackfruit chips in the Homagama area. An online survey was conducted, targeting 100 undergraduates in Sabaragamuwa University from Homagama area and selected using random sampling technique. The survey included a three section questionnaire on demographic information, consumer perception for jackfruit chips and its product characteristics such as colour, size, shape, taste, nutritional factors, and consumer willingness to price status considering packaging materials, weight, and purchasing area. The collected data were analysed using SPSS 25.0 software, employing descriptive statistical methods. The results indicated that 80% of respondents highly preferred natural ingredients of snacks. Consumers preferred the following quality characteristics: 'natural golden yellow colour' (86%), 'round slices shape' (58%), 'medium size as standard chip size' (78%), and 'very crispy' (74%). The most consumers preferred snack dip was tomato (55%) and chilli flavoured (42%). Eco-friendly craft paper bags in orange colour were considered as the best packaging material. Price willingness peak (52%) was at 40 rupees for 20g of Jackfruit chips. Both supermarket and retail shops were preferred as suitable for selling this product. This study provides insights into consumer behaviour and purchase decisions in the Homagama area.

KEYWORDS: Consumers Perception, Jackfruit chips, Packaging, Price, Snacks.

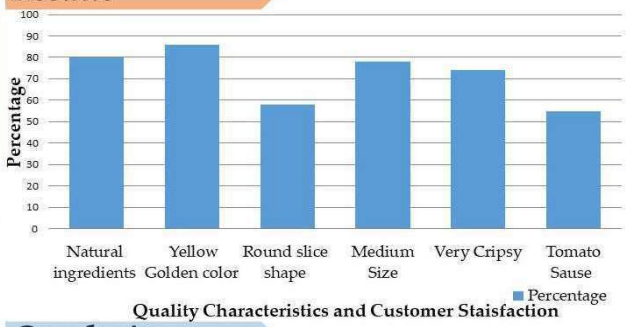
Background

Consumers are seeking nutritious, healthy and novel snacks and alternative to fried unhealthy snacks. Jackfruit chips are consisted with natural sweetness, antioxidants , Vitamins

Methodology

- An online survey
- Sample Size :100 Undergraduates in Homagama Divisional Secretariat
- Questionnaire- Three sections
- Demographic information
- Consumer perception for Jackfruit Chips
- Consumer willingness to Price status , Packaging materials
- Data Analyze : SPSS Software

Results



Quality Characteristics and Customer Staisfaction

Conclusions

This study provides insights into consumer behaviour and purchase decisions in the Homagama divisional secretariat. **Suggestion:** A guide for food manufacturers in product development and marketing strategies with rising consumer perception.

[1]Katana Refineries (Pvt) Ltd, Katana, Sri Lanka; [2]Department of Livestock Production, Faculty of Agricultural Sciences, Sabaragamuwa University of Sri Lanka, Sri Lanka; [3]Department of Export Agriculture, Faculty of Agricultural Sciences, Sabaragamuwa University of Sri Lanka, Belihuloya, Sri Lanka

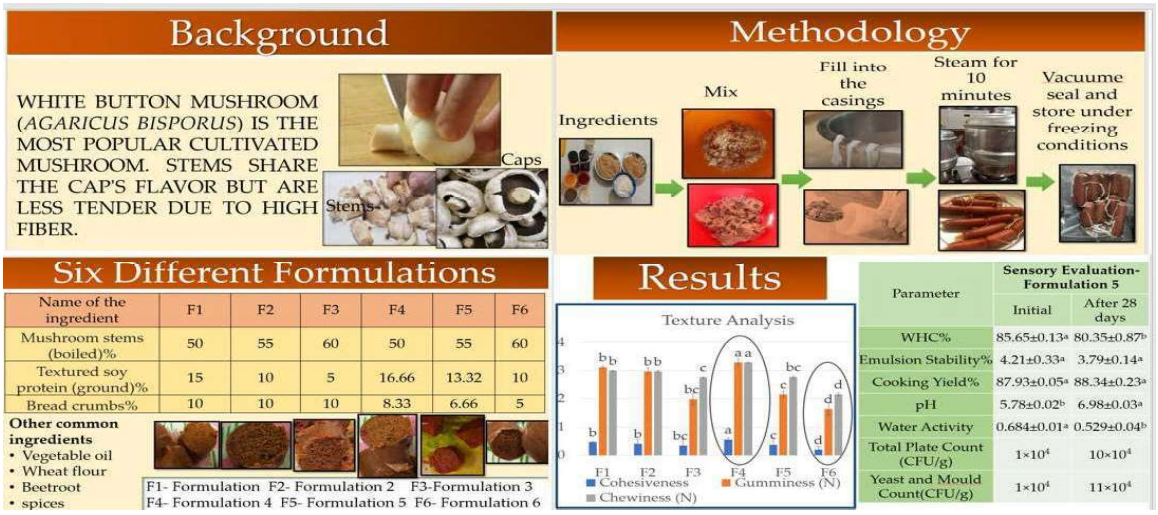
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Development of Vegan Sausage Incorporating Button Mushroom Stems and Assessment of Physicochemical and Sensory Properties

L. D. S. EKANAYAKE* and P. M. H. D. PATHIRAJE
*Corresponding Author: dilmiekanayake97.sl@gmail.com

The mushroom industry often overlooks button mushroom stems, leading to wasted potential. Recognizing their value and exploring innovative ways to utilize them sustainably is essential. Therefore, the goal of this research was to evaluate the potential of using white button mushroom (*Agaricus bisporus*) stems (MS) for developing a vegan sausage. Six formulations of sausages were made by changing the proportions of MS: 50%, 55% and 60% with other ingredients, including textured soy protein (TSP), breadcrumbs, and spices. Protein, fat, and fibre contents of the formulations containing 50%, 55%, and 60% of MS 6.79±0.18% to 12.38±0.53%, 5.68±0.44% to 6.08±0.12% and 3.16±0.51% to 3.78±0.21%, respectively. Emulsion stability and water-holding capacity of all sausage formulations decreased during the storage period of 28 days. The pH and total bacterial count of all formulations exhibited a gradual increase ($P < .05$) during the storage period, but they remained below the safe limit of $<10^6$ CFUg^{-1} according to the SLS standards. The formulation with a 60% MS and 10% TSP contents exhibited the lowest levels of cohesiveness (0.26 ±0.12) and gumminess (1.84 ±0.23N), whereas the formulation with a 50% MS and 16.66% TSP contents displayed the highest values for both parameters. The formulation with 55% MS, 13% TSP, and 7% breadcrumbs showed the highest scores for sensory attributes: colour (8.35), appearance (8.78), flavour (9.01), texture (8.32), aroma (9.05), aftertaste (7.65), and overall acceptability (8.41), making it the preferred option. This study demonstrated that MS can be used to develop a microbiologically safe and organoleptically acceptable vegan sausage.

KEYWORDS: Mushroom stems, Proximate composition, Sensory evaluation, Vegan sausage



Acknowledgement: Financial assistance by Wayamba University of Sri Lanka, Sri Lanka

Department of Food Science and Technology, Faculty of Livestock, Fisheries and Nutrition, Wayamba University of Sri Lanka, Makandura, Gonawila, NWP, Sri Lanka

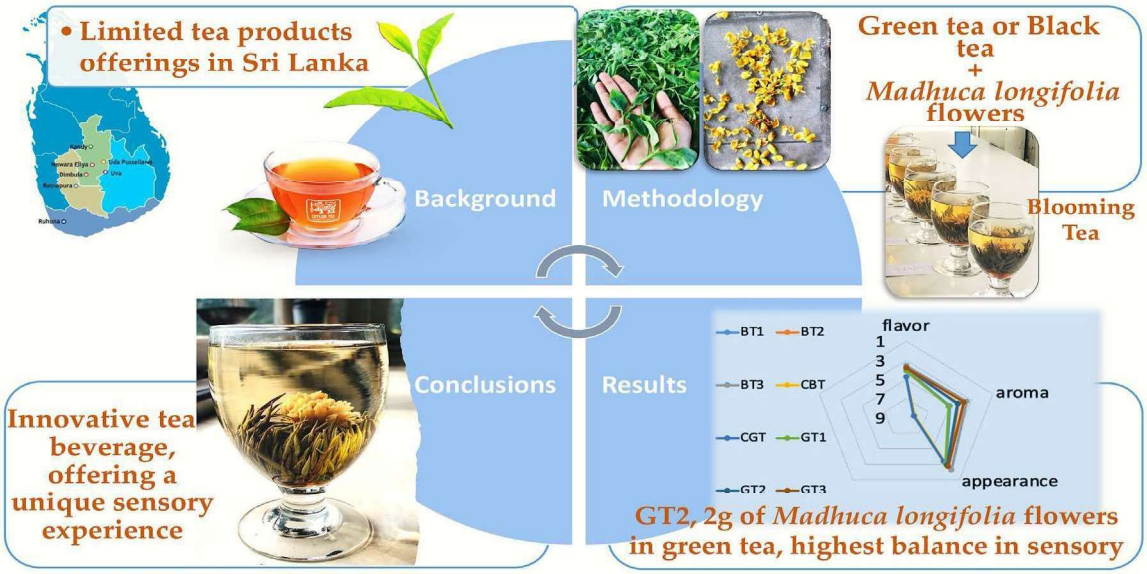
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Developing Blooming Tea Infused with *Madhuca longifolia* Flowers: A Novel Approach to Diversifying Sri Lanka's Tea Offerings

H. M. S. S. HAPUGASWATHTHA[1,2], C. M. IDAMGEDARA[2] and D. S. W. RAJAPAKSHA[2*]
*Corresponding Author: surakshi.wima@gmail.com

Sri Lanka's limited presence in the global blooming tea market hinders its export potential and weakens its position in international tea trade. Without diversifying its tea offering, Sri Lanka risks lagging behind in the global market, losing potential economic benefits. Modern consumers are more health conscious and are looking for tea products that offer health benefits in addition to taste and aroma. This study aimed to develop a novel *Madhuca longifolia*-infused blooming tea to diversify Sri Lanka's specialty tea offerings. *Madhuca longifolia*, commonly known as the Mee tree in Sri Lanka, is renowned for its diverse medicinal properties. Eight tea treatments were formulated by combining green and black teas with varying concentrations of flowers. A sensory evaluation panel of 10 experts assessed attributes such as flavour (bitterness, astringency, sweetness), aroma (floral, sweet, roasted), and appearance (colour, clarity) using a 9-point hedonic scale. Treatment containing 2 g of flowers in green tea (GT2), achieved the highest balance for flavour, aroma, and appearance ($p < .05$). In addition to sensory analysis, physicochemical properties were measured, with GT2 recording a pH of 6.23 ± 0.03 and a Brix level of 4.03% ± 0.05. Colour analysis revealed significant visual variations, with GT2 displaying a yellow ochre tone (RGB: 176, 137, 17; HEX: b08911), enhancing its visual appeal. This research underscores the potential of *Madhuca longifolia*-infused blooming tea to satisfy consumer demand for innovative beverages, offering a unique sensory experience and possible health benefits. Future research should focus on large-scale production optimization, shelf-life studies, and commercial viability.

KEYWORDS: Blooming tea, Sensory, Novel product, Functional beverage, Sri Lankan tea



[1] *Bio Tea Garden, Stassen Natural Food Plc., Idalgashinna, 90167, Sri Lanka;* [2]*Faculty of Agriculture, Aquinas College of Higher Studies, Colombo 08, 00800, Sri Lanka*

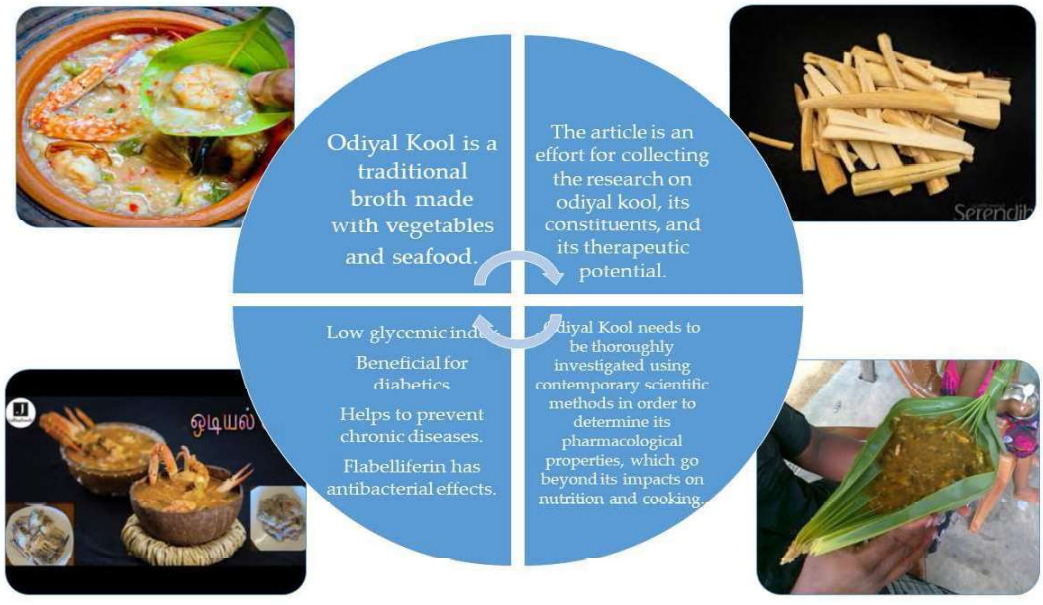
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Odiyal Kool: Jaffna's Traditional Functional Food

S. RAKULINI
Corresponding Author: r.rakulini@gmail.com

Foods that provide benefits to health beyond simple nourishment are known as functional foods. They include substances called bioactive compounds that can assist the body's natural functions, prevent illness, or enhance health. The article is an effort for collecting the research on *odiyal kool*, its constituents, and its therapeutic potential. *Odiyal kool* is a traditional broth made with vegetables and seafood. The hard snack odiyal is formed from the tubers of the palmyra palm. It is usually split in two and dried until it hardens. *Odiyal* flour is a smooth powder used for making *odiyal pittu* and *odiyal kool*. It is a famous and traditional dish among the people of Northern Sri Lanka. *Odiyal* is considered a good source of carbohydrates, fibre and some micronutrients such as calcium, magnesium and iron. *Odiyal* flour has a low glycaemic index, which is beneficial for diabetics. Phytochemicals of *Odiyal* are found to help prevent age-related problems, cardiovascular diseases, and chronic diseases while also promoting general health. Flabelliferin, a bitter substance present, has antibacterial effects. Conventional functional foods can assist optimise health or avoid chronic disease, which reduces the health care expenses and improves quality of life. Despite all preceding data, *Odiyal kool* needs to be thoroughly investigated using contemporary scientific methods in order to determine its pharmacological properties, which go beyond its impacts on nutrition and cooking.

KEYWORDS: *Odiyal Kool*, Palmyra palm tuber, Traditional food, Functional food



Faculty of Siddha Medicine, University of Jaffna, Jaffna, Sri Lanka

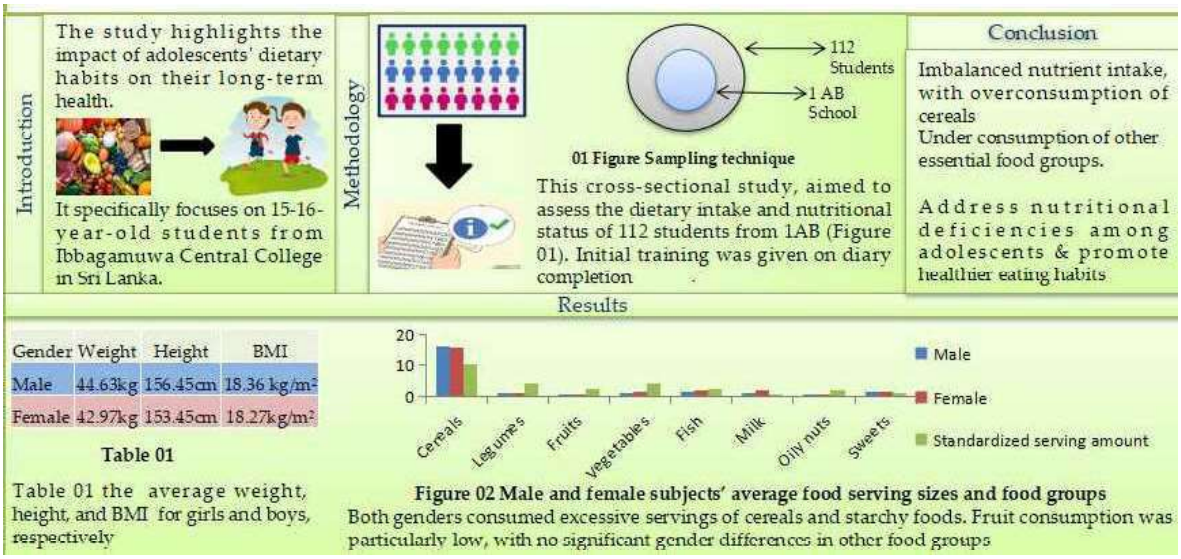
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Dietary Intake and Nutritional Status of the Adolescents in a Selected School in Kurunegala District

S. B. W. D. PREMASIRI[1], R. M. D. J. RATHNAYAKA[1], K. A. D. L. BHAGYA[2*],
G. R. N. N. WAIDYARATHNA[3], L. A. M.H. UDAYAKUMARI[1]
*Corresponding Author: lakminikalugampitiya@gmail.com

Adolescent's dietary patterns significantly influence long-term health outcomes, as proper nutrition is crucial for overall well-being. The study focused on students aged 15-16 years from Ibbagamuwa Central College in Kurunegala District, Sri Lanka, who face academic pressure and heavy workloads during ordinary-level examinations, potentially impacting their food consumption. This cross-sectional study aimed to assess their dietary intake and nutritional status using a seven-day diet diary method. The participants (112) completed structured data sheets detailing daily food consumption and portion sizes for seven consecutive days, following initial training on diary completion. Data were categorized according to Sri Lankan food-based dietary guidelines, and average daily servings for each food group were estimated. The average weight, height, and BMI were 42.97 kg, 153.45 cm, and 18.27 kg/m² for girls and 44.63 kg, 156.45 cm, and 18.36 kg/m² for boys. Results showed that both genders consumed excessive servings of cereals and starchy foods (16.19 for boys, 15.75 for girls), while intake of other food groups—legumes and pulses, fruits, vegetables, fish, eggs, lean meat, milk, and dairy products, and oily nuts, oils, and fats—were below the recommended levels. Except fruit, other food groups didn't show significant gender differences in consumption patterns. These findings highlight imbalanced nutrient intake, with overconsumption of cereals and under-consumption of other essential food groups. The study underscores the need for dietary interventions to promote healthier eating habits and address nutritional deficiencies among adolescents

KEYWORDS: Adolescents, Diet diary, Dietary intake, Nutritional status, Servings



[1]*University of Vocational Technology, Sri Lanka;* [2]*University of Sri Jayewardenepura, Gangodawila, Nugegoda, Sri Lanka;* [3]*General Sir John Kotelawala Defence University, Colombo, Sri Lanka*

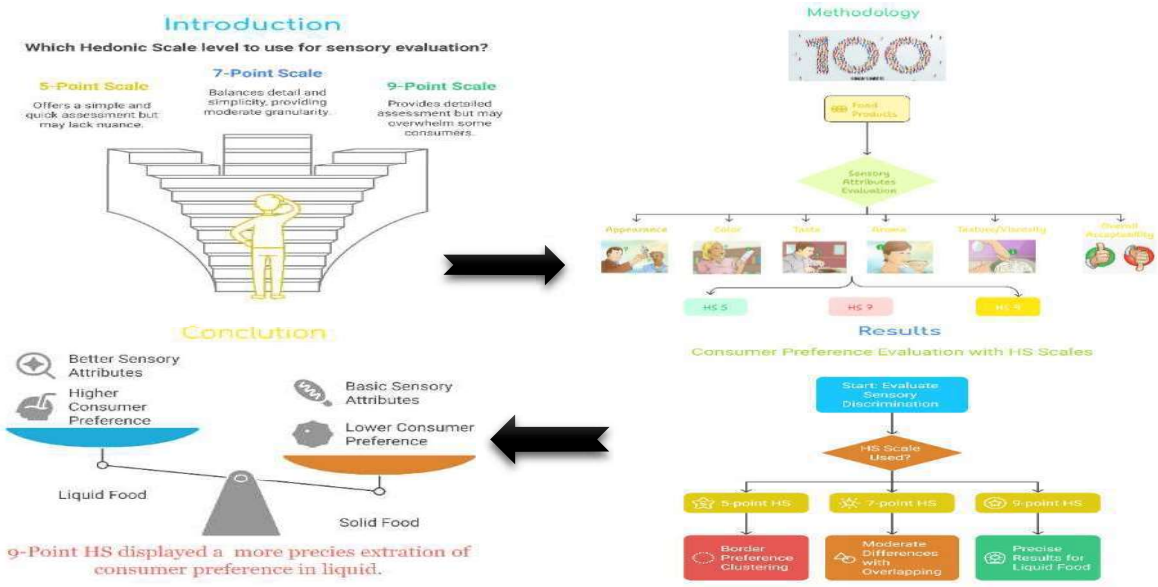
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Do Levels in Hedonic Scaling Have an Effect on the Sensory Preference for Solid and Liquid Foods in Food Sensory Evaluation?

H. M. JANS, A. P. H. I. ABEYSURIYA*
*Corresponding Author: hashinia@agri.ruh.ac.lk

Sensory characteristics play an essential role in consumers' acceptability and preference towards food products. The Hedonic scale (HS) is widely used in sensory evaluation to assess consumer preferences, with different HS levels (5-point, 7-point, and 9-point) potentially influencing the results. The study aimed to evaluate the impact of HS levels on sensory preferences for solid (wafer biscuits) and liquid (ready-to-serve mixed fruit nectar (FN) foods. Sensory evaluation was conducted with 100 participants (aged 20-25 years) using three commercial brands for each food category. The evaluated sensory attributes included appearance, colour, taste, aroma, texture/viscosity and overall acceptability using 3 different levels in the HS. As results indicate, HS levels had no any significant effect on sensory discrimination of biscuits, as consumer preference ranking remained consistent across all scales. However, a significant influence of HS levels was observed on tested liquid food. 5-point HS resulted in border preference clustering, making less effective in distinguishing between samples while 7-point HS provided a moderate level of differentiations with some overlapping in ranking. However, 9-point HS displayed a more precise extraction of consumer preference with a clear separation in the most and least preferred samples for each attribute. These findings suggested that levels in HS dose not significantly impact on consumer preference results for solid food (biscuits), but it plays a critical role in liquid food (FN) in sensory evaluation. Use of more detailed HS, such as the 9-point scale can enhance the accuracy of consumer preference, making results more reliable in sensory studies involving liquid food matrices.

KEYWORDS: Consumer panels, Consumer preference, Food sensory evaluation, Hedonic scale levels



Department of Food Science and Technology, Faculty of Agriculture, University of Ruhuna, Matara, Sri Lanka

ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

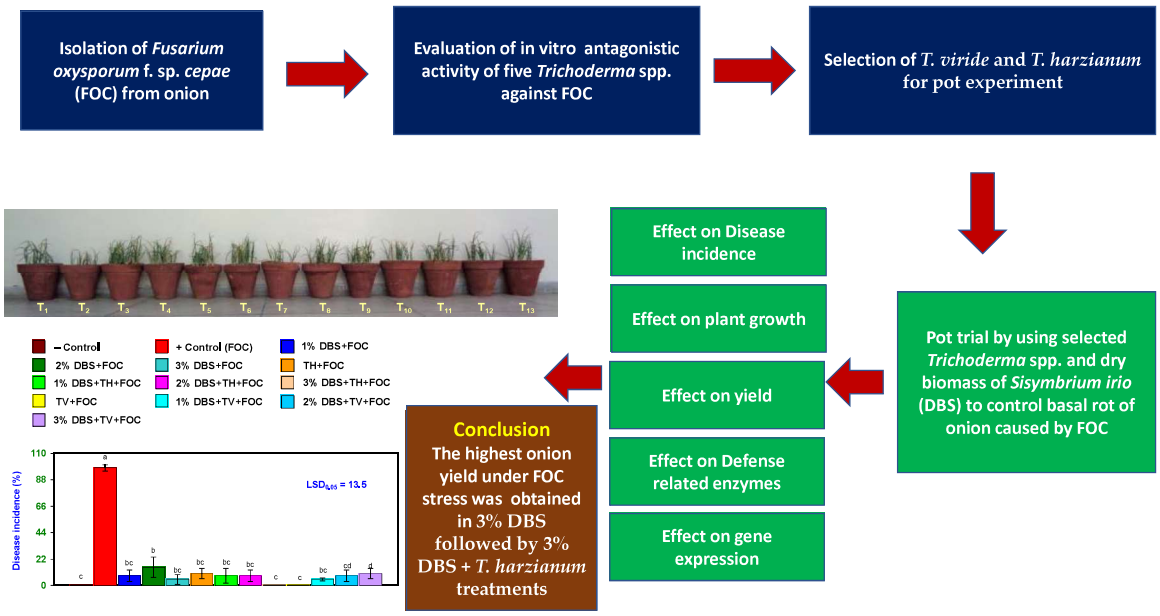
Microorganisms in Agro-Industry and Environment

Biological Management of Basal Rot of Onion by Soil Amendment with *Sisymbrium irio* and *Trichoderma* Species

A. JAVAID*, R. AKHTAR and A. SHOAIB
*Corresponding Author: arshad.iags@pu.edu.pk

This study was undertaken to evaluate the potential of five *Trichoderma* spp. and *Sisymbrium irio* as biopesticides for the management of basal rot of onion caused by *Fusarium oxysporum* f. sp. *cepae* (FOC). *Trichoderma harzianum* caused the highest suppression (79%) in FOC radial growth in laboratory bioassays followed by *T. viride* (73%), *T. koningii* (71%), *T. pseudokoningii* (71%), and *T. hamatum* (69%). In a pot experiment, FOC inoculated soil was amended with two *Trichoderma* species namely *T. viride* and *T. harzianum* separately or together with dry biomass of *S. irio* (DBS) in triplicate. The highest disease incidence (97%) was recorded in the positive control (FOC inoculation), whereas the disease was completely controlled in *T. viride*, and *T. harzianum* + DBS treatments. Application of different biopesticides enhanced fresh yield of onion from 2.93 g in positive control to 76.96–126.93 g and dry weight from 0.55 g to 7.75–16.14 g. The highest yield increase was reported in 3% DBS (w/w) followed by 3% DBS + *T. harzianum.* These treatments also significantly enhanced the chlorophyll, carotenoid and protein contents of onion. The effect of soil amendments on activities of peroxidase (POX), polyphenol oxidase (PPO) and catalase (CAT) was studied where all the treatments significantly enhanced PPO and CAT activities over the positive control. The expression of POX and PAL (phenylalanin ammonia lyase) genes was enhanced. It concludes that FOC infection and basal rot in onion can be effectively controlled either by sole application of 3% DBS or together with *T. harzianum.*

KEYWORDS: Basal rot, Biopesticides, Onion, *Sisymbrium irio, Trichoderma* spp.



Department of Plant Pathology, Faculty of Agricultural Sciences, University of the Punjab, Quaid-i-Azam Campus, Lahore 54590, Pakistan

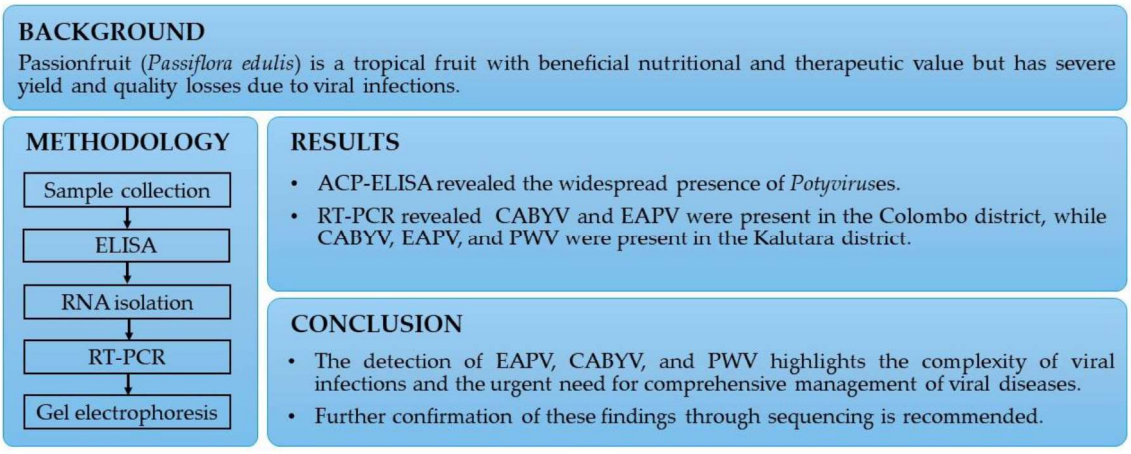
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Detection of Common Virus Diseases of Passionfruit (*Passiflora edulis*) in Colombo and Kalutara Districts in Sri Lanka

D. G. D. D. S. JAYARATHNE[1*], B. M. V. S. BASNAYAKE[2], P. W. M. THARINDI[1], A. D. R. P. ALUTHGE[3] and M. L. M. C. DISSANAYAKE[1]
*Corresponding Author: dinithijayarathne98@gmail.com

Passionfruit (*Passiflora edulis*), a tropical fruit known for its high nutritional and medicinal value, is widely cultivated in Sri Lanka but suffers significant yield and quality losses due to viral diseases. The viral pathogens affecting passionfruit in Sri Lanka have not been systematically studied. The objective of this study was to identify and detect common viral diseases in passionfruit samples collected from Colombo and Kalutara districts. Composited samples (30) of *Horana gold* variety were collected from each district. Diseased passionfruit samples were screened using serological assays, including Antigen-Coated Plate ELISA (ACP-ELISA) and Double Antibody Sandwich ELISA (DAS-ELISA), to detect potyviruses and Cowpea Aphid-Borne Mosaic Virus (CABMV), respectively. Molecular detection methods were employed to confirm the presence of East Asian Passiflora Virus (EAPV), East Asian Passiflora Distortion Virus (EAPDV), Telosma Mosaic Virus (TeMV), Cucurbit Aphid-Borne Yellow Virus (CABYV), Passionfruit Woodiness Virus (PWV), Turnip Mosaic Virus (TuMV), and Cucumber Mosaic Virus (CMV). Results revealed the widespread presence of potyviruses in both districts, the detection of EAPV and CABYV in Colombo district and the detection of EAPV, CABYV, and PWV in Kalutara district, demonstrating the prevalence of these pathogens in the selected regions. This study successfully identified key viral pathogens affecting passionfruit in Sri Lanka. The findings highlight the need for continued molecular research and extensive sampling to understand virus distribution and develop strategies to manage their impact on passionfruit production.

KEYWORDS: Molecular detection, Passionfruit viruses, Sri Lanka



Acknowledgement: Financial assistance by Sri Lanka Council for Agricultural Research Policy (SLCARP)

[1]Faculty of Agricultural Sciences, Sabaragamuwa University of Sri Lanka; [2]Fruit Research and Development Institute, Horana; [3]Plant Virus Indexing Centre, Homagama, Sri Lanka

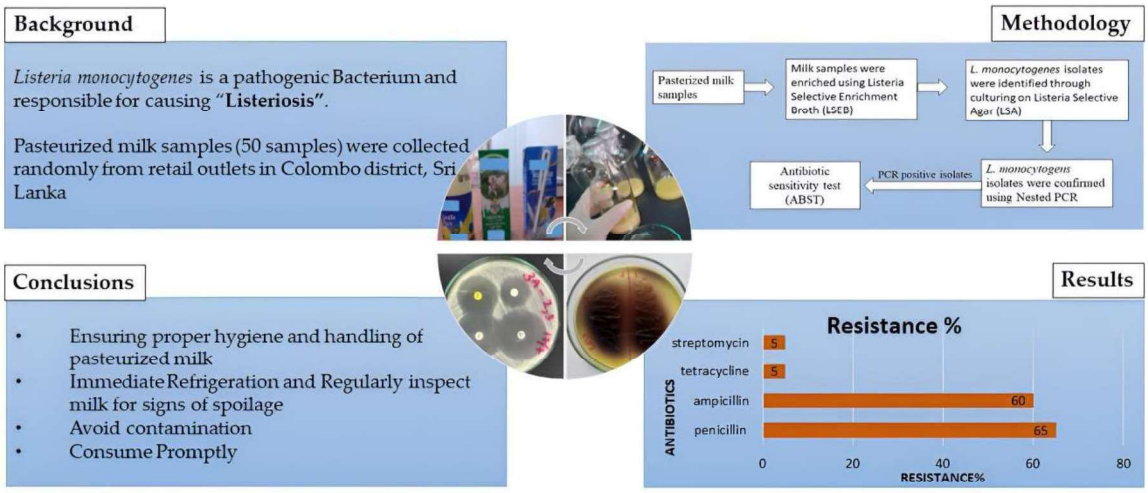
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Isolation, Detection and Antibiotic Sensitivity of *Listeria monocytogenes* in Pasteurized Milk Collected from Colombo District Sri Lanka

M. S. F. SHANU[1], T. S. THALPAVILA[2], D. A. D. V. SILVA[3] and W. A. S. WIJENDRA[3*]
*Corresponding Author: was_wij@yahoo.com

Listeria monocytogenes is a pathogenic bacterium causing Listeriosis, which commonly causes bacteremia, meningitis, or meningoencephalitis, and in pregnant women, it can lead to miscarriage or neonatal sepsis. It is a life-threatening foodborne illness responsible for many hospitalizations. Primary mode of infection is through the ingestion of contaminated food. The objective of this study was to detect the antibiotic sensitivity of *L. monocytogenes* isolated from pasteurized milk samples. Fifty pasteurized milk samples were collected randomly from various retail outlets (n=25) in Colombo district, Sri Lanka and brought to the laboratory at 4 °C. Pasteurized milk samples were cultured on Listeria selective Enrichment Broth (LSEB) and transferred to Listeria Selective Agar (LSA), and the characteristic colonies were identified and sub cultured. DNA extraction followed by nested PCR was used to confirm *L. monocytogenes*. Twenty samples were *Listeria* positive and the nested PCR positive samples were screened by the Antibiotic Sensitivity Test (ABST). Isolated *L. monocytogenes* indicated the highest resistance (65%) for penicillin, followed by that for ampicillin (60%), tetracycline (5%) and streptomycin (5%). This study revealed the presence of *Listeria* in pasteurized milk samples collected from the Colombo district Sri Lanka. *Listeria* can endure and thrive in cold environments, including refrigerated foods. As a result, detecting these pathogens is essential for food safety. Rigorous hygiene in pasteurized milk production is essential to prevent foodborne infections, as highlighted by this study.

KEYWORDS: Antibiotic resistance, Colombo, *Listeria monocytogenes*, Pasteurized milk, Penicillin



Acknowledgement: Medical Research Institute, Sri Lanka

[1]Department of Botany, Open University of Sri Lanka; [2]Department of Botany, University of Sri Jayewardenepura; [3]Medical Research Institute, Sri Lanka

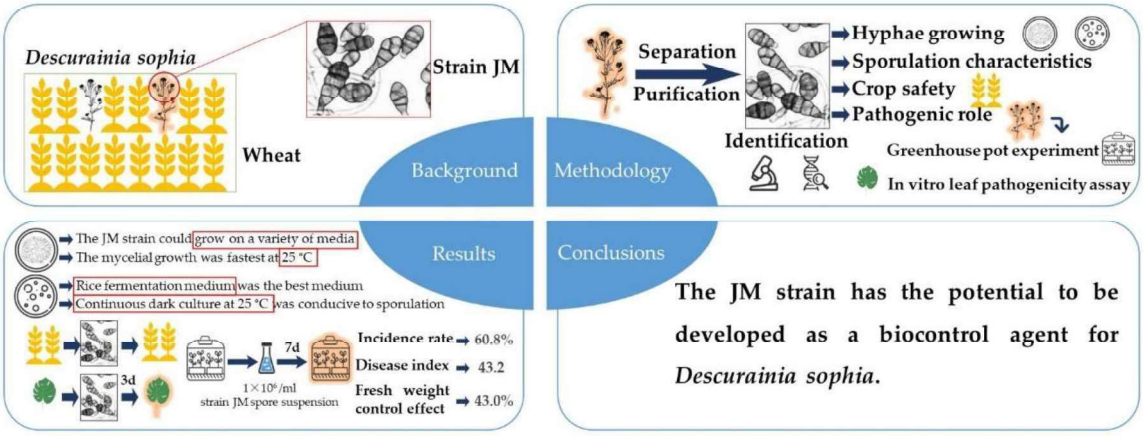
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Biological Characteristics of *Alternaria alternata* Strain JM and the Potential as a Biocontrol Agent for *Descurainia sophia*

J. Y. LI[1], X. Y. SUN[1], B. JIANG[1], Q. H. LYU[1], G. P. LIU[2], S. BAI[1], L. X. LI[1*]
*Corresponding Author: lingxulipvi@126.com

To address the escalating herbicide resistance and ecological risks associated with chemical control of the noxious weed *Descurainia sophia* in wheat fields, this study investigated the potential of fungal-based bioherbicides. The pathogenic strain JM was isolated from naturally infected *D. sophia* plants collected in Jimo district (Qingdao, China) and identified as *Alternaria alternata* by morphological characterization, endoPG, and β-tubulin gene sequence analysis. The JM strain could grow on a variety of media and it exhibited optimal mycelial growth at 25 °C on media supplemented with soluble starch and beef extract. Maximum sporulation occurred in rice fermentation medium under complete darkness at 25 °C. Brown lesions appeared after three days of inoculation with isolated leaves (three biological replicates per treatment) of *D. sophia*. The pot experiments demonstrated that inoculation of *D. sophia* with a 1×10^6 spores/mL JM suspension (prepared in 0.05% Tween-80) for seven days (n=3) resulted in 60.8% disease incidence, a disease index of 43.2, and 43.0% fresh weight reduction, which were significantly higher ($P < 0.05$) than those observed in the control group treated with the same volume of 0.05% Tween-80 alone. The safety evaluation conducted in pot experiments (n=3) demonstrated that foliar application of JM strain mycelial suspension at 1×10^7 CFU/ mL caused no pathogenicity (safety rating: "++++", disease incidence < 5%) after seven days on 2-3 leaf-stage crops including wheat, oilseed rape, maize and pea under controlled conditions (26 °C, 14/10 h light/dark cycle). The JM strain has the potential to be developed as a biocontrol agent for *D. sophia*.

KEYWORDS: *Alternaria alternata*, Biocontrol, Bioherbicides, *Descurainia sophia*



Acknowledgement: Financial assistance by Key R&D Program of Shandong Province (2021CXGC010811) and Graduate Innovation Program of Qingdao Agricultural University (QNYCX23075)

[1] Shandong Engineering Research Center for Environment-friendly Agricultural Pest Management, College of Plant Health and Medicine, Qingdao Agricultural University, Qingdao Shandong; [2] Agricultural Service Center of Jingzhi Town, Anqiu City, Weifang Shandong

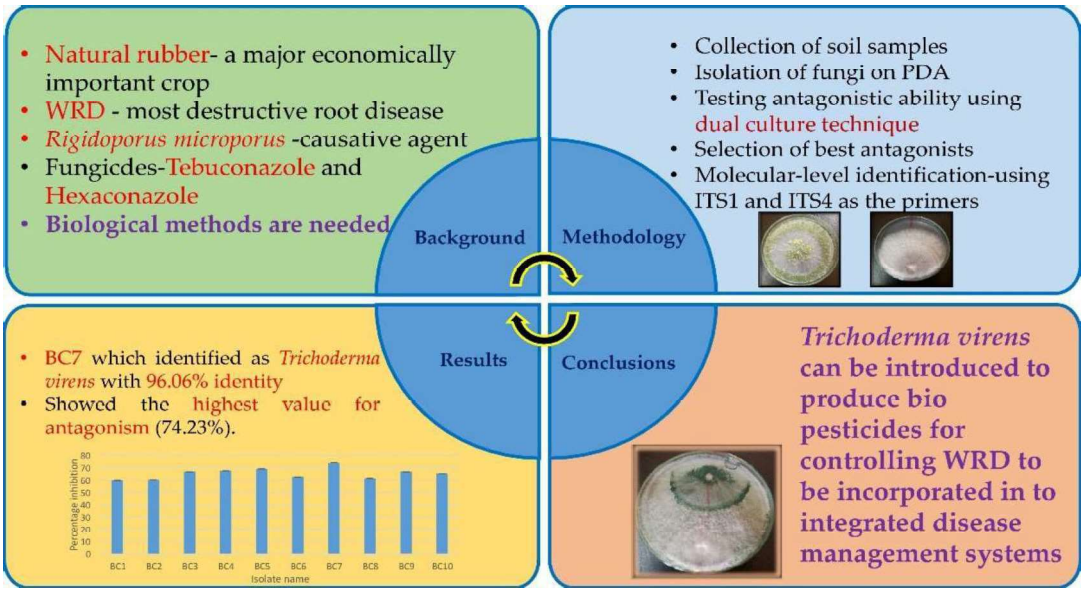
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Trichoderma virens as an Effective Biological Control Agent Against *Rigidoporus microporus*, the Causative Agent of White Root Disease in Rubber (*Hevea brasiliensis*) Plantations

T. H. P. S. FERNANDO* and A. H. M. N. R. ABERATHNE
*Corresponding Author: sarojinifernando787@gmail.com

Natural rubber; *Hevea brasiliensis* is one of the major economically important crops in Sri Lanka. White Root Disease (WRD) is the most destructive root disease causing a huge economic loss to the rubber sector. *Rigidoporus microporus* is the causative agent of White Root Disease in rubber plantations. To control the pathogen, Tebuconazole and Hexaconazole are used as systemic fungicides. However, due to many constraints in chemical controlling, antagonistic fungi are suggested to be used as a sustainable method. Soil samples were collected from different rubber-growing soils in Sri Lanka and 10 morphologically different fungal colonies (BC1 – BC10) were isolated using the dilution plate technique. Pure cultures were prepared on Potato Dextrose Agar (PDA) and antagonistic ability against *R. microporus* was tested using dual culture technique. The fungi with the highest inhibition were selected as the best antagonists and subjected to molecular-level identification. DNA was extracted using a NORGEN Plant-Fungi DNA extraction kit and PCR was performed for the ITS gene region using ITS1 and ITS4 as the primers. The fungal isolate BC7 which identified as *Trichoderma virens* with 96.06% identity showed the highest antagonism (74.23%) for *R. microporus*. Hence, isolated *Trichoderma virens* can be utilized to produce an effective bio pesticide for controlling WRD in *Hevea brasiliensis*. The biocontrol agent has potential to be incorporated in to integrated disease management systems for *R. microporus*

KEYWORDS: Antagonistic fungi, *Hevea brasiliensis*, *Rigidoporus microporus*, *Trichoderma virens*, White root disease



Acknowledgement: Financial support by the National Science Foundation

Rubber Research Institute of Sri Lanka, Dartonfield, Agalawatta, Sri Lanka

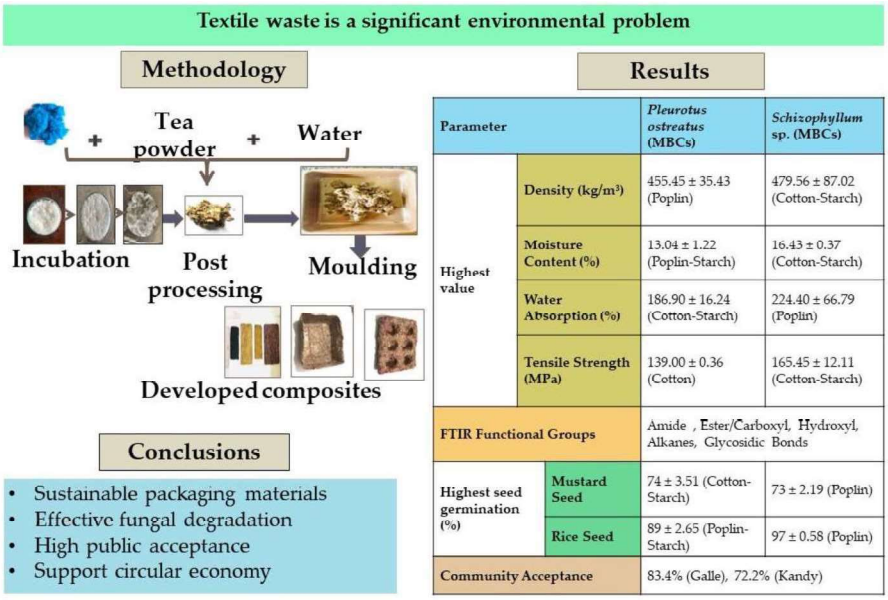
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Properties and Potentials of Mycelium-based Composites Developed by *Pleurotus ostreatus* and, *Schizophyllum* sp., on Textile Wastes for Bio-based Packaging

K. S.THARAKA* and A. D. S. N. P. ATHUKORALA
*Corresponding Author: sanduni.tharakak@sci.pdn.ac.lk

Textile waste is a growing environmental concern, necessitating sustainable solutions. This study investigates mycelium-based composites (MBCs) as bio-based packaging materials using textile waste from Sri Lanka. *Pleurotus ostreatus* and *Schizophyllum* sp. were cultivated on cotton and poplin textile waste, with and without starch, supplemented with used tea powder in triplicate at 28 °C. After 21 days, composites were assessed for physical and mechanical properties following ASTM guidelines, while Fourier-transform infrared (FTIR) spectroscopy analysed chemical modifications due to fungal colonization. The highest density (479.56 ± 87.02 kg/m³) and tensile strength (165.45 ± 12.11 MPa) were observed in *Schizophyllum* sp. MBCs from cotton-starch. The highest moisture content (16.43 ± 0.37%) was also in *Schizophyllum* sp. cotton-starch, while the highest water absorption (224.40 ± 66.79%) occurred in *Schizophyllum* sp. poplin. In *P. ostreatus* MBCs, the highest density (455.45 ± 35.43 kg/m³) was in poplin, the highest tensile strength (139.00 ± 0.36 MPa) in cotton, the highest moisture content (13.04 ± 1.22%) in poplin-starch, and the highest water absorption (186.90 ± 16.24%) in cotton-starch. FTIR confirmed fungal enzymatic activity, showing amide, ester/carboxyl, hydroxyl, alkanes, and glycosidic bond stretching, indicating lignocellulose degradation. In seed germination assays, *P. ostreatus* MBCs exhibited the highest germination rates, with 74 ± 3.51% (mustard) in poplin and 89 ± 2.65% (rice) in poplin-starch. *Schizophyllum* sp. MBCs produced in poplin achieved 73 ± 2.19% (mustard) and 97 ± 0.58% (rice). These results highlight MBCs' potential as biodegradable packaging materials, supporting a bio-based economy, waste reduction, and commercial applications.

KEYWORDS: Bio-based packaging, Mycelium-based composites, *Pleurotus ostreatus*, *Schizophyllum* sp., Textile waste



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

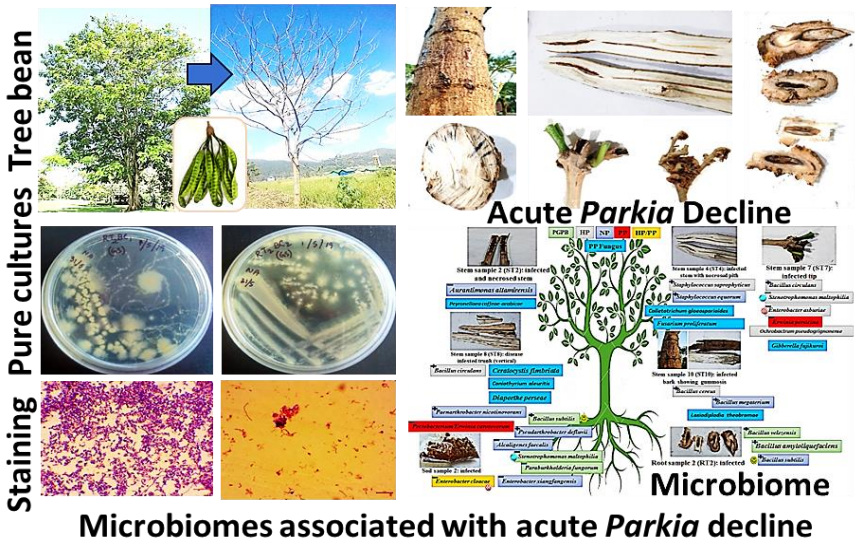
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Microbiome Associated with Acute *Parkia roxburghii* G. Don Decline in the North-Eastern Hill Region of India

M. DASGUPTA[1,2,*], R. SAPAM[3], M. R. SAHOO[1,4]
*Corresponding Author: madhudg78@gmail.com

Parkia roxburghii G. Don is a leguminous underutilized crop grown in the north-eastern states of India. Acute Parkia decline (APD) is emerging as a serious threat to its cultivation. The cause of this critical problem is still unidentified. In order to determine the microbiome associated with APD, we have systematically investigated the bacteria and fungi from the infected plants by isolation and characterization following 16S and 18S rRNA sequencing. About 15 bacterial strains with rod-shaped morphology were isolated from the soil samples, of which seven were gram-negative and the rest were gram-positive. Similarly, 22 bacterial strains comprising of gram-positive (11) and gram-negative (11) and having bacilli (20) and cocci (2) morphologies were isolated from various parts of the infected stems. In addition, 12 fungal strains were isolated from infected root and stem samples and cultured on PDA media. The PCR purified products of the bacterial and fungal pathogens were sequenced using 16S rRNA universal primers *27F* and *1492R* and 18S rRNA primers *ITS1* and *ITS4*, respectively. Out of 15 isolated bacteria from soil, four *Bacillus* sp. were found to be plant growth-promoting bacteria, two were phytopathogenic bacteria (*Erwinia persicina* and *Pectobacterium carotovorum*) causing various diseases in a wide variety of plant species, whereas two were non-pathogenic species (*Pseudarthrobacter defluvii* and *Alcaligenes faecalis*). We have identified a complex of pathogenic, non-pathogenic and opportunistic bacterial and fungal pathogens (*Fusarium proliferatum*, *Nectaria pseudotrichia*, *Ceratocystis fimbriata*, *Lasiodiplodia theobromae*, *Diaporthe perseae*, *Peyronellaea coffeae-arabicae*) associated with APD, which has been confirmed through pathogenicity assay. The result of the study would help design a consortium to manage the acute *Parkia* decline effectively.

KEYWORDS: Acute Parkia decline, *Parkia roxburghii*, microbiome, Sanger Sequencing



Microbiomes associated with acute *Parkia* decline

[1]*ICAR Research Complex for NEH Region, Manipur Center, Lamphelpat, Imphal 795004, Manipur, India;* [2]*Institute of Agricultural Sciences, Siksha O Anusandhan, Deemed to be University, Bhubaneswar 751003, Odisha, India;* [3]*Manipur University, Canchipur, Imphal 795004, Manipur, India;* [4]*ICAR–Central Tuber Crops Research Institute, Thiruvananthapuram 695017, Kerala, India*

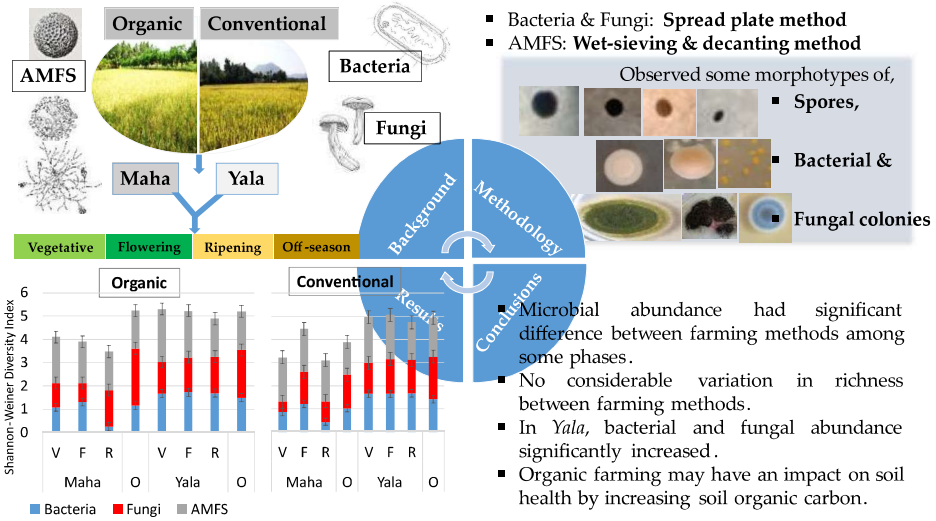
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Seasonal Variation of Microbial Community in Paddy Fields under Organic and Conventional Farming: A Case Study from Sri Lanka

M. V. N. PREMACHANDRA[1,2], S. H. BOYAGODA[1], A. M. T. A. GUNARATNE[1], H. T. K. ABEYSUNDARA[1], H. M. S. P. MADAWALA[1] and B. S. NANAYAKKARA[1*]
*Corresponding Author: buddhie@sci.pdn.ac.lk

Soil microbial community plays a crucial role in soil health and plant nutrition. A study was conducted to assess the effect of farming method and seasonal variation on microbial diversity in paddy cultivation. The comparison between Organic (OF) and Conventional (CF) fields was done in Malsiripura (7°42'55"N, 80°29'42"E), Sri Lanka, during the 2023/24 *Maha* and *Yala* seasons, across four phenological phases: vegetative, flowering, ripening, and off-season. Twelve replicate soil samples (10 cm depth) were collected, and microbial communities (bacteria, fungi, and arbuscular mycorrhizal fungal spores; AMFS) were analyzed. Bacteria and fungi were enumerated using spread-plate method, and AMFS were extracted using wet sieving-decanting. Shannon-Weiner diversity index (H) was calculated, revealing 9 bacterial, 11 fungal, and 20 AMFS morphotypes. There were significant differences in microbial abundance between farming methods across some phases, but morphotype richness was not. In *Yala*, bacterial and fungal abundance significantly increased, while AMFS abundance remained unchanged. During *Yala*-flowering, OF showed the highest bacterial diversity (H=1.7), and the highest fungal diversity (H=2.4) during the off-season after *Maha*. OF exhibited lower AMFS abundance, except flowering phases. During *Yala*-vegetative in OF, AMFS diversity peaked (H=2.3). Organic carbon (OC) was significantly higher in OF, while soil pH was higher in CF. Organic farming influenced microbial diversity by increasing bacteria and fungi abundance while lowering AMFS abundance in some phases. *Yala* season had higher bacterial and fungal diversity than *Maha*, highlighting seasonal variation. OF may improve soil health by increasing soil OC, benefiting long-term sustainability and soil microbial populations in paddy cultivation.

KEYWORDS: Bacteria, Fungi, Microbial diversity, Soil organic carbon, Soil pH



Acknowledgement: Financial assistance by the URG grant number URG/2023/32/S

[1]Faculty of Science, University of Peradeniya; [2]Postgraduate Institute of Science, University of Peradeniya, Peradeniya 20400, Sri Lanka

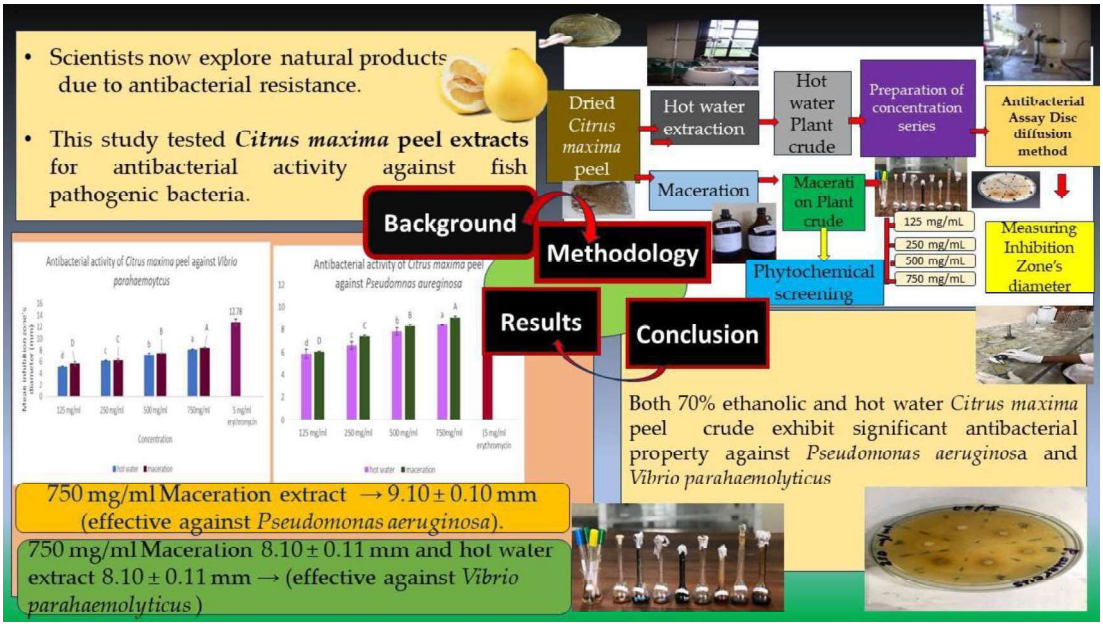
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Antibacterial Activity of Pomelo (*Citrus maxima*) Peel Extracts Against Fish Pathogenic Bacteria, *Vibrio parahaemolyticus* and *Pseudomonas aeruginosa*

S. V. GALAPPATHTHI[1]*, A. M. K. C. J. COSTA[2] and J. M. S. N. RATHNAPALA[1]
*Corresponding Author: abstractresearch@gmail.com

The excessive use of antibiotics in the aquaculture industry can lead to antibiotic-resistant bacteria, environmental contamination, and potential health risks for consumers. Novel studies are performed to find effective plant-based antibacterial agents instead of commercially used synthetic antibiotics. Present research is aimed to study antibacterial activity of Pomelo (*Citrus maxima)* peel against *Vibrio parahaemolyticus* and *Pseudomonas aeruginosa*. Extraction was carried out with 70% ethanol maceration (MP) and hot water (HP). The results of the preliminary phytochemical tests and FTIR analysis showed the presence of alkaloid, flavonoid, tannin and diterpenes available in both MP and HP extracts while saponin was only found in HP. Antibacterial activity of pomelo peel extract was evaluated by disc diffusion method including 125 mg/mL, 250 mg/mL, 500 mg/mL and 750 mg/mL concentrations in triplicate with 5 mg/mL erythromycin as the positive control. Significant ($P < .05$) antibacterial effect was indicated by 125 mg/mL, 250 mg/mL, 500 mg/mL, 750 mg/mL concentrations of HP and MP for both bacterial species. Inhibition effect of the crude extracts increased with the concentration and the highest inhibition was found with 750 mg/mL . There was no significant difference between the inhibition effect of two extraction methods. Both 750 mg/mL of MP (8.43±0.10 mm) and HP (8.10±0.11 mm) were significantly efficient for *Vibrio parahaemolyticus* while only 750 mg/mL of MP (9.10±0.10 mm) was showing the significant results for *Pseudomonas aeruginosa*. The study underscores the potential of pomelo peel extracts as an herbal antibiotic against *Vibrio parahaemolyticus* and *Pseudomonas aeruginosa* infections in aquatic species.

KEYWORDS: Antibacterial, *Citrus maxima*, Maceration, Phytochemicals



[1]*Department of Fisheries and Aquaculture,* [2]*Department of Limnology and Water technology, Faculty of Fisheries and Marine Sciences and Technology, University of Ruhuna, Matara, Sri Lanka*

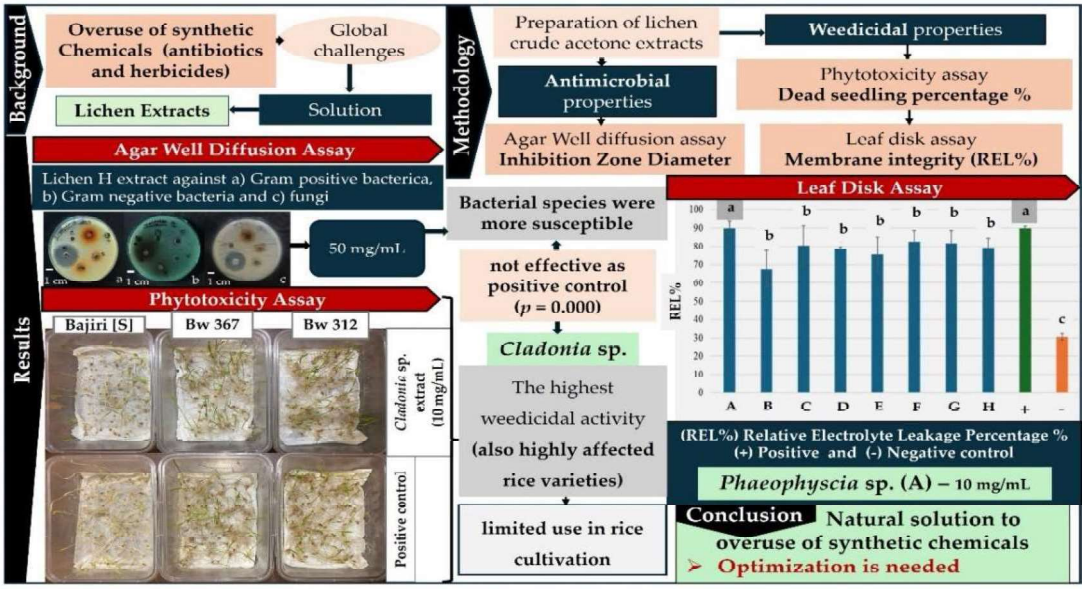
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Antimicrobial and Weedicidal Potential of Crude Acetone Extracts of Selected Lichen Species in Sri Lanka

A. C. L. DE SILVA[1*], A. D. S. N. P. ATHUKORALA[2] and W. G. D. I. GUNAWARDANA[3]
*Corresponding Author: s18023@sci.pdn.ac.lk

The widespread use of synthetic herbicides and antibiotics leads to serious global issues such as antimicrobial resistance, environmental pollution, and biodiversity loss. This study investigated the antimicrobial and weedicidal potential of secondary metabolites from lichen species in Sri Lanka. Samples of lichen species were collected from Badulla, Nuwara Eliya, Kandy and Gampaha, identified using morphological observations and standard keys. Five lichen species were observed and identified as *Phaeophyscia*, *Collema*, *Ramalina*, *Heterodermia* and *Cladonia* up to genus level from eight lichen species. Crude acetone extracts were prepared from each species [the powdered lichen material was mixed with absolute acetone (0.1 g/mL) and kept for 72 hours at 25°C]. Antimicrobial potential of the extracts in triplicates was screened using agar well diffusion assay using three bacterial species and five candidal species with tetracycline and miconazole respectively as the positive control, while 10% DMSO was the negative control. All lichen extracts (50 mg/mL), except for *Phaeophyscia* sp., exhibited antimicrobial activity but were less effective than the positive controls. A phytotoxicity assay on *Echinochloa crus-galli* showed all extracts (10 mg/mL) had significant weedicidal effects, with *Cladonia* sp. exhibiting the highest activity (55 ± 6.88% dead seedling percentage). *Cladonia* sp. also caused high seedling mortality in two rice varieties, limiting its use in rice cultivation. A leaf disk assay with *Monochoria vaginalis* showed all extracts had weedicidal effects, with *Phaeophyscia* sp. as effective as the positive control (P>0.05). These lichen extracts have potential as herbicides and antimicrobials, with further optimization for agriculture and economic growth.

KEYWORDS: antimicrobial, lichen extracts, secondary metabolites, weedicidal



[1]*Department of Botany, Faculty of Science, Peradeniya, University of Peradeniya, Sri Lanka;* [2]*Department of Biology, St. John's Campus, Memorial University of NL, St. John's, NL A1C 5S7, Canada*

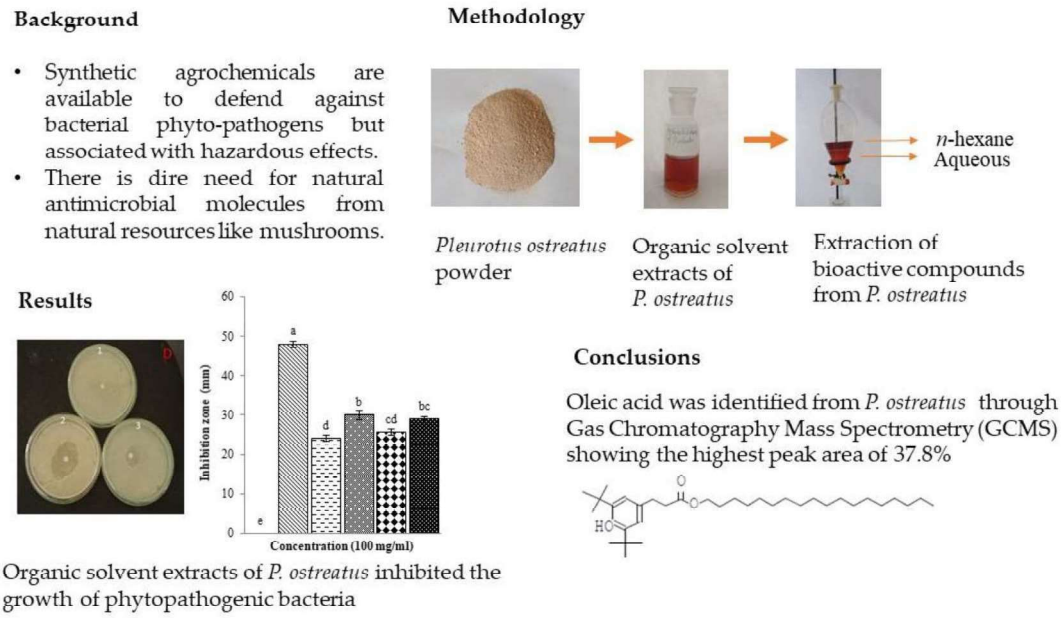
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Characterization of Antimicrobial Lipophilic Constituents in Wild *Pleurotus ostreatus* from Murree Hills, Pakistan

U. ASIF, M. AKBAR*, and T. KHALIL
*Corresponding Author: muhammad.akbar@uog.edu.pk

Bacterial phytopathogens greatly decrease the yield and quality of agricultural produce. Synthetic agrochemicals are available to defend against such pathogens but associated with hazardous effects on the environment and human. In recent years, there is dire need for natural antimicrobial molecules from natural resources to combat against the bacterial phytopathogens. There have been successful attempts to find such molecules from various plants and mushrooms but there are no reports that show the antimicrobial activity of oyster mushroom (*Pleurotus ostreatus*), growing wild in Pakistan. In the present investigation, antimicrobial efficacy of *P. ostreatus* was studied. Dry powder of mushroom was dissolved into four different organic solvents *viz.*, CH_3OH, C_6H_{14}, $CHCl_3$, and $C_4H_8O_2$ for preparation of crude organic extracts. Antimicrobial assay was investigated against three bacterial species *viz.*, *Erwinia*, *Ralstonia,* and *Xanthomonas* sp., at a concentration of 100 mg/ml in 3 replicates, by using disk diffusion method, including a positive and a negative control. The positive and negative controls comprised Penicillin and Dimethyl sulfoxide, respectively. *n*-hexane extract showed the highest antimicrobial activity of 62% and 48% against *R. solanacearum* and *X. axonopodis*. Gas Chromatography-Mass Spectrometry (GCMS) analysis of *n*-hexane extract of *P. ostreatus* revealed the presence of 19 bioactive constituents in which oleic acid showed the highest peak area of 37.8%, followed by benzenepropanoic acid, 3,5-bis(1,1-dimethylethyl)-4-hydroxy-octadecyl ester (35%). The present study concludes that *P. ostreatus* has antimicrobial constituents that can be isolated and their structures can be used to synthesize antibacterial compounds on industrial scale.

KEYWORDS: Antibacterial, GCMS, Oyster mushroom, *Pleurotus ostreatus*



Department of Botany, University of Gujrat, Gujrat, 50700, Pakistan

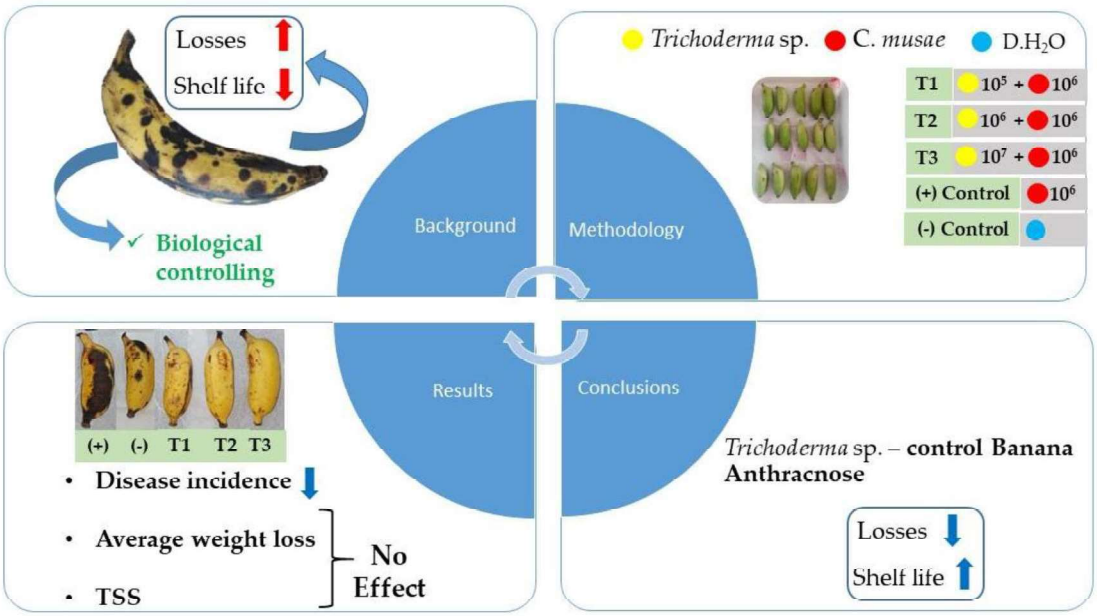
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Effect of *Trichoderma* sp. for the Management of Banana Anthracnose Caused by *Colletotrichum musae*

D. R. I. MADHUSHANI[1], J. J. M. N. FERDINAND[1] and K. D. R. C. RIENZIE[1*]
*Corresponding Author: ryanrienzie@agri.pdn.ac.lk

Postharvest losses of bananas are a major concern due to their highly perishable nature and banana anthracnose caused by *Colletotrichum musae* is one such widely distributed post-harvest disease that causes huge economic losses. Due to the negative effects of agrochemicals, biological control of post-harvest diseases is receiving greater demand. This study aimed to assess the effectiveness of *Trichoderma* sp. against *C. musae* in suppressing the banana anthracnose. Previously isolated *Trichoderma* sp. was tested for the inhibition of *C. musae* isolated from banana peel *in vitro* and *in vivo* by dual culture plating and inoculating into banana variety '*Seeni kesel*'. Three treatments (1×10^5, 10^6, 10^7 spores/ml) were applied by dipping fruits in *Trichoderma* spore suspension for three min, and the pathogen inoculum was sprayed after 30 min. Fruits treated with distilled water and *C. musae* only were kept as negative and positive controls respectively. Total Soluble Solid (TSS) content, average fruit weight loss percentage (AWL), and disease incidence (DI) were measured 5, 7, and 9 days after treatment. The percent inhibition of radial growth of *C. musae* was 55.5% by *Trichoderma* sp. All treatments indicated a significant effect ($P < .05$) on reducing the disease incidence on fruits. Disease incidence was 0% on the 5th day after inoculation with 1×10^7 spores/ml. The treatments did not show a significant effect on the AWL and TSS content of fruits. The results conclude that *Trichoderma* sp. is capable of controlling banana anthracnose and increase the market shelf life.

KEYWORDS: Banana anthracnose, Biological control, *Colletotrichum musae*, Postharvest disease, *Trichoderma* sp.



Department of Agricultural Biology, Faculty of Agriculture, University of Peradeniya, Peradeniya,20400 Sri Lanka

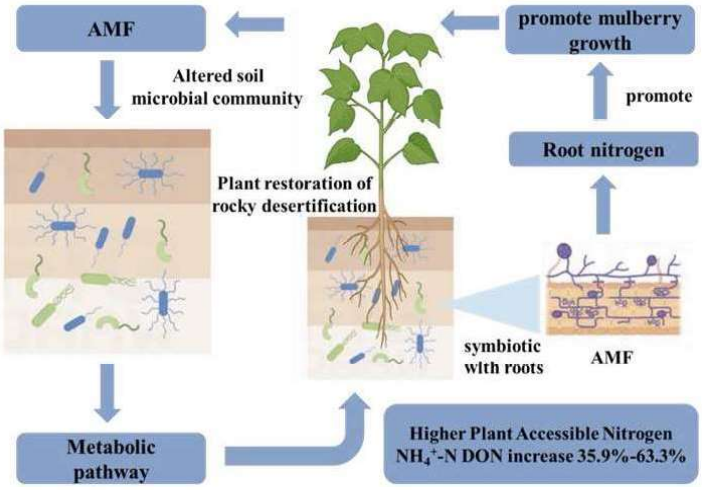
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Arbuscular Mycorrhizal Fungi Drive Mulberry Root Nitrogen Uptake via Soil Microbial Mechanisms

Z. WU and H. ZHANG*
*Corresponding Author: 1461954617@qq.com

During initial phases of vegetation restoration in areas that undergo rocky desertification, plant establishment is critically dependent on nitrogen availability, predominantly assimilated through root-mediated uptake mechanisms. Arbuscular mycorrhizal fungi (AMF), functioning as specialized rhizosphere engineers, play a pivotal role in augmenting plant nitrogen acquisition efficiency. Nevertheless, the ecological mechanisms underlying AMF-mediated regulation of rhizosphere nitrogen assimilation in these calcium carbonate-enriched, nutrient-depauperate environments remain poorly characterized. Therefore, in this study, the root box experiment was used to simulate the growth of rocky desertification mulberry tree. The purpose is to investigate the effects of AMF inoculation on plant growth, root nitrogen accumulation, soil nitrogen forms, and soil microbial communities. The results showed a well-developed mycorrhizal symbiosis with the dominant fungal species *Funneliformis mosseae* (Fm) and *Rhizophagus intraradices* (Ri), which promoted shoot growth and root nitrogen content by 11.90%–28.45%., AMF inoculation regulated soil nitrogen transformation and soil ammonium nitrogen (NH_4^+-N) and dissolved organic nitrogen (DON) significantly increased ($p < .05$) by 35.9%–63.3% compared with the control (CK). After symbiosis with AMF, significant changes were observed in soil microbial community and the abundance of soil bacteria involved in dissimilatory nitrate reduction to ammonium (DNRA) increased indicating that AMF promote DNRA synergism, facilitating ammonium formation. Correlation analysis showed that *Roseobacter* and *Arthrobacter*, two typical nitrogen-fixing bacteria, exhibited a positive correlation with NH_4^+-N. Therefore, AMF regulate soil nitrogen forms by altering the soil microbial community composition, which in turn contributes to vegetation restoration in rocky desertification areas.

KEYWORDS: Arbuscular mycorrhiza fungi, *Morus alba* L., Rocky desertification, Soil microbial community



Acknowledgement: This study was funded by the National Natural Science Foundation of China (Nos. 32060377)

[3]*Guizhou University, Guiyang, 550025, Guizhou, China*

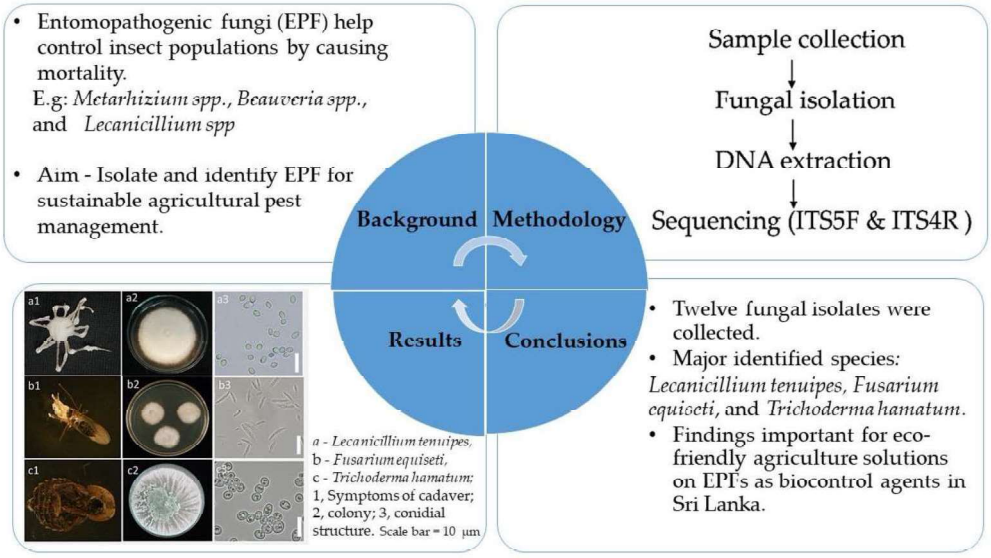
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Isolation and Identification of Native Entomopathogenic Fungi from Mycotic Insect Cadavers

M. S. GUNASEKARA[1], T. C. BAMUNUARACHCHIGE[1*], D. K. HETTIARACHCHI[2], and N. N. WIJAYAWARDENE[1,3,4]
*Corresponding Author: tcbamunu@tec.rjt.ac.lk

Entomopathogenic fungi reported from natural and agroecosystems are essential in the regulation of insect pest populations and are a promising alternative to chemical control of pests. The entomopathogenic fungi are frequently found in insect cadavers and soils. The main objective of this study was to collect, identify, isolate, and characterize entomopathogenic fungi. Infected cadavers were collected from different locations in Kalawana, Kanneliya, and Mihintale, Sri Lanka representing different habitats, including upper and lower surfaces of leaves, tree trunks, decomposing wood, and litter layers. Collected insect cadavers suspected of fungal infection were surface-sterilized using 0.5% solution of sodium hypochlorite solution for 3 min, followed by three washes with sterile distilled water, incubated on moistened filter paper to promote fungal growth, and upon detection, fungi were isolated on potato dextrose agar supplemented with 0.5 g/L chloramphenicol and incubated at 27± 2 °C. Isolates were identified based on morphological characteristics and PCR of ITS primers (ITS5F and ITS4R) followed by sequencing. In this study, 12 fungal isolates were found, and three of them were confirmed as major entomopathogenic species, namely *Lecanicillium tenuipes*, *Fusarium equiseti*, and *Trichoderma hamatum*. The findings enhance the knowledge base of entomopathogenic fungal species in Sri Lanka, and their application as biopesticides in environmentally sustainable pest management is projected.

KEYWORDS: Biocontrol agents, Biopesticides, Entomopathogenic fungi



Acknowledgement: Financial support of the Asian Development Bank through research grant no R3/RJ2

[1]Department of Bioprocess Technology, Faculty of Technology; [2]Department of Biological Sciences, Faculty of Applied Sciences, Rajarata University of Sri Lanka, Mihintale, Sri Lanka; [3]Center for Yunnan Plateau Biological Resources Protection and Utilization, Qujing Normal University, Qujing, Yunnan Province 655011, P.R. China; [4]Tropical Microbiology Research Foundation, 96/N/10, Meemanagoda Road, Pannipitiya 10230, Sri Lanka

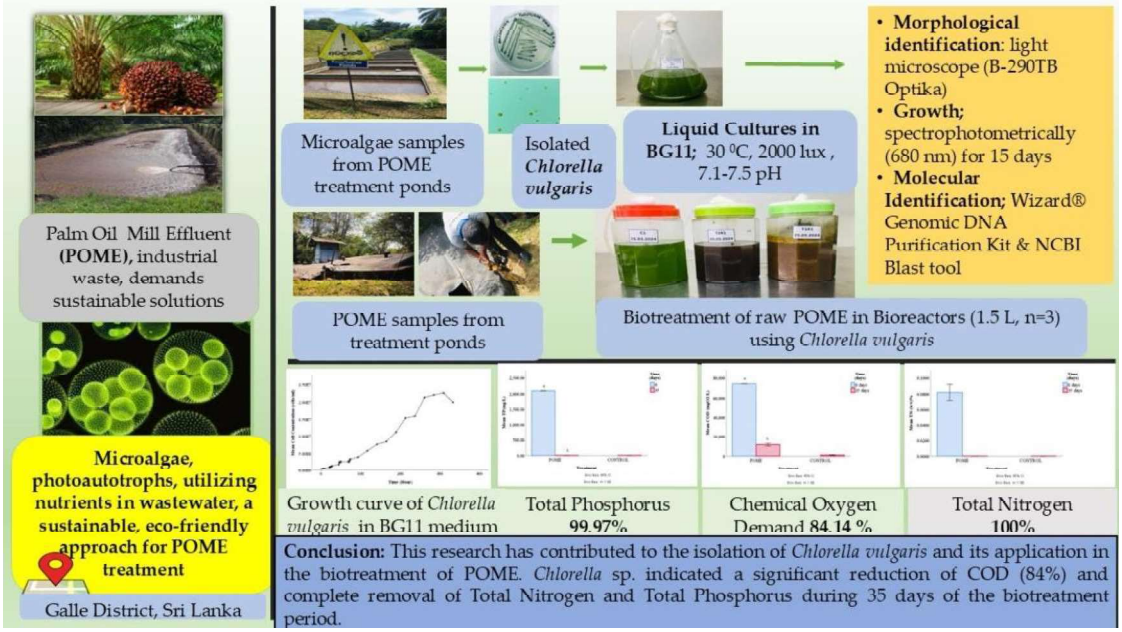
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Isolation, Identification and Characterization of Microalgae *Chlorella* sp. from Palm Oil Mill Effluent (POME) Ponds for Biotreatment of Wastewater

U. A. R. INDUMINI, B. L. W. K. BALASOORIYA*, N. G. C. A. BANDARA and R. M. D. RATHNAYAKE
*Corresponding Author: wajirab@wyb.ac.lk

Microalgae are unicellular, photosynthetic microorganisms capable of utilizing nutrients in wastewater for biomass growth. In recent years, microalgae have emerged as a promising solution for biotreatment of municipal and industrial wastewater. This study aimed to isolate, identify, and characterize microalgae species for biotreatment of POME. Samples were collected from palm oil wastewater ponds in Galle, Sri Lanka, and microalgae were isolated in BG11 media, 2000 lux, 16/8 hr light/dark conditions. The cells were characterized with small (3–10 μm), spherical, motile unicells with thin cell walls. Genomic DNA sequencing of pure culture identified *Chlorella vulgaris*. The cell growth pattern was studied in culture flasks (2 L, n=3) by spectrophotometry (680 nm) calibrated with Neubauer haemocytometer. The growth pattern indicated a short lag phase and an 11-day exponential phase. Mass cultures (4 L) of *Chlorella vulgaris* were maintained in transparent plastic culture vessels at 30 ^{0}C, BG11, pH of 7.1–7.5, 2000 lux, 16:8 hr (light/dark) and 1.6 L/hr aeration. Studies on the biotreatment potential of raw POME (30%) using *Chlorella vulgaris* were carried out in 1.5 L culture flasks (n=3) for 35 days and a significant reduction of COD (84.14%) and 100% removal of total nitrogen and total phosphorus were observed. This research has contributed to the isolation of *Chlorella vulgaris* and its application in the biotreatment of POME.

KEYWORDS: Biotreatment, *Chlorella* sp., Microalgae, Palm oil mill effluent (POME)



Acknowledgement: Financial assistance by Watawala Plantations PLC

Department of Biotechnology, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka, Makandura, Gonawila (NWP), 60170, Sri Lanka

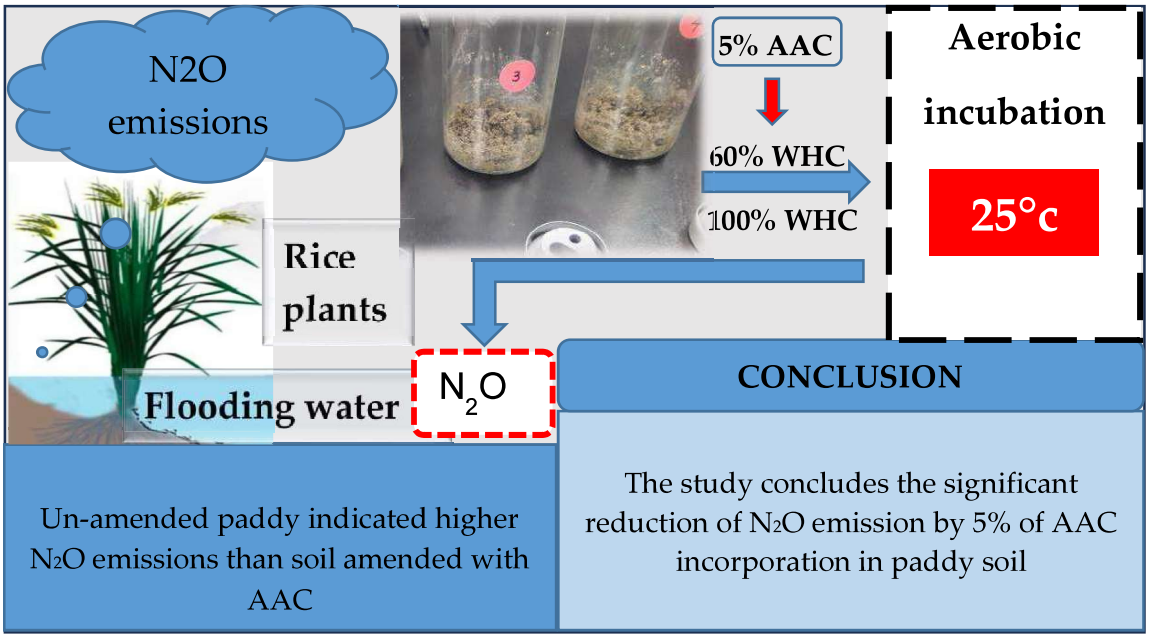
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Effects of Autoclaved Aerated Concrete (AAC) on N_2O Emissions from Paddy Soil under Laboratory Aerobic Conditions

N. R. R. W. S. RATHNAYAKE, D. A. L. LEELAMANIE* and T. D. P. LIYANAGE
*Corresponding Author: leelamanie@soil.ruh.ac.lk

Nitrous oxide (N_2O) is one of the longest-lived greenhouse gases with a global warming potential 273 times that of carbon dioxide (CO_2) on a 100-year timescale. Paddy soils are a major anthropogenic source of N_2O emissions due to frequent changes in redox conditions and nitrogen fertilization. Mitigating N_2O emission is essential for climate-smart agriculture. Autoclaved aerated concrete (AAC), which is a calcium silicate containing porous material produced as a civil construction waste, is emerging as a soil conditioner to reduce greenhouse gas emissions and in wastewater treatment. This study aimed to examine the influence of AAC on N_2O emissions from paddy soils under laboratory conditions. N_2O emission was determined in paddy soil amended with 5% of AAC under 60% and 100% water holding capacity (WHC) in 100 mL glass bottles. All treatments and negative control in triplicate were incubated under aerobic conditions at 25 °C. Emissions of N_2O were determined at 0, 1, 3, 7, 14, and 21 days using gas chromatography with an electron capture detector. The addition of AAC significantly decreased the cumulative N_2O emissions, from 80 μg N kg^{-1} to 56 μg N kg^{-1}, showing 55% and 62% reductions at 60% and 100% WHC levels, respectively, compared with the control. The effects of AAC addition and soil moisture content on cumulative N_2O emissions were statistically significant ($P < .05$). The study concludes the significant reduction of N_2O emission by 5% of AAC incorporation in paddy soil and further studies at the field scale are projected to assess its potential as a soil conditioner.

KEYWORDS: Autoclaved aerated concrete, N_2O emission, Paddy, Soil conditioner



Department of Soil Science, Faculty of Agriculture, University of Ruhuna, Mapalana, Kamburupitiya 81100, Sri Lanka

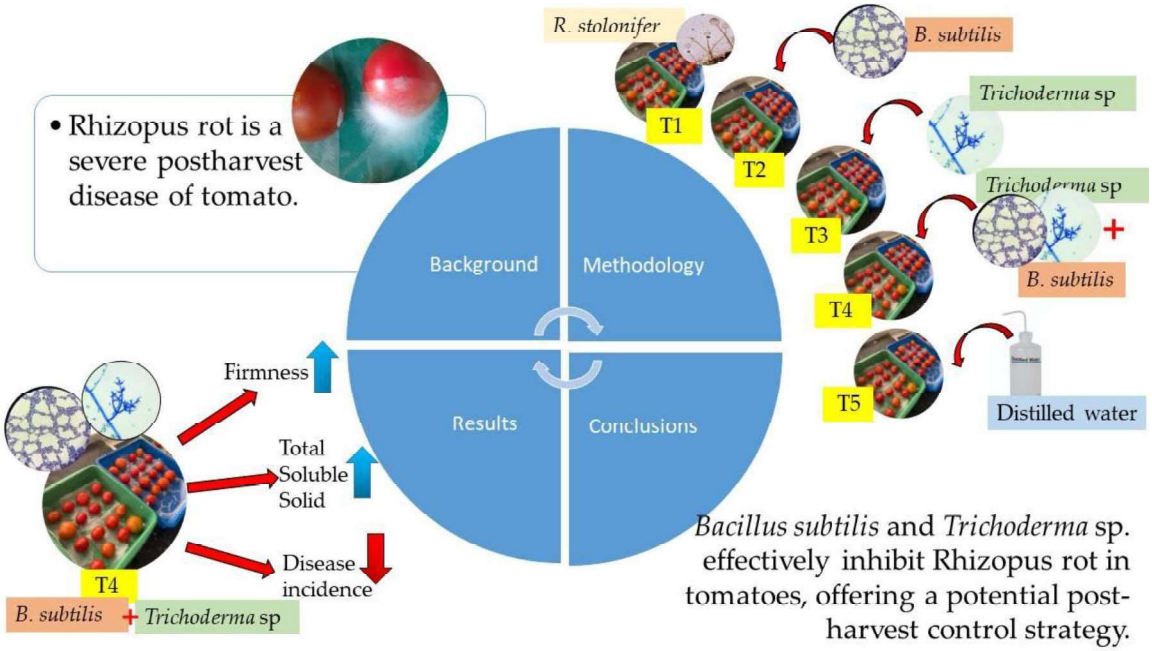
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Evaluating *Bacillus subtilis* and *Trichoderma* sp. as Biological Control Agents for Controlling Post-Harvest Rhizopus Rot in Tomato

J. J. M. N. FERDINAND, D. R. I. MADHUSHANI and K. D. R. C. RIENZIE*
*Corresponding Author: ryanrienzie@agri.pdn.ac.lk

Post-harvest Rhizopus rot, by *Rhizopus stolonifer*, is a significant cause of spoilage in tomatoes (*Solanum lycopersicum* L.), leading to substantial economic losses. Biological control agents (BCAs) offer a promising alternative to chemical fungicides for managing post-harvest diseases in fruits. This study evaluated the efficacy of *Bacillus subtilis* and *Trichoderma* sp. as BCAs against Rhizopus rot in tomatoes. An *in vivo* assay was performed with previously isolated *B. subtilis* and *Trichoderma* sp were tested for inhibition of R. *stolonifer* isolated from infected tomato *in vitro* and *in vivo* by dual culture plating and inoculating into tomato. Three treatments (T_1 - *B. subtilis* only, T_2 -*Trichoderma* sp only and T_3 -mix of both species, 1 x 10^6 spores/ml from each species), were applied by dipping fruits in three replicates, and pathogen inoculum was sprayed. Average fruit weight loss, Disease incidence, Firmness and Total Soluble Solid (TSS) content were measured. Treatments indicate a significant effect ($P < .05$) on reducing the disease incidence and TSS on fruits. This study highlights the potential of *B. subtilis* and *Trichoderma* sp. as effective and environmentally friendly alternatives for managing post-harvest Rhizopus rot in tomatoes, offering a promising approach to reducing reliance on chemical fungicides in post-harvest fruit management.

KEYWORDS: *Bacillus subtilis*, Biological control, *Rhizopus stolonifer*, Tomatoes, *Trichoderma*



[1]*Department of Agricultural Biology, Faculty of Agriculture, University of Peradeniya, Peradeniya, 20400, Sri Lanka*

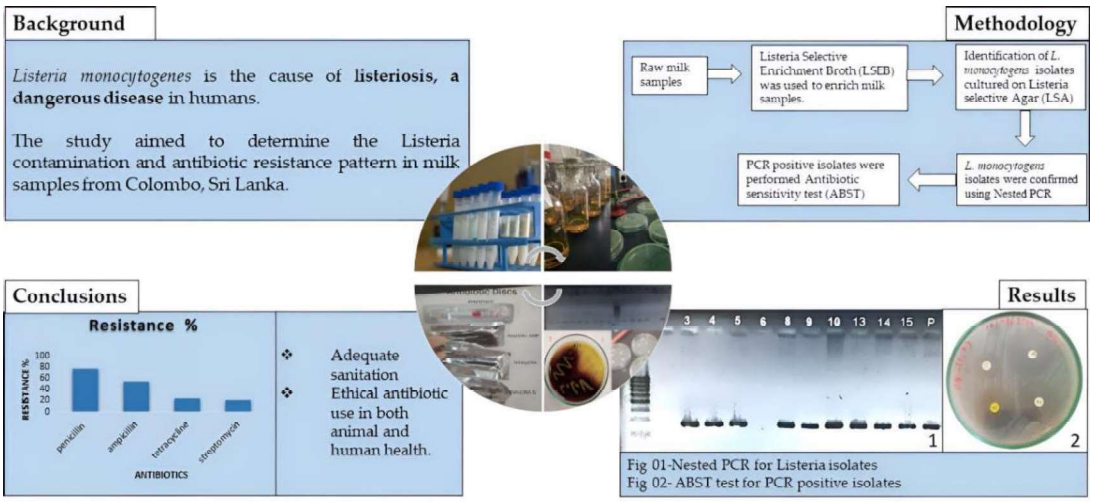
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Prevalence and Antimicrobial Resistance Patterns of *Listeria monocytogenes* in Raw Milk Samples Collected from Colombo District, Sri Lanka

D. A. D. V. DE SILVA[1], O. T. WEERASINGHE[2], M. S. F. SHANU[3], H. B. C. HARSHANI[1] and W. A. S. WIJENDRA[1]*
*Corresponding Author: was_wij@yahoo.com

The gram-positive foodborne bacteria *Listeria monocytogenes* is the cause of the dangerous illness listeriosis in humans. It causes serious infection in the elderly, newborns, and immunocompromised individuals. Their immune systems are impaired, making them more susceptible than the general population. The objective of this study was to examine the prevalence and antibiotic resistance for selected antibiotics in *L. monocytogenes* found in raw milk samples. In this study, raw milk samples (n=50) were randomly collected from Udahamulla, Homagama and Korathota milk collection centers in Colombo district, Sri Lanka and transported to the laboratory at 4 °C. The milk samples were enriched in *Listeria* Selective Enrichment Broth (LSEB) and transferred to *Listeria* Selective Agar (LSA). Culture plates were examined for the presence of typical colonies and sub-cultured on the same agar medium. Isolates were confirmed using nested PCR and 65 isolates were identified of which 39 were *Listeria* positive. All positive samples were tested for antibiotic sensitivity, which was positive at variable degrees in 32 samples. Antibiotic Sensitivity Test (ABST) media were used to identify the resistance patterns of *L. monocytogenes* and the highest resistance was for Penicillin (76.92%), while for Ampicillin, Tetracycline and Streptomycin values of 53.84%, 23.07% and 20.51% were reported respectively. This investigation identified antibiotic resistant *Listeria* contamination in raw milk samples collected from Colombo district, Sri Lanka. This study emphasizes adequate sanitation and ethical antibiotic use in both animal and human health to minimize the spread of *Listeria* contamination.

KEYWORDS: Antibiotic resistance, Colombo, *Listeria monocytogenes*, Penicillin, Raw milk



Acknowledgement: Medical Research Institute

[1]Medical Research Institute, Sri Lanka, [2]Department of Botany, University of Sri Jayewardenepura, [3]Department of Botany, Open University of Sri Lanka, Nawala, Sri Lanka

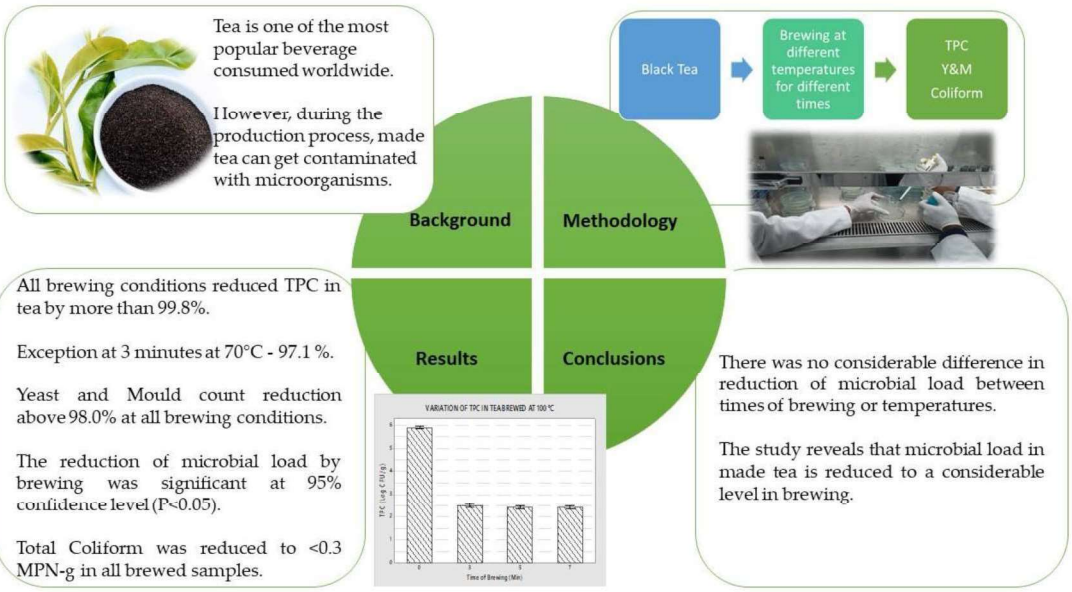
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Effect of Brewing on Reducing Microbial Load of Black Tea

N. D. U. D. AMARASENA[1], H. A. P. W. HETTIARACHCHI[1], N. K. M. C. NAGAHAWATHTHA[2] and S. D. T. MADUWANTHI[2*]
*Corresponding Author: tharaka@ucr.ac.lk

Tea is one of the most popular beverages consumed worldwide. During the production process, microbial contamination of tea can occur at different stages such as plucking, withering, rolling, fermentation, firing, sorting and packing. This study aimed to assess the microbial load in contaminated black tea samples collected at the Analytical Laboratory of Sri Lanka Tea Board and the effect of brewing on reducing microbial load. Contaminated black tea samples (n = 6) collected from different tea manufacturers in Sri Lanka were used for the study. Samples were analysed for its microbial load before brewing and after brewing at 70 ^{0}C, 85 ^{0}C, 100 ^{0}C for 3, 5, 6 minutes. The Total Plate Count (TPC), Yeast and Mould Count (YMC) and Total Coliform Count (TCC) were determined following (ISO 4833 -1:2013), (ISO 21527-2:2008) and (ISO 4831:2006) methods, respectively. The TPC, YMC and TCC were recorded as $7.9\times10^5 \pm 1.2\times10^5$ CFU g^{-1}, $5.1\times10^3 \pm 1.5\times10^3$ CFU g^{-1}, and $>1.1\times10^3$ MPN g^{-1} in the contaminated made tea samples before brewing. Then the samples were brewed at 70 ^{0}C, 85 ^{0}C, 100 ^{0}C for 3, 5, 6 minutes in triplicates. All brewing conditions significantly reduced TPC in tea by more than 99.8%, except for 3 minutes at 70 °C, where a reduction of 97.1% was recorded. Similar behavior was observed in YMC as more than 98.0% reduction was caused by all brewing conditions. Total Coliform was reduced to <0.3 MPN/g in all brewed samples regardless of the time and temperature in brewing. The study revealed that brewing at high temperature can effectively reduce the microbial load below the threshold levels.

KEYWORDS: Black tea, Brewing, Microbial load, Total coliform count



[1]*Department of Biosystem Technology, Faculty of Technology, South Eastern University of Sri Lanka;*
[2]*Department of Agriculture and Food Technology, Faculty of Industrial Technology, University of Vocational Technology*

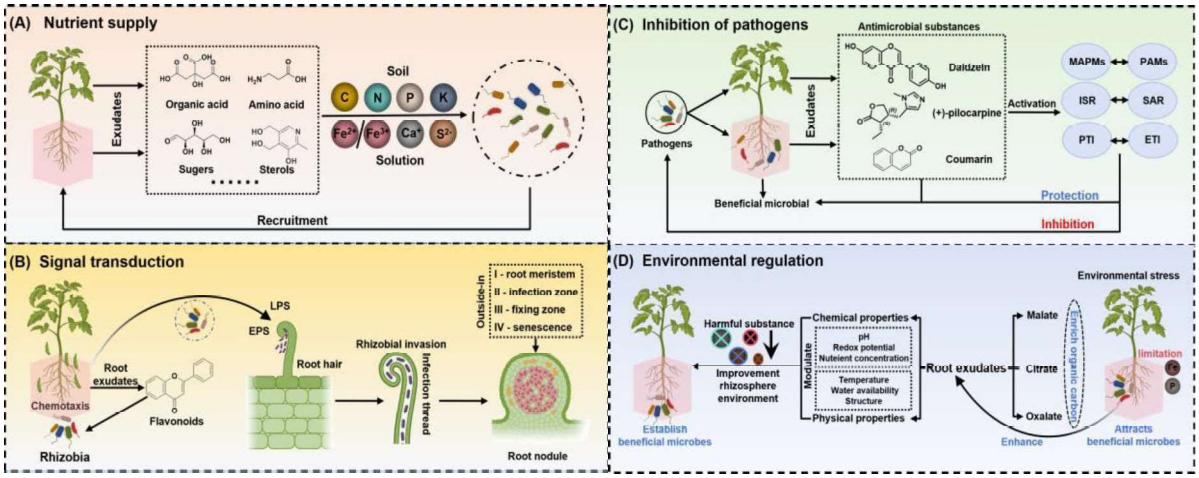
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Plant-Microbial Interactions through Root and Leaf Exudates

CHANGXIN-YANG, SHIJIE-CHEN and GEFEI-HAO*
*Corresponding Author: gefei_hao@foxmail.com

Plant exudates play a crucial role in the recruitment and assembly of microorganisms. In recent years, plant exudates-mediated microbial recruitment and assembly, and the bidirectional regulatory mechanisms for maintaining a mutually beneficial relationship between plants and microorganisms has been made great progress. The OsPAL02 controls 4-hydroxycinnamic acid synthesis, promoting Pseudomonadales enrichment in the rice leaves, thereby enhancing rice's resistance to diseases. Nonpathogenic bacteria and their elicitors can trigger the "cry for help" mechanism in plants, facilitating the assembly of beneficial microbial communities, thereby suppressing pathogen invasion and promoting plant growth. Trichoderma can activate the transcriptional ability, thereby acting as a plant growth promoter and improving the plant's ability to respond to local and systemic defenses against biotic and abiotic organisms. Therefore, utilization of the plant exudates-mediated microbial recruitment and assembly is of great significance to improve plant health and productivity. However, there is lack of summative and critical review for establishing the relationship between plant exudates-mediated microbial recruitment and assembly, thereby its impact on plant health. Plant-driven microbial communities are identified as diverse groups influenced by the secretions of roots and leaves, as well as the regulatory role of microbial secretions on microbial community dynamics. Additionally, multiple environmental gradients shape up the plant microbial communities such as soil characteristics, climatic conditions, plant microbial selection mechanisms, vegetation types, and biological interactions. Finally, through a comprehensive analysis of existing research, the current understanding of plant-microbe interactions was summarized, and future research directions were outlined.

KEYWORDS: Plant exudate, Plant-microbiome interaction, Microbial community recruitment, plant health



Acknowledgement: Financial assistance through the grant 2024YFE0214300, 2024T170200.

State Key Laboratory of Green Pesticide; Key Laboratory of Green Pesticide and Agricultural Bioengineering, Ministry of Education, Center for Research and Development of Fine Chemicals of Guizhou University, Guiyang, 550025, P.R. China

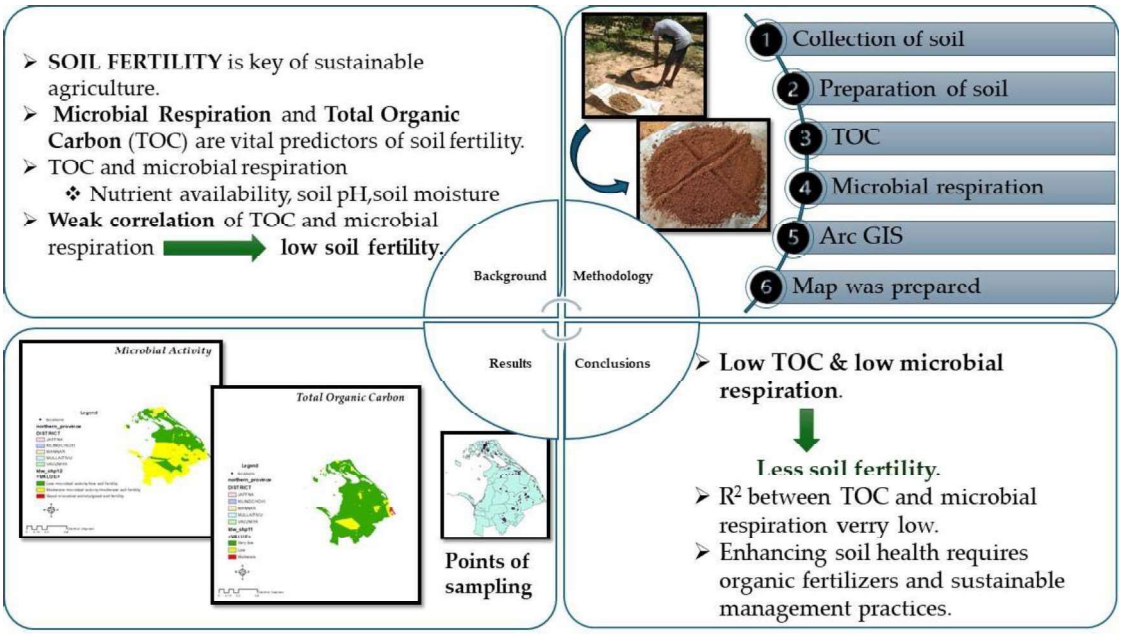
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Patterns of Microbial Activity and Total Organic Carbon in The Farmer Field Soils in Northern Region of Sri Lanka

A. H. A. R. JAYASUMANA[1]*, A. KIRISAN[1] and N. GNANAVELRAJAH[1]
*Corresponding Author: ruwansaraamila984@gmail.com

Microbial respiration and total organic carbon (TOC) are biological indicators of nutrient cycling and soil fertility. Farmers have faced significant problems due to low TOC and microbial respiration, indicating poor soil fertility. The study aimed to assess the microbial respiration and TOC patterns, their correlations and implications for soil fertility across mainly Jaffna, Kilinochchi, Vavuniya and Mullaitivu districts of Sri Lanka. Soil samples were collected at depth of 0-15 cm with three replicates, totalling 161 locations. Spatial data were evaluated by ArcMap 10.4. Microbial respiration was determined by the alkali trap titration method and TOC by the Walkey Black method. Microbial respiration (mg CO_2/ 100g) was positively correlated with TOC content, however R^2 was low. In Kilinochchi had highest 1.1% of TOC and lowest was 0.1%. In Vavuniya it ranged from 1.4% to 0.32% whereas in Jaffna district and Mullaitivu districts it ranged from 1.4% to 0.2% and from 1.32% to 0.42% respectively. In Jaffna district highest microbial respiration was 47.3 mg CO_2/100 g and lowest value was 3.3 mg CO_2/100 g. In Kilinochchi it was ranged from 80.42 to 2.42 mg CO_2/100 g. In Vavuniya district it was ranged from 48.85 to 3.85 mg CO_2/100 g. Mullaitivu it ranged from 46.93 to 1.92 mg CO_2/100 g. Highest R^2 of 0.1538 was recorded in the Kilinochchi district while the lowest R^2 of 0.0496was recorded in Vavuniya district. The lower TOC and microbial activity in the region indicate a low fertility status. These results imply that biological activity and organic matter, essential for preserving soil health and productivity. To improve soil fertility in this region necessary to apply biological fertilizer and follow soil conservation methods.

KEYWORDS: Microbial respiration, Northern region, Sri Lanka, Soil biological fertility, Total organic carbon



[1]*Department of Agricultural Chemistry (Soil Science), Faculty of Agriculture, University of Jaffna, Kilinochchi 44000, Sri Lanka*

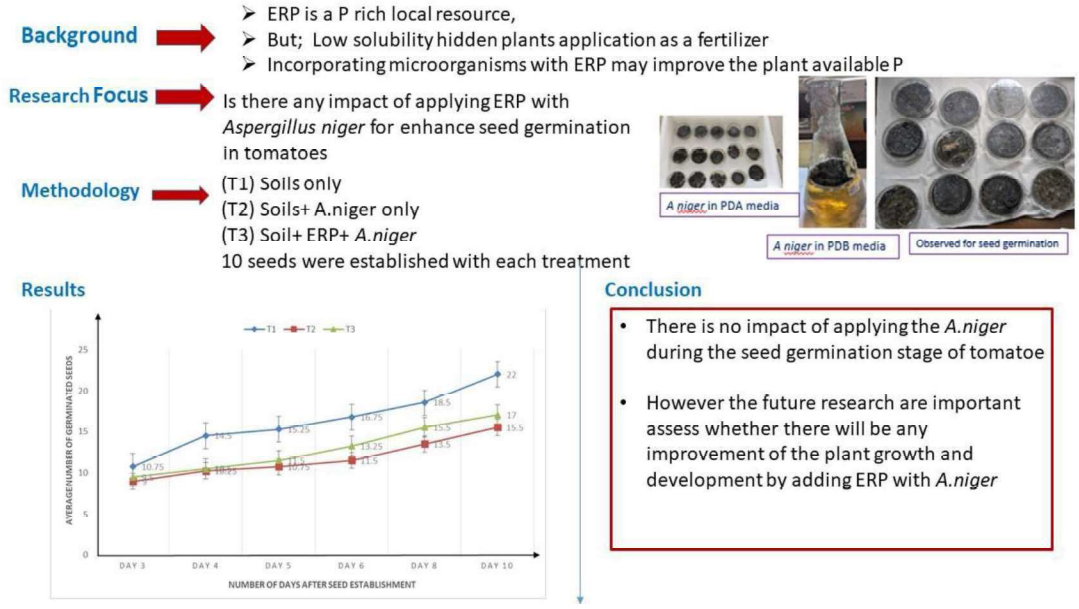
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Applying *Aspergillus niger* as a Phosphorus Solubilizer with Combination of Rock Phosphates for Seed Germination in Tomato

W. M. R. W. WEERAKOON[1*], H. M. T. G. A. PITAWALA[2] and L. D. B. SURIYAGODA[3]
*Corresponding Author: rajithaw96@gmail.com

Phosphorus is crucial for seed germination as it fuels energy transfer, root development, and seedling growth. While seeds naturally contain phosphorus, supplementing it through soil amendments, microbial inoculation, or seed treatments may improve germination rates and seedling vigor, especially in phosphorus-deficient soils. This study evaluated the effect of High-Grade Eppawala Rock Phosphate (HERP) and *Aspergillus niger* on tomato seed germination. *A. niger* was chosen for its efficient phosphorus solubilization. One-week-old *A. niger* culture on Potato Dextrose (PD) agar was used to prepare a solution with a concentration of 1×10^8 CFU by mixing with PD broth (1:100). Three treatments were applied with four replicates: T1 (HERP 3 g, *A. niger* 10 ml, soil 12 g), T2 (control: soil 15 g, distilled water 10 ml), and T3 (soil 15 g, *A. niger* 10 ml). All soils were autoclaved before application. Tomato seeds (25 per petri dish) were placed one week after treatment, and germination was monitored for 14 days.T1 exhibited the highest germination rate, followed by T2 and T3, but differences were not statistically significant. Results suggest that phosphorus reserves in tomato seeds are sufficient for germination, limiting the immediate impact of phosphorus solubilizing microorganismS (PSM) application. While no direct economic benefits are observed at this stage, further studies should assess the impact of PSMs with HERP during the vegetative phase, where phosphorus plays one of the most critical roles in plant growth and productivity.

KEYWORDS: *Aspergillus niger*, Biofertilizer, Phosphorus solubilizing microorganisms, Tomato, Seed germination



[1]*Postgraduate Institute of Agriculture, University of Peradeniya, Sri Lanka;* [2]*Department of Geology, Faculty of Science, University of Peradeniya, Sri Lanka;* [3]*Department of Crop Science, Faculty of Agriculture, University of Peradeniya, Sri Lanka*

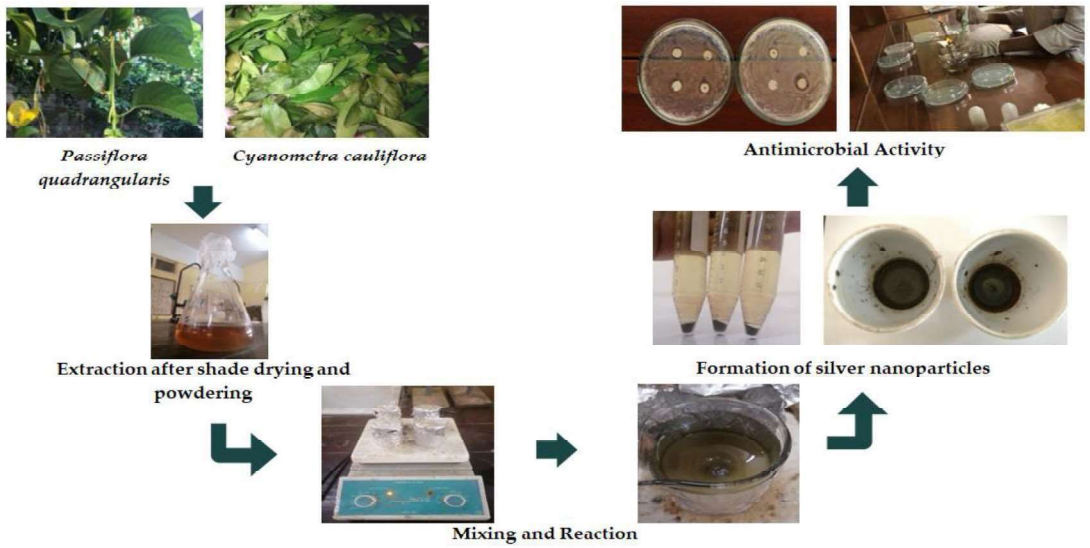
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Green Synthesis of Silver Nanoparticles, Phytochemical Profiling and Antimicrobial Activity of Leaf Extracts from *Passiflora quadrangularis* and *Cyanometra cauliflora*

M. J. A. YAAZMIN[1], T. MANORANJAN [1*] and A. C. THAVARANJIT[2]
*Corresponding Author: *tmranjan@univ.jfn.ac.lk*

The study aimed for green synthesis of silver nanoparticles (AgNPs) using leaf extracts of *Cyanometra cauliflora* and *Passiflora quadrangularis*, from Sri Lanka and determining their antimicrobial properties and phytochemical constituents. These plant species are commonly used for medicinal applications and bioactive constituents have been reported, however, they have not utilized for the synthesis of AgNPs. Leaves collected from Welimada and Awissawella were extracted (20 g/100 mL water). They exposed to 4 mM $AgNO_3$ (9:1) at pH 10 and, titrated with 0.1 M NaOH. Colour change from colourless to yellowish brown signified formation of AgNP and confirmed by UV-Vis spectroscopy with Surface Plasmon Resonance at 420 nm and 0.0142 g/g dw yield for *P. quadrangularis* and 453 nm 0.0298 g/g dw yield for *C. cauliflora*. Phytochemical analysis determined in triplicate leaf extracts, indicated presence of tannins, flavonoids, phenols, and alkaloids in both plants while FTIR identified functional groups responsible for AgNP stabilization. The AgNPs remained stable for one month by spectroscopy. Antimicrobial activity of the synthesized AgNPs, plant extracts in comparison with the negative control ($AgNO_3$) and positive controls (mancozeb and streptomycin) were assessed for a panel of bacterial (*Escherichia coli*, *Bacillus* sp., *Pseudomonas aeruginosa*, *Proteus* sp., and *Staphylococcus aureus*) and fungal (*Colletotrichum* sp., *Rhizopus* sp., *Mucor* sp., *Aspergillus* sp., and *Fusarium* sp.) pathogens using the disc diffusion method. AgNPs produced showed significantly higher antimicrobial activity, than that of plant extracts alone and $AgNO_3$.

KEYWORDS: AgNPs, Antimicrobial activity, *Cyanometra cauliflora*, Green synthesis, *Passiflora quadrangularis*.



[1]*Department of Chemistry, University of Jaffna;* [2]*Department of botany, University of Jaffna*

ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

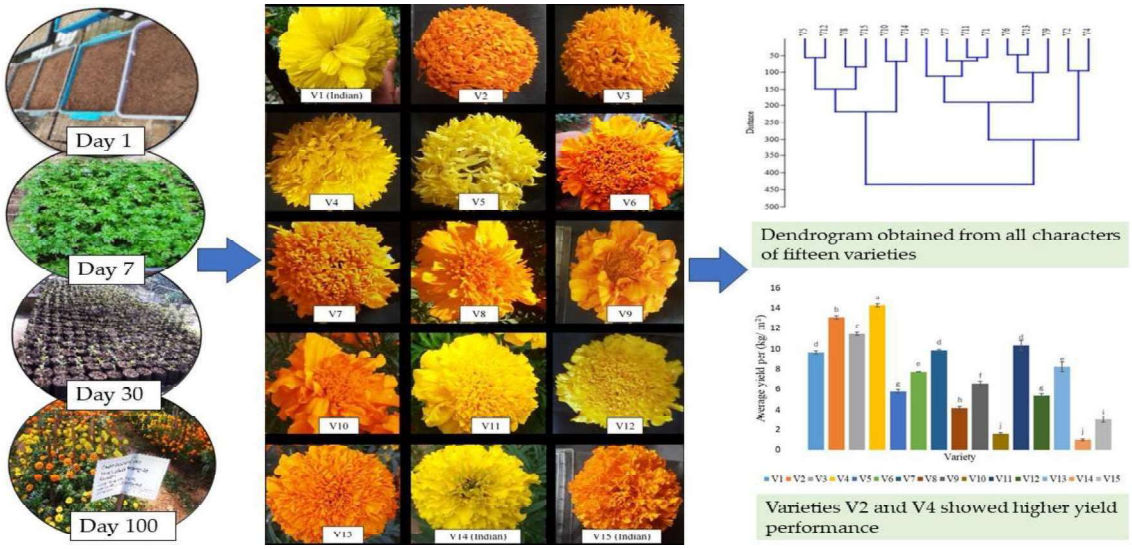
Aesthetic Agriculture and Environment

Performance Evaluation of Marigold (*Tagetes erecta* L.) Varieties for Yield-related Parameters

A. M. A. S. ATTANAYAKE[1], J. P. EESWARA[2] and S. S. KUMARI[2*]
*Corresponding Author: suwinikumari@gmail.com

Marigold (*Tagetes erecta* L.) is an ornamental flowering plant of the family Asteraceae, known for its multifunctionality and value addition potential in various industries. However, growers often lack awareness of high yielding varieties with desirable vegetative and reproductive traits, limiting production optimization. Therefore, this study aimed to evaluate the performance of marigold varieties based on yield-related parameters for the promotion of selected varieties in the Sri Lankan floriculture industry. A field experiment was conducted at the Royal Botanic Gardens, Peradeniya, using a Randomized Complete Block Design with three replicates. Fifteen marigold varieties were selected as treatments, and each block consisted of one plot per variety. Data on vegetative (plant height, number of leaves and branches) and reproductive parameters (days to first flower bud initiation, days to 50% flowering, fresh flower weight, flower diameter, colorimeter values, flower duration, vase life, number of flowers, and flower yield) were collected and analysed. The results revealed statistically significant ($P < .05$) differences among varieties for all parameters. Principal component analysis and cluster analysis showed homogenous grouping of varieties. Varieties V2 (orange, small single petals) and V4 (yellow, small single petals) showed superior performance, recording significantly higher branch numbers, flower diameters, fresh flower weights, longer flower durations and higher yields per plant (V4: 917.30±9.67 g; V2: 840.71±10.56 g) and per square meter. These two varieties can be recommended for commercial cultivation. This is the first varietal evaluation of marigold in Sri Lanka, providing critical insights for growers seeking suitable marigold varieties for commercial purposes.

KEYWORDS: Marigold, Ornamental plant, Performance, Varieties



Acknowledgement: Financial assistance by Royal Botanic Gardens, Peradeniya, Sri Lanka

[1]Department of National Botanic Gardens, Royal Botanic Gardens, Peradeniya, Sri Lanka; [2]Department of Crop Science, Faculty of Agriculture, University of Peradeniya, Sri Lanka

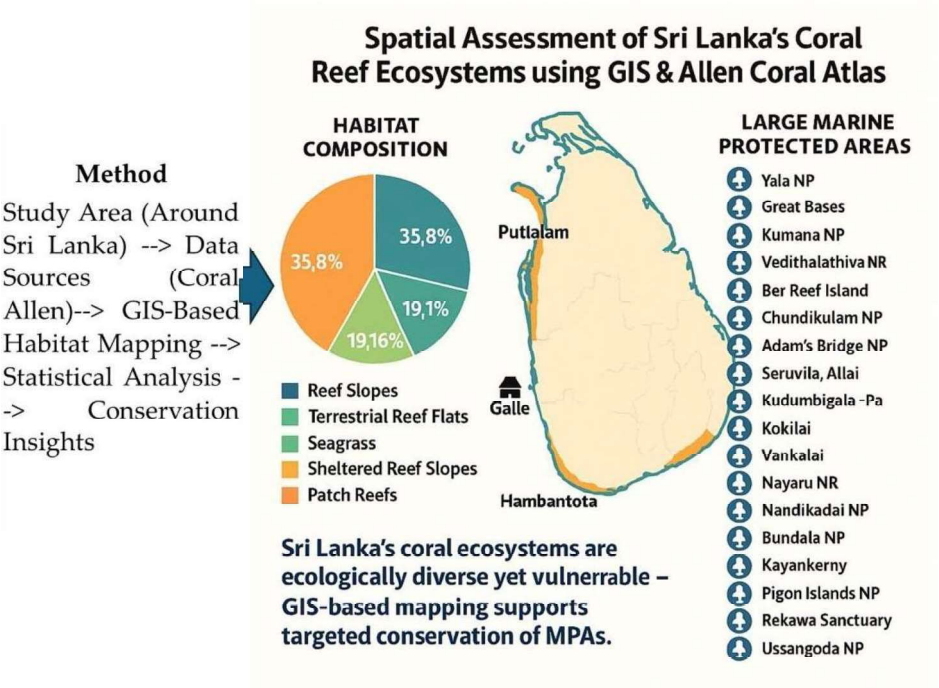
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

A GIS-based Analysis of the Coral Reef Ecosystems in Sri Lanka

E. T. S. MADHUBHASHINI*
*Corresponding Author: thushanis@pdn.ac.lk

Coral reef ecosystems play a crucial role in marine biodiversity, providing habitat and coastal protection. This study analysed the spatial distribution and classification of Sri Lanka's coral reef ecosystems using Allen Coral Atlas Mapping data (2020) and gazettes from the Department of Wildlife Conservation. The objective was to classify and assess coral reef habitats and their spatial extent using Geographic Information System (GIS) tools. Employing ArcMap 10.8, coral reef habitats were delineated into key classes, including coral-algae, seagrass, reef slopes, sheltered reef slopes, and patch reefs. The analysis revealed that reef slopes were the most dominant habitat type, covering 613.0 km² (35.8%), followed by terrestrial reef flats (385.0 km²; 22.5%) and seagrass areas (318.2 km²; 19.7%). Smaller habitat categories included sheltered reef slopes (26.2 km²; 1.5%) and patch reefs (101.0 km²; 0.7%). These habitats were predominantly located along the western boundaries of Galle, Kalutara, Puttalam, Mannar, Kilinochchi, and Jaffna districts, as well as the eastern boundaries of Jaffna, Kilinochchi, Mullaitivu, Trincomalee, and Batticaloa districts. Significant coral reef ecosystems were identified along the southern boundaries of Hambantota and Matara districts and the south-eastern boundary of Ampara district. Additionally, several Marine Protected Areas (MPAs) have been designated, including the Bar Reef, Delft National Park, Hikkaduwa, and Yala. Among these, the smallest MPA is Rocky Islet (0.64 km perimeter, 1.6 ha area), while Yala is the largest (226.1 km perimeter, 97,957.3 ha area). Findings highlight the ecological diversity of Sri Lanka's marine habitats, emphasizing the need for further research on human impacts and temporal changes.

KEYWORDS: Coral reef ecosystems, GIS, Habitat classification, Marine protected areas, Sri Lanka



Department of Animal Science, Faculty of Agriculture, University of Peradeniya, Sri Lanka

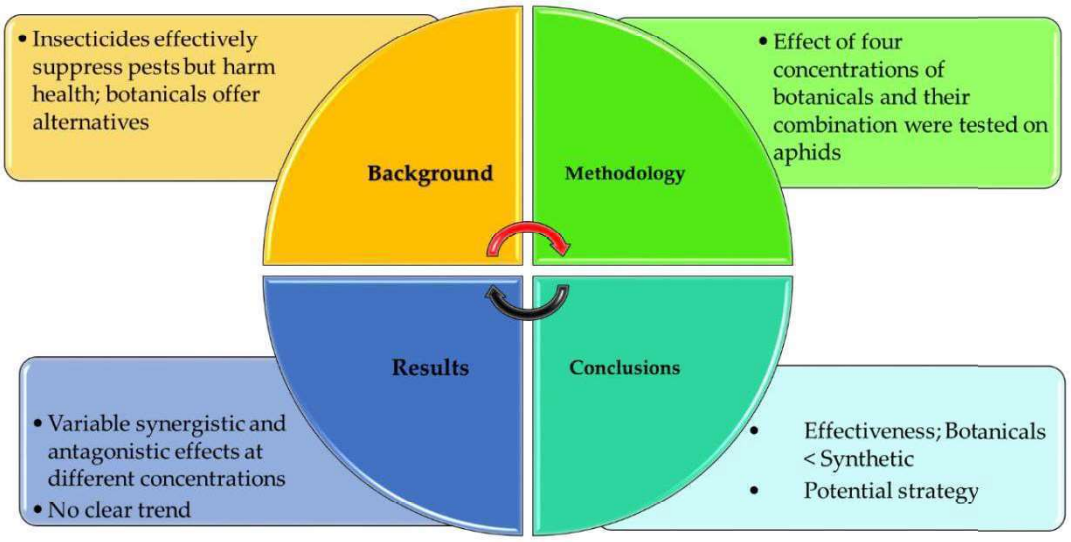
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Efficacy of Selected Botanicals against Aphid (*Myzus persicae*) in Laboratory Conditions

T. D. V. THALAGALA* and K. S. HEMACHANDRA
*Corresponding Author: devrangat@agri.pdn.ac.lk

Control insect populations using insecticides pose a significant risk to human health and environmental sustainability; hence, demands alternate approaches. This study evaluated the efficacy of three botanical extracts; Neem (N), *Azadirachta indica* (T_1), West-Indian lantana (L), *Lantana camara* (T_2) and Malabar Nut (M), *Adhatoda vasica* (T_3) and their combinations against aphids (*Myzus persicae)*, compared to a synthetic insecticide, Thiocyclam-50% (w/w) SP (Evisect S) (T_8). Leaves of L and M, and N seeds were air-dried and ground. Botanical powder was soaked in 50 ml of water for 24 hours to prepare 1, 10, 30, and 50% concentrations for evaluation. Botanical combinations were prepared taking equal proportions of N:L (T_4), N:M (T_5), M:L (T_6), N:M:L (T_7). Water was used as control. Efficacy was evaluated by introducing 1 ml of the botanical solution onto filter paper in a petri dish, followed by the introduction of 30 aphids from laboratory reared culture. Mortality was measured after 24 hours. Significant difference ($P < .05$) was found in corrected mortality among treatments. The mean corrected mortalities for the treatments ranged from 26.4±4.5 to 60.6±1.7, with Thiocyclam achieving the highest mortality rate. T_1, T_2 and T_3 exhibited increasing mortality 13.4-40.6%, 7.1-64.6% and 4.5-61.5%, respectively with increasing concentrations. The interaction between concentration and treatment was significant ($P < .05$), revealing variable synergistic and antagonistic effects among combinations, and no clear trend was detected. Although botanicals are less effective, it has potential to use in ecological pest management, promoting sustainable agricultural practices and minimizing adverse impacts on human and environmental health.

KEYWORDS: Botanical extracts, Combinations, Concentrations, Corrected mortality, *Myzus persicae*



Department of Agricultural Biology, Faculty of Agriculture, University of Peradeniya, Sri Lanka

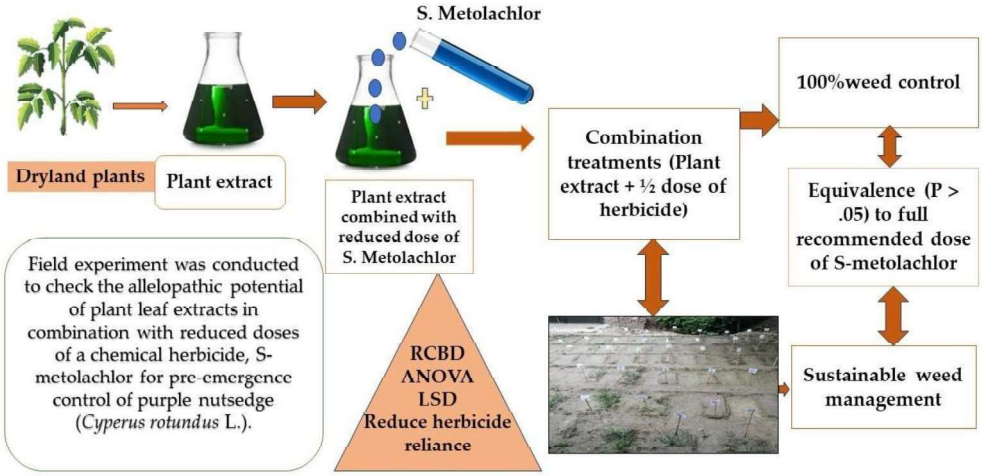
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Allelopathic Potential of Dryland Plant Extracts Combined with Reduced Herbicide Dose as Pre-emergence Application against Purple Nutsedge (*Cyperus rotundus* L.)

J. IQBAL[1*], S. AIMEN[2], A. AZIZ[2] and M. H. JAVAID[3]
*Corresponding Author: jiqbal@gudgk.edu.pk

Plants grown under drought conditions have strong allelopathic potential and can be used as herbicides against weeds. A study was conducted to assess the allelopathic potential of dry land plant leaf extracts combined with reduced doses of weedicide, S-metolachlor for pre-emergence control of purple nutsedge. Five dryland plant species *Rhazya stricta*, *Fagonia indica*, *Haloxylon salicornicum*, *Capparis decidua*, and *Leptadenia pyrotechnica* were assessed in a Randomized Complete Block Design (RCBD) having three replications under field condition (without cropped area). The data were analyzed using ANOVA and treatments were separated by LSD test at 5% probability level. In this study, pre-emergence applications of a combined treatment comprising plant extract formulations and a 50% reduced dose of S-metolachlor demonstrated complete suppression of purple nutsedge emergence throughout the experimental period. This treatment regimen achieved 100% control efficacy, exhibiting statistical equivalence ($P > .05$) to the full dose of S-metolachlor (S-metolachlor: 2.15 kg a.i. ha^{-1} recommended). Among the plant species, *H. salicornicum* followed by *R. stricta* and *L. pyrotechnica* respectively demonstrated significantly higher inhibition when they were applied alone in comparison to half dose of the S-metolachlor. Significant reduction in root, shoot length and root, shoot fresh and dry weights, plant and tuber density was observed in sole applications of all plant extracts compared to the control. Notably, plant extract combinations with a half dose of S-metolachlor were significantly effective than the herbicide applied at half dose, The study highlighted the efficacy of allelopathic plant extracts combined with reduced herbicide doses for weed-suppressing potential.

KEYWORDS: Allelopathy, Dryland plants, Purple nutsedge, S-metolachlor, Sustainable weed management



[1]*Department of Agronomy, Ghazi University, Dera Ghazi Khan, Punjab, Pakistan;* [2]*Department of Botany, The Women University Multan, Punjab, Pakistan;* [3]*Department of Soil and Environmental Sciences, Ghazi University, Dera Ghazi Khan, Punjab, Pakistan*

ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Application of Soft Computing Techniques for Soil Salinity Estimation in Native Paddy Cultivation of Sri Lanka

K. C. M. C. PREMATHILAKE and U. S. PREMARATHNE*
*Corresponding Author: uspre@ou.ac.lk

Rice production is a primary economic contributor to the agrarian lifestyle of Sri Lanka. Maintaining accuracy of soil salinity measurements in paddy cultivation is an important consideration. This research paper investigated two aspects. First, accuracy of soils conductivity measurements using Wenner array with different electrodes and configurations were compared. Second, soft-computing techniques were used to validate variations in selected salinity computations from the studied fields based on Wenner array measurement setups. Over 500 clay soil samples were collected randomly from paddy fields in Kegalle, Anuradhapura, Ratnapura, Jaffna and Colombo. Calibrations of Wenner array configurations were done based on the initial conductivity measurements. Conductivity measurements were used to estimate the salinity values using standard conversion models. Error distributions of the conductivity measurements for samples from different regions were calculated and adjusted. K-means clustering algorithm revealed three patterns considering the conductivity measurements, corresponding salinity values computed and estimated salinity values. A web-based tool was developed to compute salinity versus crop selection and tested for 500 sample inputs. These results are useful to make informed decisions in selecting salinity resilient native rice varieties for agricultural practitioners in Sri Lanka.

KEYWORDS: Clustering, Native rice crops, Soil conductivity, Soil salinity, Wenner array measurements


```
import matplotlib.pyplot as plt
from sklearn.cluster import KMeans
from sklearn.preprocessing import LabelEncoder
from sklearn.preprocessing import MinMaxScaler
wenner_data = pd.read_csv('/content/Classification Data.csv'
)
    wenner_data
    wenner_data.shape
    wenner_data.info()
    Label_encode = LabelEncoder()
    labels = Label_encode.fit_transform(wenner_data.Sample
_Area)
    wenner_data['sample Area'] = labels

    wenner_data_drop = wenner_data.drop(['Sample_Area'], a
xis=1)
    wenner_data_drop.head()
    X = wenner_data_drop.iloc[:,[4,1]].values
    print(X)
    #Standardize data
    scaler = MinMaxScaler()
    scaler.fit(X)

    X_standardized = scaler.transform(X)

    print(X_standardized)
    wcss = []

    for i in range(1,11):
      kmeans = KMeans(n_clusters=i, init = 'k-
means++', random_state= 42)
      kmeans.fit(X_standardized)
```

Department of Electrical and Computer Engineering, Faculty of Engineering Technology, The Open University of Sri Lanka, Sri Lanka

ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Chemical Nutrient Status of Soils in Different Drainage Blocks in Research Farm at Puliyankulama, Anuradhapura, Sri Lanka

M. D. S. SILVA* and D. M. S. DUMINDA
*Corresponding Author: dsawumya98@gmail.com

Soil fertility evaluation provides a comprehensive understanding of the major soil characteristics of arable land with a quantitative estimate of nutrients for better cultivation. This soil fertility survey was conducted in Alfisols to investigate the initial major soil chemical characteristics in different drainage blocks of the research farm where the soil study had not been conducted at Puliyankulama in Anuradhapura district. Soil samples were collected from the surface (0–15 cm) and subsurface (15–30 cm) soil just before land preparation from different blocks of land representing well-drained (block 1), moderately drained (block 2), and poorly drained (block 3) drainage classes where the land had not been cultivated for many years. Soil chemical characteristics were studied using standard analytical procedures. Data analysis was done using ANOVA procedure. Soil exchangeable K, organic carbon and exchangeable Na were significantly varied ($P < .05$) between block two and block one. Soil total N, ammonium N, exchangeable Ca, cation exchangeable capacity (CEC), total P and available N were significantly different ($P < .05$) between block two and block three. Soil pH, Mg and Zn were significantly different ($P < .05$) between block one and block three. Soil total P, Mg, Zn and total K were significantly greater ($P < .05$) in subsurface soil than in surface soil. Soil total P, available N, ammonium N, exchangeable Ca and CEC were significantly greater ($P < .05$) in block three than in block two. Block three and block one drainage classes depicted comparatively greater fertility status than block two referring to major soil fertility parameters.

KEYWORDS: Soil analysis, Soil drainage, Soil fertility, Soil nutrients, Soil properties

- Study area - Research Farm at Puliyankulama, Anuradhapura
- Problem –fertility status was not found before the cultivation.
- Objective - To study the chemical characteristics of the Alfisols soil of the research farm according to the drainage level of the land

Property \ Drainage Classes	Well drain (block 01)	Moderately drain (block 02)	Poorly drain (block 03)
pH	6.8 b	6.97 ab	7.31 a
EC (dS/m)	0.08 a	0.10 a	0.08 a
CEC (cmol/kg)	12.25 ab	11.24 b	13.05 a
available nitrogen (mg/kg)	29.80 ab	24.56 b	36.14 a
total nitrogen %	0.17 ab	0.20 a	0.15 b
nitrate nitrogen (mg/kg)	7.68 a	8.70 a	11.24 a
ammonium nitrogen (mg/kg)	18.41 ab	14.82 b	24.02 a
available phosphorus (mg/kg)	19.65 a	10.57 a	13.07 a
total phosphorus (mg/kg)	383.05 ab	275.29 b	507.15 a
exchangeable potassium (mg/kg)	75.20 a	42.10 b	58.43 ab
total potassium (mg/kg)	468.59 a	294.27 a	382.36 a
exchangeable calcium (mg/kg)	663.27 ab	546.53 b	883.43 a
organic matter %	2.14 a	1.21 b	1.95 ab

Property \ soil depth	Surface (0-15cm)	Subsurface (15-30 cm)
pH	7.02 a	7.03 a
EC (dS/m)	0.09 a	0.08 a
CEC (cmol/kg)	12.12 a	12.39 a
available nitrogen (mg/kg)	29.58 a	30.75 a
total nitrogen %	0.19 a	0.18 a
nitrate nitrogen (mg/kg)	9.63 a	8.11 a
ammonium nitrogen (mg/kg)	18.24 a	21.25 a
available phosphorus (mg/kg)	14.48 a	14.38 a
total phosphorus (mg/kg)	277.62 b	443.37 a
exchangeable potassium (mg/kg)	75.40 a	53.73 b
total potassium (mg/kg)	260.40 b	463.07 a
exchangeable calcium (mg/kg)	830.82 a	779.64 a
organic matter %	1.93 a	1.17 b

Conclusion

- Block 3 and block 1 drainage classes depicted comparatively greater fertility status than block 2 referring to major soil fertility parameters.

Department of Agricultural Engineering and Soil Science, Faculty of Agriculture, Rajarata University of Sri Lanka, Puliyankulama Anuradhapura, Sri Lanka

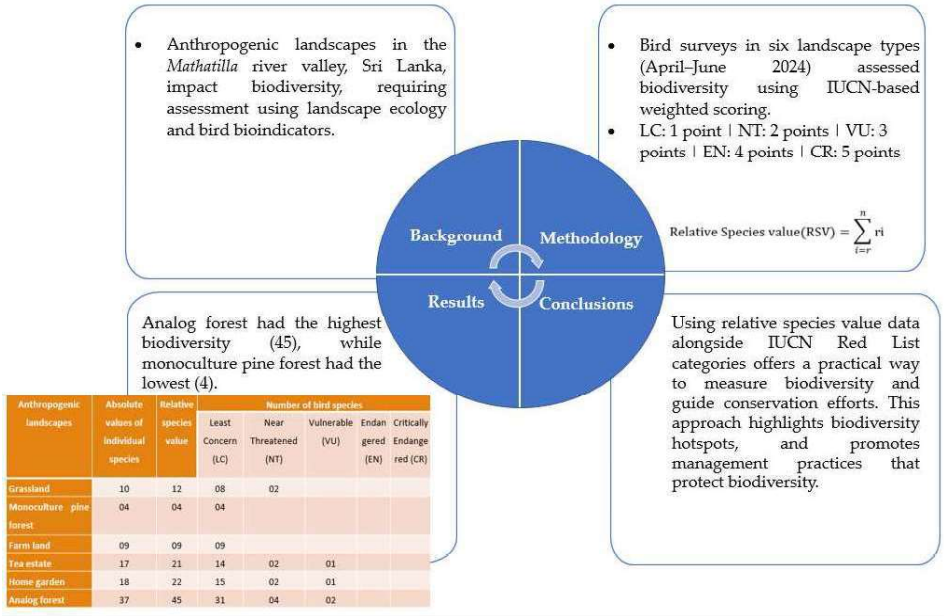
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Assessing Bird Biodiversity and Ecological Significance across Anthropogenic Landscapes in the *Mathatilla* River Valley, Sri Lanka

H. N. CHATHURANGA[1,2*], F. R. SENANAYAKE[2,3], K. M. V. SANKALANA[2],
M. K. L. CHANDANA[2] and D. De ZOYSA[2,3]
*Corresponding Author: nchedigalla@gmail.com

Birds play crucial roles in ecosystems. This study explores the bird biodiversity of anthropogenic landscapes in the *Mathatilla* River Valley, Sri Lanka, using the principles of landscape ecology and seral representation. Six landscape types were investigated including analog forest, monoculture pine forest, grassland, home garden, farmland, and tea estate to assess their relative species value and ecological significance. Bird biodiversity was selected as an indicator of overall ecosystem health due to its vital roles in ecological processes. Bird surveys were conducted from April to June 2024 using the point count method, where observers recorded all species seen or heard within a 25 x 25 m^2 area for 10 minutes. Relative species value was calculated based on recorded species and their IUCN Red List status, employing a weighted scoring system: Least Concern (LC): 1 point, Near Threatened (NT): 2 points, Vulnerable (VU): 3 points, Endangered (EN): 4 points, and Critically Endangered (CR): 5 points. Results revealed significant biodiversity variations, with analog forest showing the highest relative species value (45), followed by home garden (22), tea estate (21), grassland (12), farmland (9), and monoculture pine forest (4). These findings provide concrete guidance for developing standardized biodiversity recording and monitoring systems tailored to anthropogenic landscapes. The study highlights the role of bird biodiversity as an ecological indicator, offering a framework for assessing habitat quality, ecosystem succession, and conservation priorities. The insights gained can directly inform policy-making, habitat restoration strategies, and land-use planning, ensuring more effective protection and rehabilitation of flora and fauna across diverse landscapes.

KEYWORDS: Anthropogenic landscapes, Biodiversity monitoring, Bird diversity, Ecosystem succession



Anthropogenic landscapes	Absolute values of individual species	Relative species value	Number of bird species				
			Least Concern (LC)	Near Threatened (NT)	Vulnerable (VU)	Endangered (EN)	Critically Endangered (CR)
Grassland	10	12	08	02			
Monoculture pine forest	04	04	04				
Farm land	09	09	09				
Tea estate	17	21	14	02	01		
Home garden	18	22	15	02	01		
Analog forest	37	45	31	04	02		

[1]*Postgraduate Institute of Agriculture, University of Peradeniya, Sri Lanka;* [2]*Earthrestoration (PVT) Ltd., Sri Lanka;* [3]*AQUAE Lab (PVT) Ltd., Singapore*

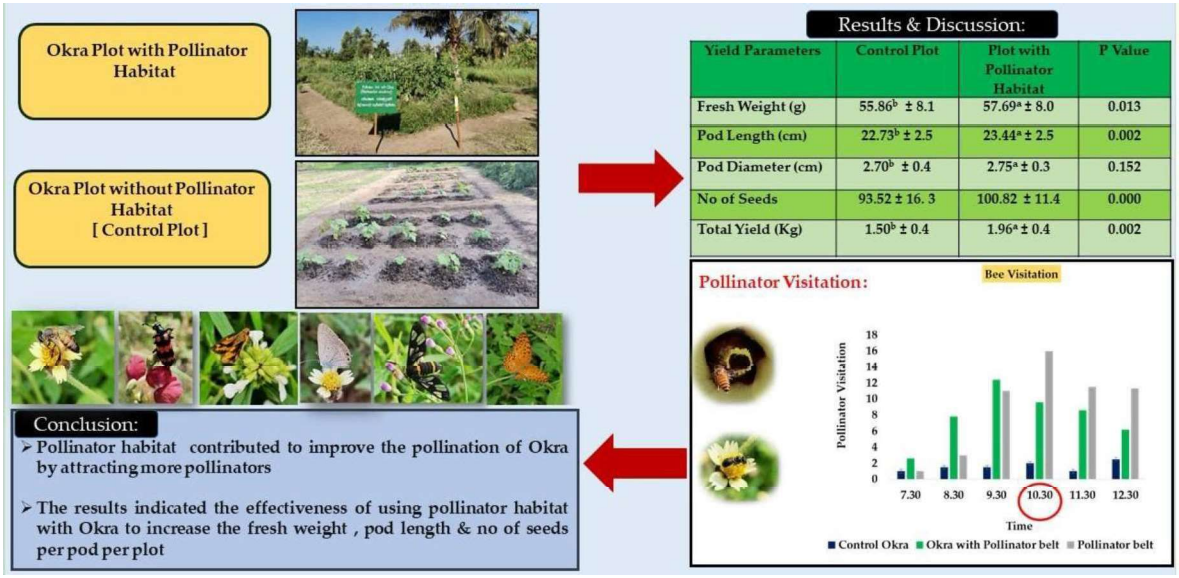
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Enhancing Okra (*Abelmoschus esculentus* L.) Production through a Pollinator Habitat

W. B. U. KUSUMSIRI, K. YAKANDAWALA*, A. D. M. A. K. WIJETUNGA and H. M. D. N. HERATH
*Corresponding Author: kapilay@wyb.ac.lk

A pollinator habitat is an environment designed to support pollinators and other beneficial insects. It typically includes a diverse range of flowering plants that provide nectar and pollen, nesting sites and minimal pesticide exposure. This concept could be promoted in pollinator-dependent crops to enhance the yield. The yield of okra (*Abelmoschus esculentus* L.), both a self and cross-pollinating crop, could be enhanced through a pollinator support system. Hence, the current study investigates the effect of pollinator habitat on the yield of okra. Two okra plots were established, one with pollinator habitat, comprising wild plants and another with only okra plants. During the peak flowering stage of okra and pollinator habitat, pollinator visitation was recorded within 14 days. The yield and other yield related parameters of okra were measured throughout the cropping period. Yield data were analysed by using Welch's t-test, and the pollinator visitation was analysed by using one-way ANOVA, and mean separation was done by using the LSD test. The data analysis was done in R studio. The okra plot associated with a pollinator habitat attracted a higher number of pollinators compared to the control. *Apis cerana* and *Tetragonula iridipennis* were recognized as the pollinator bees of okra. A significantly high fresh weight, pod length, number of seeds and total yield were recorded in the okra plot associated with a pollinator habitat compared to the control plot. Hence, a pollinator habitat could be recommended to incorporate into okra plots to increase the quality and quantity of okra yield.

KEYWORDS: *Apis cerana*, Okra, Pollinator habitat, *Tetragonula iridipennis*, Yield parameters



Department of Horticulture and Landscape Gardening, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka, Makandura, Gonawila, Sri Lanka

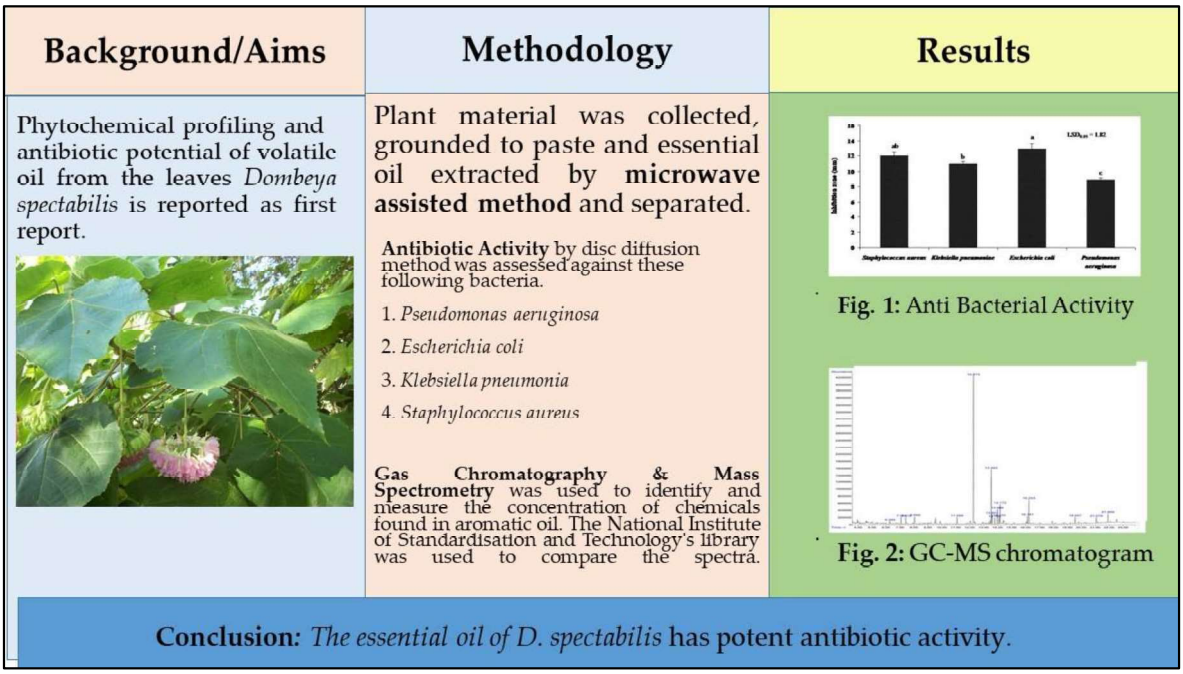
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Phytochemical Profiling and Antibacterial Activity of Essential Oil of *Dombeya spectabilis* Leaves from Pakistan

M. F. H. FERDOSI[1*] and A. JAVAID[2]
*Corresponding Author: fiaz.iags@pu.edu.pk

This study was carried out with the objectives to assess antibacterial activity and to study the chemical profile of essential oil from leaves of *Dombeya spectabilis*. This is the first report as per of our knowledge on such an experiment. The aromatic oil was extracted from leaves by microwave assisted method that yielded 0.24% oil. The disc diffusion method was applied for the antibiotic study. The plates were incubated for 24 hours at 37 °C and inhibition zones were recorded. Four bacterial species namely *Klebsiella pneumoniae, Escherichia coli, Staphylococcus aureus* and *Pseudomonas aeruginosa* were selected to assess the antibacterial activity. As per findings the *K. pneumoniae* and *E. coli* were the most susceptible bacterial species with 12 mm zone of inhibition each followed by *Staphylococcus aureus* (11 mm) and *Pseudomonas aeruginosa* (10 mm). GC-MS analysis showed the presence of 15 compounds in the oil. Pentadecanal was the predominant component with 42.99% peak area followed by neophytadiene (13.27%), phytol (7.79%) and butyl 9,12,15-octadecatrienoate (6.99%). Other important compounds included α-Ionone (2.12%), 2-methoxy-4-vinylphenol (2.38%), naphthalene, 1,2-dihydro-1,1,6-trimethyl- (2.65%), tetradecanal (2.36%), 3,7,11,15-tetramethylhexadec-2-ene (2.44%), and squalene (2.69%). From the above reported findings, it is concluded that the essential oil of *D. spectabilis* has potent antibiotic activity.

KEYWORDS: Antimicrobial activity, *Dombeya spectabilis*, Essential oil



Acknowledgement: Financial assistance by the University of the Punjab, Lahore, Pakistan

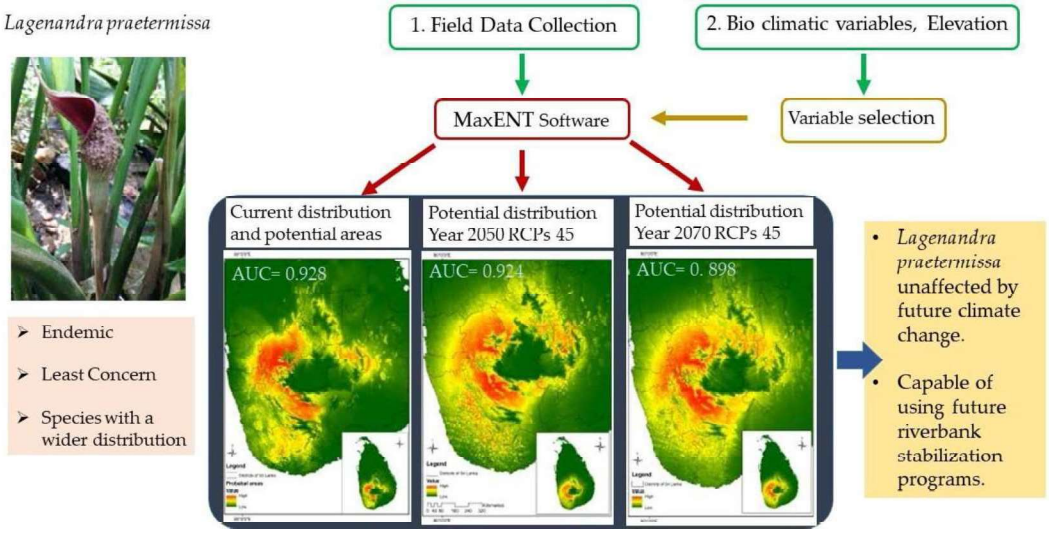
[1]Department of Horticulture, Faculty of Agricultural Sciences, University of the Punjab, Quaid-i-Azam Campus, Lahore, Pakistan; [2]Department of Plant Pathology, Faculty of Agricultural Sciences, University of the Punjab, Quaid-i-Azam Campus, Lahore, Pakistan

Predicting Climate Change Impact on *Lagenandra praetermissa* Distribution

I. MADOLA[1], K. YAKANDAWALA[1*], S. B. KARUNARATHNE[2] and D. M. D. YAKANDAWALA[3]
*Corresponding Author: kapilay@wyb.ac.lk

Lagenandra praetermissa de Wit (Araceae) is an endemic plant, listed as 'Least Concerned' in the National Red List (2020), due to its wider distribution. Although at present it has a wide distribution, future climate shifts and waterway changes may significantly impact the species. Hence, the present study was conducted to identify potential areas of occurrence and future distribution for *L. praetermissa* using species distribution modelling. Field visits were conducted from 2018-2024, exploring new locations. Modelling was done using MaxENT software with occurrence localities, bioclimatic variables and elevation. The modelling was done based on future climate in ACCESS1-0 2050 and 2070 based on RCPs 45. Data points were tested with 10000 background points, 5000 maximum iterations, 25 random test percentages and 15 replicates. The model achieved a high accuracy with an Area under the Curve (AUC) of 0.93. The highest contribution to the model was recorded by BIO9 (38.8%) and BIO19 (22.9%). The resulting model revealed that the highest probability of occurrences for the present-day climate is in Kegalle and Ratnapura districts. With AUC values of 0.924 and 0.898 in 2050 and 2070, respectively, the model predicts future expansion of suitable habitats for the species. Highest contribution to the model in both 2050 and 2070 by BIO9 32.6% and 40.5% respectively and is based on temperature bioclimatic variable. As this species remains unaffected by future climate change, it could be recommended for future riverbank stabilization programs as *L. praetermissa* is capable of protecting river banks from erosion.

KEYWORDS: Climate change, Conservation, MaxENT, Species distribution modelling



Acknowledgement: Financial assistance by Peradeniya University Research Grant through the grant ID URG/2022/57/S and the Forest Department of Sri Lanka

[1]Department of Horticulture and Landscape Gardening, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka; [2]Agriculture and Food, CSIRO, Australia; [3] Department of Botany,Faculty of Science, University of Peradeniya, Sri Lanka

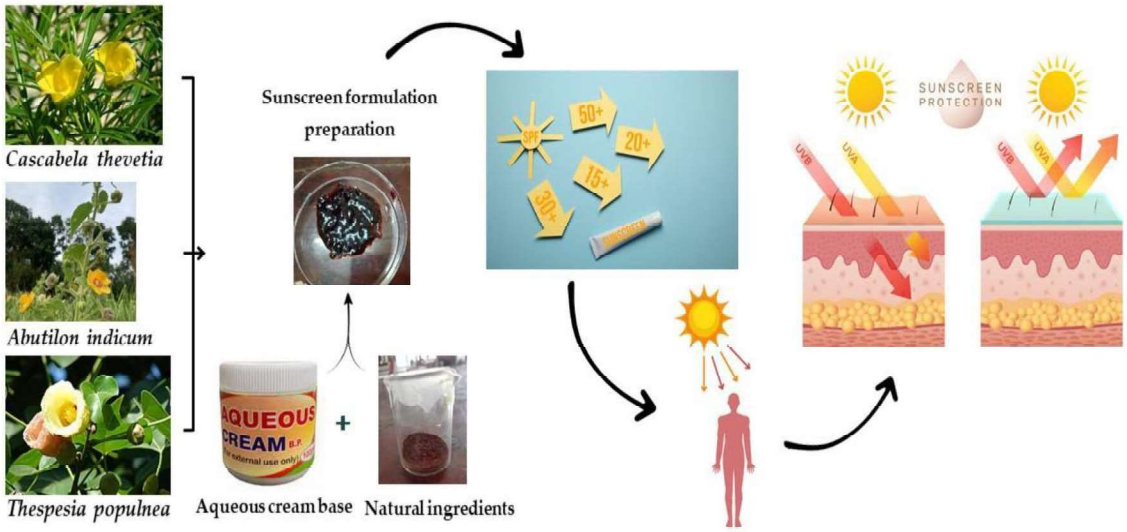
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Evaluation of Phenol Content and Development of Herbal Sunscreen Formulations using *Thespesia populnea* (L.) *Sol. ex Corrêa*, *Cascabela thevetia* (L.) Lippold and *Abutilon indicum* (L.) Sweet

M. R. F. NIFLA and T. MANORANJAN*
*Corresponding Author: tmranjan@univ.jfn.ac.lk

The present study aimed at developing herbal sunscreen formulations from flowers of *Thespesia populnea (L.) Sol. ex Corrêa* and *Cascabela thevetia* (L.) Lippold and leaves of *Abutilon indicum* (L.) Sweet. Total phenolic content was determined by the Folin-Ciocalteu method and the UV filtering potency and subsequently, the sun protection factor (SPF) in the methanolic extract of above plants were determined. Thereafter, this extract was incorporated into the aqueous cream base at 25%, 50%, and 75% (w/w) and the SPF values of the prepared formulations were evaluated. The methanolic flower extract of *T. populnea* had the highest total phenolic content (244.814 mg Gallic Acid Equivalent (GAE)/g ± 0.0045); while the flower extract of *C. thevetia* had the lowest content (32.718 mg GAE/g ± 0.0019). The initial SPF value of the crude flower extract of *T. populnea* (37.56 ± 0.33) had hardly changed even after incorporating it at 75% into the aqueous cream base. This 75% formulation surpassed the other two formulations and the commercial sunscreen (positive control) in terms of the higher SPF and broader spectrum of UV absorption. Its SPF value altered only slightly during the storage for 21 days in light conditions and was photostable. Preliminary observations demonstrated the appropriateness of *T. populnea* for the formulation of herbal sunscreens at the commercial stage.

KEYWORDS: Herbal sunscreens, Photostability, Sun protection factor, *Thespesia populnea*, UV radiation



Acknowledgement: Financial assistance by the Department of Chemistry, Faculty of Science, University of Jaffna, Sri Lanka

Department of Chemistry, Faculty of Science, University of Jaffna, Sri Lanka

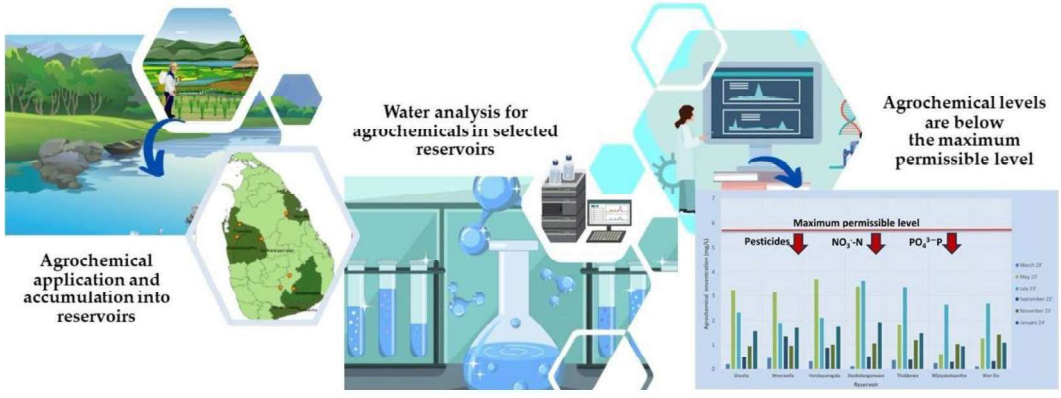
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Potential Agrochemical Pollution in Selected Dry Zone Reservoirs in Sri Lanka

D. T. LAKCHANI[1], U. A. D. JAYASINGHE[1]*, R. A. MAITHREEPALA[1] and U. ULRICH[2]
*Corresponding Author: asanka@fish.ruh.ac.lk

In Sri Lanka, freshwater reservoirs act as the backbone of agricultural and aquacultural economy while ensuring stable water supply for hydropower plants, drinking and industrial uses and supporting wildlife. Accumulation of agrochemical pollutants in reservoirs may lower the water quality with potential health effects to human This study aimed to evaluate the agrochemical contamination in seven dry zone reservoirs in Sri Lanka: Weerawila, Handapanagala, Urusita, Thabbowa, Vijayakatupotha, Siyabalangamuwa and Wan Ela. Water samples (n=210) were collected from April 2023 to March 2024 using a Ruttner sampler and analysed for pesticides and nutrients. Out of ten selected pesticides five were detected: in decreasing order MCPA>azardirachtin A>emamectin benzoate> thiamethoxam>fipronil using High Performance Liquid Chromatography. The rest: chlorpyrifos, diazinon, etofenprox, fenoxaprop-p-ethyl and profenofos were not detected. Nutrients were determined using the UV-visible spectroscopy. Pesticide (0.001–0.39 µg/L) and nutrient (nitrate: 0.10–3.71 mg/L and phosphate: 0.05–0.22 mg/L) concentrations were below the tolerance limits as per World Health Organization and Food and Agriculture Organization requirements (pesticides: 5 µg/L, nitrate: 10 mg/L and phosphate: 0.4 mg/L). No significant differences (One-way ANOVA: $P > .05$) were observed within pesticides and nitrogen levels among reservoirs. Phosphate levels in reservoirs were significantly different ($P < .05$). Pesticide contaminations varied throughout the year with elevated levels observed in the rainy season. Though low levels of agrochemical contamination were observed in the selected reservoirs, sustainable agricultural practices and regular water quality assessments are recommended to maintaining the ecosystem stability for healthier promotion of inland fisheries and other water uses.

KEYWORDS: Agrarian reservoirs, Dry zone, Fertilizers, Pesticides, Sri Lanka



Acknowledgement: Financial assistance by the Australian Centre for International Agricultural Research (ACIAR/FIS/2018/157) and the Institute for Natural Resource Conservation, Kiel University, Germany

[1]Department of Limnology and Water Technology, Faculty of Fisheries and Marine Sciences and Technology, University of Ruhuna, Sri Lanka; [2]Institute for Natural Resource Conservation, Department of Hydrology and Water Resources Management, Kiel University, Germany

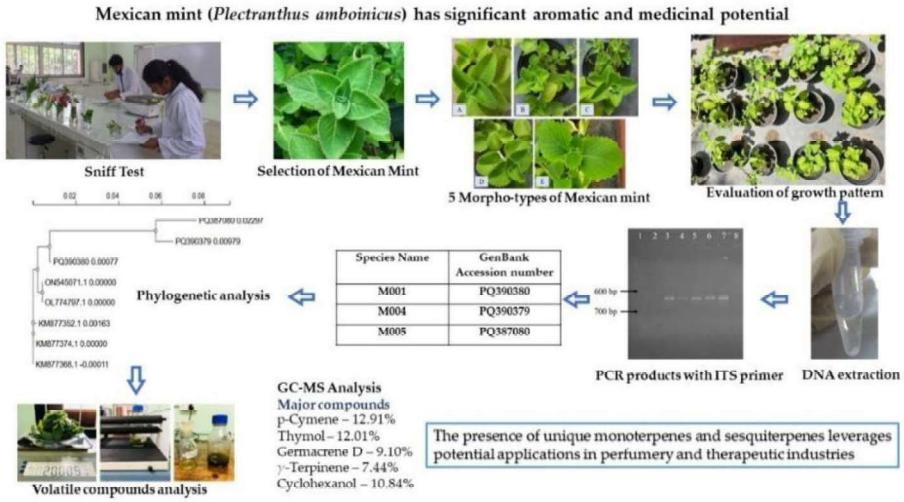
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Characterization of Aromatic, Morphological, and Genetic Diversity in Mexican Mint (*Plectranthus amboinicus*) for Sustainable Fragrance and Medicinal Applications

C. M. ANUSHIKA[1*], S. TERENSAN[1] and K. GAJAPATHY[2]
*Corresponding Author: manushika25@gmail.com

Mexican mint (*Plectranthus amboinicus*), an aromatic and medicinal herb from the family Lamiaceae, holds immense potential for the fragrance and pharmaceutical industries. As an indigenous plant, its utilization aligns with sustainable and eco-friendly agricultural practices. This study evaluated its aromatic, morphological, and genetic diversity to support its sustainable use and value-added applications. An initial sniff test of 38 aromatic plants from home gardens and public markets in Jaffna, Mullaitivu, and Kilinochchi ranked Mexican mint highly in aroma preference and intensity. Five distinct morphotypes were identified and coded as M001, M002, M003, M004, and M005 based on morphological traits such as leaf margin type and dentation count. Three morphotypes (M001, M004, M005) with higher aroma intensity were selected for molecular analysis. Internal Transcribed Spacer (ITS) markers confirmed species identity and genetic diversity. Phylogenetic analysis of Sri Lankan sequences (GenBank: PQ387080, PQ390379, PQ390380) revealed unique genetic traits compared to Indian and Indonesian sequences. Sequence PQ390380 from Jaffna, exhibited a distinct grouping pattern, indicating local adaptations. M001, the morphotype with the highest aroma, underwent GC-MS analysis, identifying 28 volatile organic compounds (VOCs), including *p*-Cymene (12.91%), Thymol (12.01%), Cyclohexanol (10.84%), and Gamma-Terpinene (7.44%). These compounds, linked to antimicrobial, anti-inflammatory, and antioxidant properties, highlight the plant's therapeutic potential. The unique chemical composition of *P. amboinicus* suggests broader pharmacological applications. Its indigenous status, genetic, and aromatic diversity support selective breeding, essential oil production, and eco-friendly agriculture, contributing to the sustainable utilization of local plant resources.

KEYWORDS: GC-MS analysis, Genetic diversity, Morphological diversity, *Plectranthus amboinicus*, Volatile organic compounds



[1]*Department of Agricultural Biology, Faculty of Agriculture, University of Jaffna, Sri Lanka;* [2]*Department of Zoology, Faculty of Science, University of Jaffna, Sri Lanka*

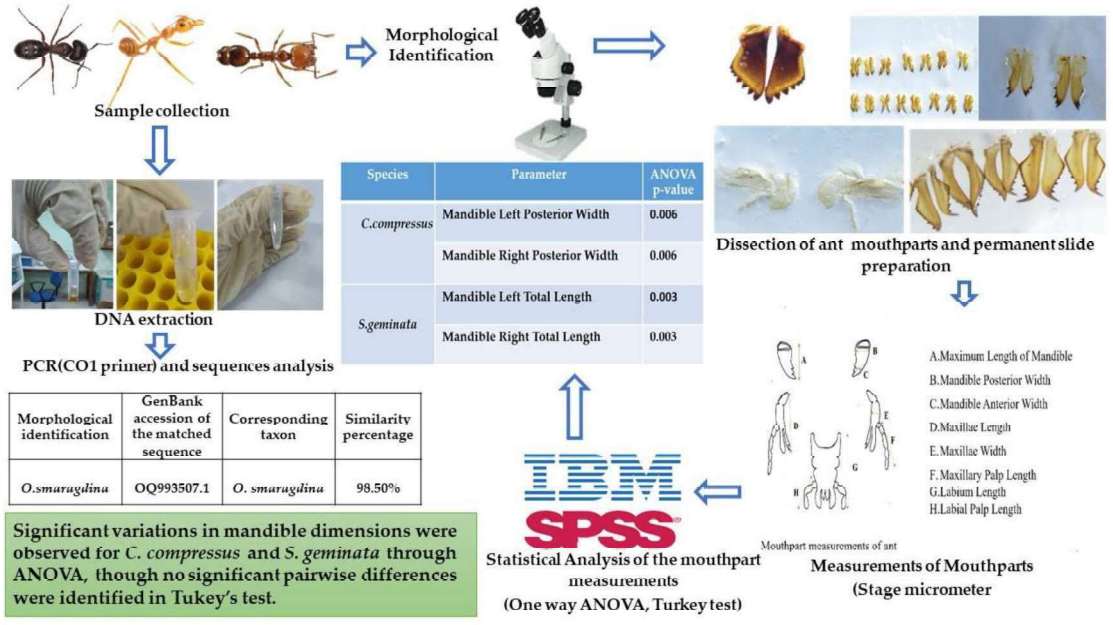
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Morphological and Molecular Analysis of Ant Mouthparts to Explore Functional and Evolutionary Adaptations

T. SULAKSHANA[1], S. TERENSAN[1] and K. GAJAPATHY[2*]
*Corresponding Author: sulakshanasulax@gmal.com

Ants are globally abundant insects that play vital roles in agriculture, acting as biological control agents by managing crop pests through their predatory behavior. They also enhance soil aeration, organic matter decomposition, and nutrient enrichment, contributing significantly to ecosystem functioning. This study evaluated the mouthpart structures of selected ant species (*Camponotus compressus*, *Oecophylla smaragdina*, and *Solenopsis geminata*) to identify structural modifications, functional adaptations, and their roles in food handling across castes. Ant samples were collected from fields in the Jaffna district, with climatic parameters recorded at each site. Morphological identification based on stereo dissection microscopic observations was followed by molecular confirmation of species using polymerase chain reaction (PCR) with universal cytochrome oxidase I (CO1) primers and DNA sequencing. Measurements of dissected mouthparts were recorded using a stage micrometer, and morphometric data were analysed using one-way analysis of variance (ANOVA) and Tukey's test. Morphometric analysis revealed caste-specific differences, with the largest mandibles found in major workers, followed by queens and males. Significant variations in mandible dimensions were observed for *C. compressus* and *S. geminata*, though no significant pairwise differences were identified. These findings highlight notable morphological adaptations linked to feeding behaviours and functional roles within colonies. Deviation in mandible measurements, i.e. mandible width in the right side was observed only in C. *compressus* when compared with previous studies. Understanding these morphological and functional adaptations will be useful for the development of agricultural pest management strategies for sustainable agriculture.

KEYWORDS: Agricultural pest management, Ant mouthparts, Molecular analysis, Morphological adaptations, Sustainable agriculture



[1]*Department of Agricultural Biology, Faculty of Agriculture, University of Jaffna, Sri Lanka;* [2]*Department of Zoology, Faculty of Science, University of Jaffna, Sri Lanka*

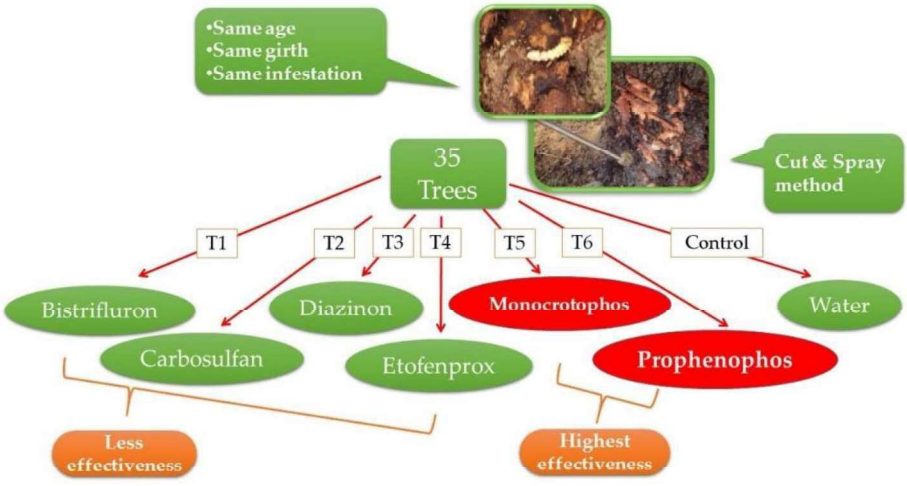
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Effectiveness of Insecticides for the Control of Cashew Stem and Root Borer (*Plocaederus ferrugineus* L.)

H. M. A. S. JAYAWARDANA[1*], P. M. A. P. K. WIJETUNGE[1],
H. L. A. N. T. LIYANARACHCHI[1], B. RANAWEERA[2] and W. WIJESURIYA[3]
*Corresponding Author: h.m.a.srikantha@gmail.com

Cashew Stem and Root Borer (CSRB) (*Plocaederus ferrugineus*) is a serious pest affecting cashew (*Anacardium occidentale*) plantations, causing severe damage by tunnelling into the tree stems and roots. This damage significantly impacts tree health, reducing yield and potentially leading to plant death. Traditional control measures, such as manual larval removal and application of burnt engine oil, have shown limited effectiveness. Hence, there is a necessity to investigate possible control measures against this insect. This study aimed to evaluate the effectiveness of six contact and systemic insecticides Bistrifluron, Carbosulfan, Diazinon, Etofenprox, Monocrotophos, and Prophenophos against *P. ferrugineus.* The experiment was conducted in a Completely Randomized Design (CRD) in Eluwankulama plantation of Sri Lanka Cashew Corporation. Selected trees with the same infestation were treated with insecticides at their recommended label concentrations using the cut-and-spray method. Larval counts were recorded after three months, and data were analysed using Analysis of Variance (ANOVA) followed by post-hoc Tukey's Honestly Significant Difference (HSD) test to determine treatment differences. Logistic regression was performed to assess the probability of larval mortality among the insecticide treatments. The results revealed significant differences between the treatments. Monocrotophos and Prophenophos had the highest efficacy, achieving larval mortality rates of 95.45% and 78.57%, respectively, while the other insecticides showed limited effectiveness. These findings highlight the potential of Monocrotophos and Prophenophos for pest control in cashew cultivation. Effective pest control can improve cashew productivity, reduce economic losses, and contribute to the growth of the agricultural sector, thereby enhancing the national economy.

KEYWORDS: Agricultural Productivity, Cashew, Cashew Stem and Root Borer, Insecticides, Pest Management



[1]Sri Lanka Cashew Corporation, Rajagiriya, Sri Lanka; [2]Department of Horticulture and Landscape Gardening, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka; [3]Rubber Research Institute of Sri Lanka, Agalawatta, Sri Lanka

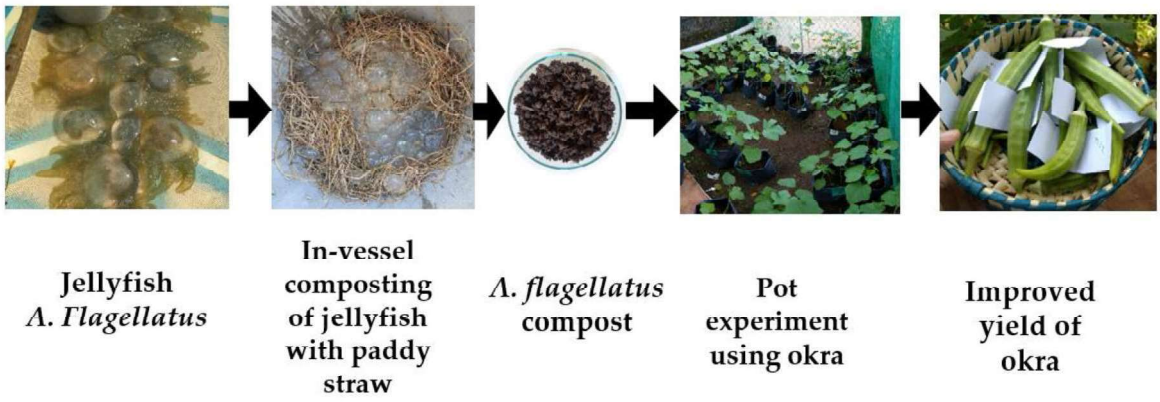
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Exploring the Potential Application of Jellyfish Blooms as an Organic Fertilizer

V. D. SAMARAWEERA[1]*, D. C. T. DISSANAYAKE[1] and S. H. N. P. DE SILVA[2]
*Corresponding Author: vishdulanji@gmail.com

Jellyfish blooms pose significant challenges to fisheries, tourism, and marine ecosystems by disrupting economic activities and ecological balance. Transforming these nuisance blooms into valuable products offers a sustainable solution to mitigate their negative impacts. This study explores the potential use of jellyfish blooms as an organic fertilizer. *Acromitus flagellatus*, frequently discarded from small-mesh gillnets, was collected from the Negombo fish landing site (7°6'53.442''N, 79°50'41.7156'E) between May and July 2023. Organic fertilizer was prepared using the in-vessel composting method by mixing jellyfish with paddy straw in a 1:3 (w/w) ratio. The physicochemical properties and fertility parameters of the compost (n=3) were analysed. A pot experiment (n=30) with okra (*Abelmoschus esculentus*) was used to assess compost effectiveness on plant growth and yield, using five treatments: three compost concentrations (10, 15, and 20 kg/ha), a commercial fertilizer (positive control) and untreated soil (negative control), each with six replicates. The jellyfish compost exhibited significantly higher moisture (69.30±0.25%), total nitrogen (0.93%), and total phosphate (0.2%) contents than commercial compost ($P < .05$). Okra plants treated with jellyfish fertilizer showed greater height over fifteen weeks (129.67±3.93 cm) than the positive control (121.00±15.18 cm; $p<0.05$). Similarly, jellyfish-treated plants reached 50% flowering in 48±4 days and showed higher dry matter production (11.76±0.21g) than the control (60.00±0.57 days; 9.85±2.77g, respectively; $P < .05$). Additionally, jellyfish-treated plants produced a higher average yield per plant (19±8 pods) than the control (11±7; $P < .05$). This study confirms the potential use of highly abundant but problematic jellyfish blooms as organic fertilizer, contributing to sustainable blue economy initiatives.

KEYWORDS: *Acromitus flagellatus*, Compost, Jellyfish, Okra



Acknowledgement: Financial assistance by the University of Sri Jayewardenepura through the grant ID ASP/01/RE/SCI/2022/33

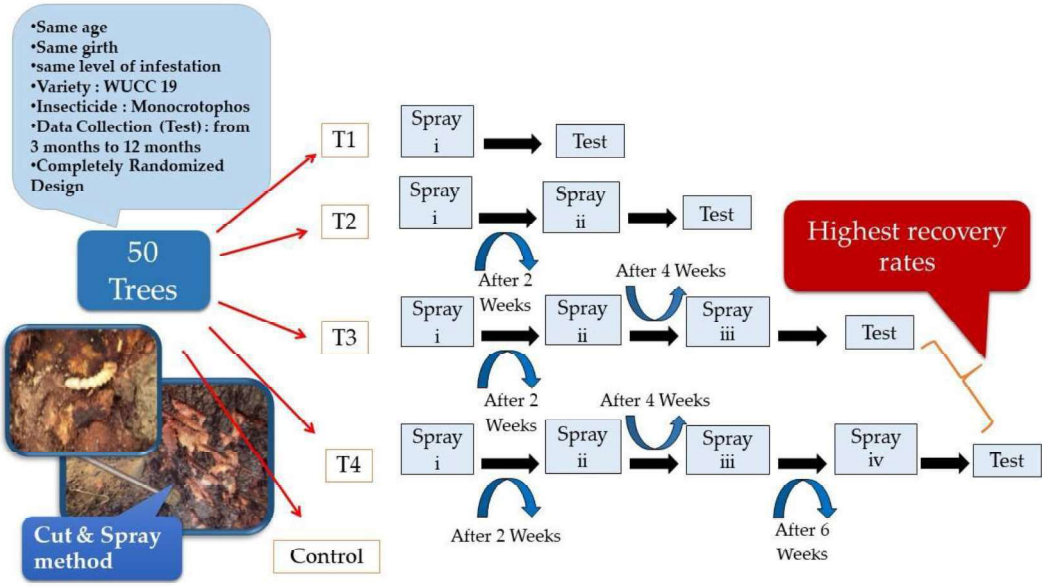
[1]Department of Zoology, University of Sri Jayewardenepura, Nugegoda, Sri Lanka; [2]Department of Crop Science, Faculty of Agriculture, University of Peradeniya, Sri Lanka

Efficacy of Application Frequency of Monocrotophos on Controlling *Plocaederus ferrugineus* L. in Cashew

H. M. A. S. JAYAWARDANA[1*], P. M. A. P. K. WIJETUNGE[1],
H. L. A. N. T. LIYANARACHCHI[1], B. RANAWEERA[2] and W. WIJESURIYA[3]
*Corresponding Author: h.m.a.srikantha@gmail.com

Cashew (*Anacardium occidentale* L.) is a significant cash crop, providing both economic and nutritional benefits worldwide, particularly in tropical regions. However, the infestation of the Cashew Stem and Root Borer (CSRB) (*Plocaederus ferrugineus* L.), a major pest, poses a substantial threat to cashew production, with losses reaching up to 40%. This study assesses the efficacy of application frequency of Monocrotophos 36% SL for CSRB control. Field experiments were conducted at the Puttalam plantation of Sri Lanka Cashew Corporation using a Completely Randomized Design with five treatment groups: one application, two applications at two-week intervals, three applications at two-week intervals, four applications at two-week intervals, and an untreated control. Each treatment was replicated 10 times on cashew trees of the variety WUCC 19 of uniform age, infestation severity, and girth. Monocrotophos was applied via the cut-and-spray method at a concentration of 3 ml per liter (0.3% v/v), with a total application volume of 2.5 l per tree. Recovery, measured based on bark regeneration, and reduction in active borer tunnels, was assessed over 12 months. Statistical analysis revealed significant differences among treatments ($P < .05$). Trees that received three and four applications had the highest recovery, showing substantial improvement in overall tree health. However, there was no statistically significant difference between these two treatment groups ($P > .05$), demonstrating that three applications are sufficient for effective pest control. The untreated control group exhibited minimal recovery, underscoring the necessity of chemical intervention. These findings provide critical insights into optimizing CSRB management strategies for sustainable cashew production.

KEYWORDS: Cashew, Monocrotophos, Pest management, *Plocaederus ferrugineus*



[1]*Sri Lanka Cashew Corporation, Rajagiriya, Sri Lanka;* [2]*Department of Horticulture and Landscape Gardening, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka;* [3]*Rubber Research Institute of Sri Lanka, Agalawatta, Sri Lanka*

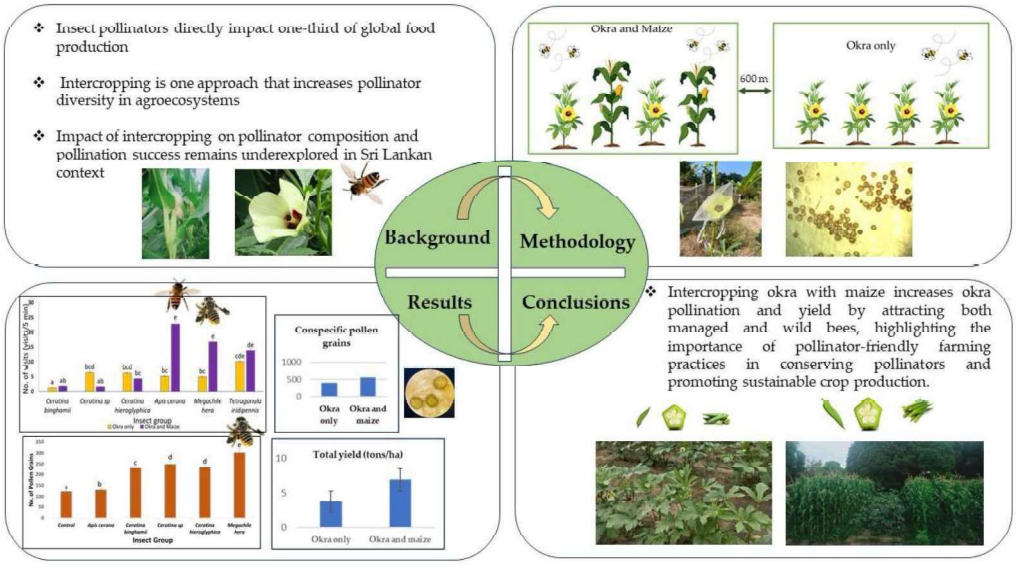
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Intercropping Increases Pollinator Visits, Conspecific Pollen Deposition, and Yield in Okra (*Abelmoschus esculentus)*

P. S. VIDANAPATHIRANA[1], S. A. E. C. WIJESINGHE[1*], D. JAYAMANNE[2] and H. P. M. DASANTHI[2]
*Corresponding Author: erandic@wyb.ac.lk

Insect pollinators directly impact one-third of global food production. Intercropping is one such approach that increases pollinator diversity by offering floral resources and habitats in agroecosystems. However, its impact on pollinator composition and pollination success remains underexplored in Sri Lanka. Hence, this study aimed to assess the impact of a maize-based intercropping system on pollinator visits and reproductive success of okra (*Abelmoschus esculentus* L.). In this study, two treatments were tested as okra monocrop and okra intercropped with maize, with three replicates in two locations. Insect visitation rates, pollination effectiveness, conspecific pollen deposition and yield of okra were recorded and statistically compared by performing generalized linear mixed effect models using R software. The composition of flower visitors and their visitation rates (11±7.01 visits/5 min) were significantly higher in the okra intercropped with maize compared to the monocropping plots (5±5.10 visits/5 min). Okra flowers were frequently visited by both honey bees (*Apis cerana* and *Tetragonula iridipennis*) and wild bees (*Megachile hera*, *Ceratina binghamii*, *Ceratina hieroglyphica*, and *Ceratina* spp.) where *M. hera* being the most effective, followed by *C. hieroglyphica*, in pollination. Okra stigmas were collected from intercropped plots denoted significantly higher number of conspecific pollen grains (566±38) than that of monocropping plots (392±22). Further, okra intercropped with maize exhibited significantly greater pod length, pod width, and overall yield compared to those in the monocrop plots. Thus, this study shows that intercropping okra with maize increases okra pollination and overall yield by attracting pollinators, emphasizing the role of pollinator-friendly practices in sustainable farming.

KEYWORDS: *Abelmoschus esculentus*, Conspecific pollen, Intercropping, Maize, Pollinators



[1]*Department of Horticulture and Landscape Gardening, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka, Makandura, Gonawila, Sri Lanka;* [2]*Sustainable Agriculture Research and Development Centre, Department of Agriculture, Makandura, Sri Lanka*

ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

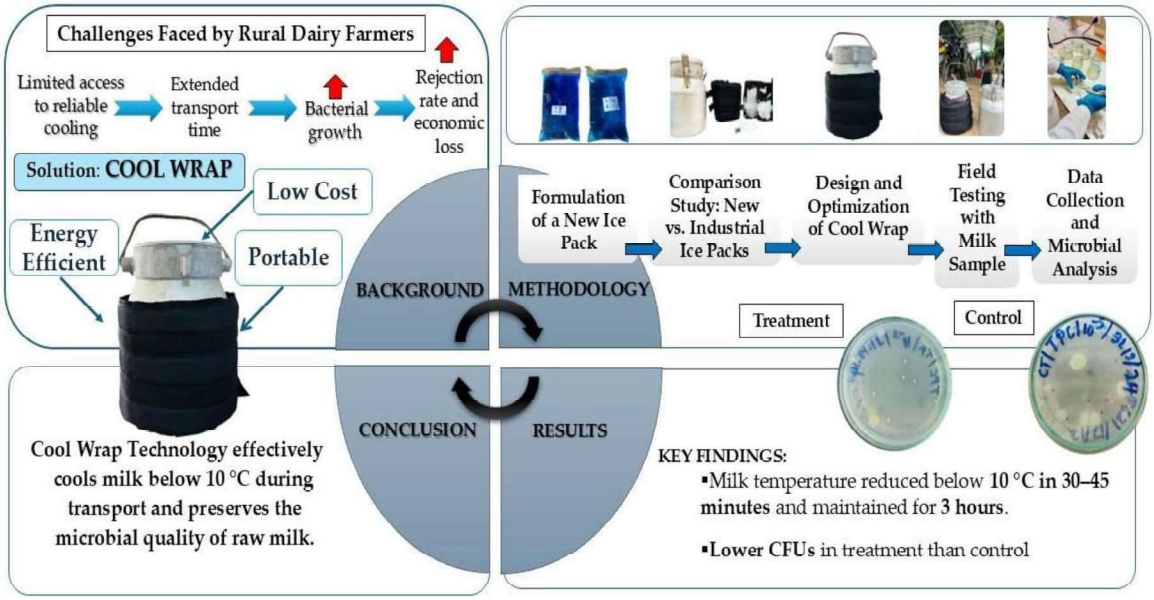
Animal Production Systems and Industry Trends

Cool Wrap Technology for Milk Canisters: Preserving Raw Milk Microbial Quality during Transportation by Smallholder Dairy Farmers in Sri Lanka

C. PRAVEEN and K. A. H. T. KODITHUWAKKU*
*Corresponding Author: heshank@wyb.ac.lk

In Sri Lanka, raw milk from smallholder dairy farmers has often transported to milk chilling centers without prior cooling, leading to microbial deterioration in tropical conditions. To address this, we developed the Cool Wrap (CW) system, which consists of multi-layered wrap with new ice packs. CW is applied directly to milk canisters, cooling the raw milk within the canister. This method reduced milk temperature to below 10 °C within 45 minutes and maintained it for over 3 hours under tropical conditions. The CW's effectiveness in controlling microbial growth was evaluated by storing equal volumes of raw milk (5 L) in stainless-steel canisters with CW (Treatment, T) and without CW (Control, C). Milk samples (n=4) were taken from both canisters immediately after storage and after two hours, where temperature and total bacteria counts (Aerobic Plating at 30 °C) were compared. Initially, there was no significant difference ($P > .05$; *t*-test) in temperature (27.75 ± 0.35 vs. 30.05 ± 0.74 °C) or Colony Forming Unit (CFU) counts (2.3 ± 0.07 × 10^5 vs. 2.5 ± 0.11 × 10^5 CFU/mL) between T and C. However, after two hours, T canisters showed significantly lower ($P < .05$; *t*-test) temperatures (9.75 ± 0.18 vs. 26.00 ± 0.18 °C) and CFU counts (3.0 ± 0.35 × 10^6 vs. 4.3 ± 0.35 × 10^6 CFU/mL) compared to C. These findings highlight that CW effectively cools milk below 10 °C during transport, preserving microbial quality, reducing post-harvest losses, improving milk marketability, and ultimately enhancing smallholder farmers' income.

KEYWORDS: Cool wrap, Dairy, Microbial quality, Milk preservation, Tropical climates



Department of Livestock & Avian Sciences, Faculty of Livestock, Fisheries & Nutrition, Wayamba University of Sri Lanka, Makandura, Gonawila (NWP), Sri Lanka, 60170

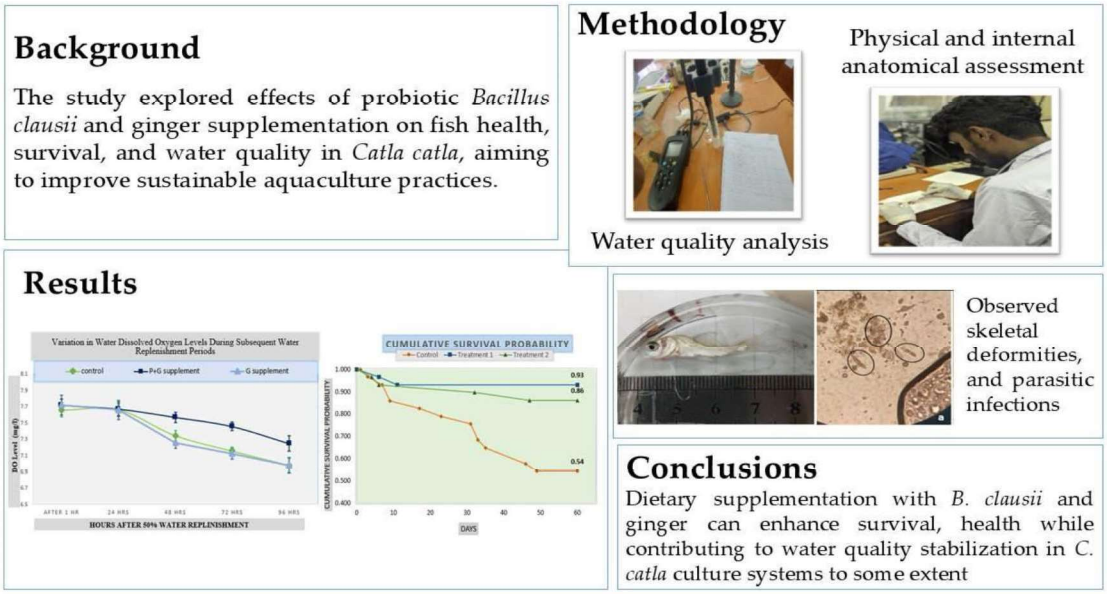
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Optimizing Water Quality Stability, Fish Health and Survival in Aquaculture through Probiotic and Herbal Feed Additives

V. LAGEESHAN[1*], N. P. G. PUSHPITHA[1] and N. M. HAAKKIL[1]
*Corresponding Author: LageeshanFMS002@student.ocu.ac.lk

The global aquaculture industry faces challenges in maintaining fish health and water quality while meeting the increasing demand for cultured fish as food. This study examined the effects of dietary supplementation with the probiotic *Bacillus clausii* and ginger on the survival, health, and water quality in *Catla catla*, a significant freshwater species. Over a 60-day feeding trial during the fry-to-fingerling transition phase, three dietary treatments were administered to triplicate fish groups stocked at sub-optimal levels: (1) a probiotic-ginger (P+G) diet containing *B. clausii* (1×10^7 spores/g) and powdered ginger (10 g/kg), (2) a ginger-only (G) diet (10 g/kg), and (3) a control diet (commercial feed) without supplementation. The study aimed to determine if combined supplementation offers greater benefits than individual supplementation regarding survival, overall health, and key water quality parameters. At the trial's conclusion, the P+G diet group exhibited a significantly higher survival rate (93.1%), followed by the G diet group (86 %), compared to the control group (54.4 %) ($P < .05$). Notably, no skeletal deformities or parasitic infections were observed in the P+G diet group. Water quality analysis indicated that, although dissolved oxygen (DO) levels declined in all systems towards the trial's end, the probiotic-supplemented tanks maintained more stable DO levels compared to other groups ($P < .05$). No differences were found in water temperature and pH levels across treatments. These findings suggest that combined dietary supplementation with *B. clausii* and powdered ginger can enhance survival and health while mitigating water quality deterioration in *C. catla* culture systems.

KEYWORDS: *Bacillus clausii*, Integrated supplementation, Parasitic infections, Probiotics, Skeletal deformities



Acknowledgement: Financial assistance was provided by Ocean University of Sri Lanka.

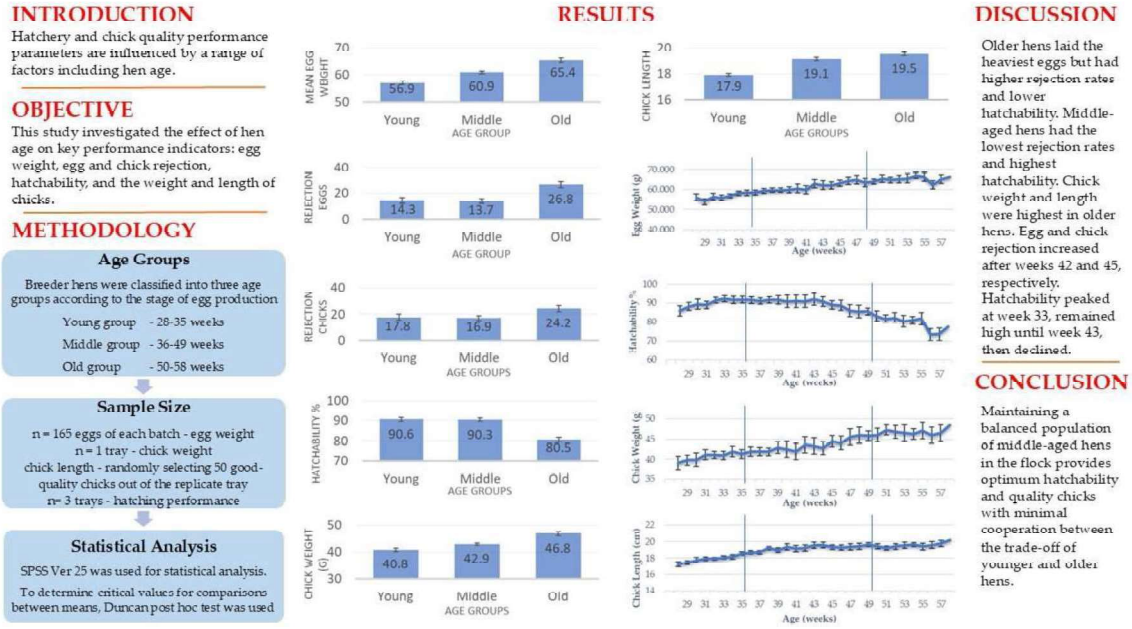
Department of Fisheries and Marine Science, Ocean University of Sri Lanka, Mahawela Road, Tangalle, Sri Lanka.

The Effect of Hen Age on Egg Weight, Hatching Performance, Length and Weight of Chicks

P. H. K. PERERA[1], A. L. RANAWEERA[2] and N. S. B. M. ATAPATTU[1*]
*Corresponding Author: mahindaatapattu@gmail.com

This study investigated the effect of hen age on key performance indicators: egg weight, egg and chick rejection, hatchability, and the weight and length of chicks. Broiler breeder hens, reared under identical management conditions across three farms, were classified into three age groups: young (28–35 weeks), middle-aged (36–49 weeks), and old (50–58 weeks). The sampled eggs equally represented all three farms. 165 eggs from each age group were set in replicate trays, and average egg weight was determined. Hatchability was assessed based on unhatched eggs and rejected chicks. Chick weight was measured by weighing all good-quality chicks in the replicate trays, while chick length was determined from a random selection of 50 good-quality chicks per batch. Data collection occurred over 12 weeks. Egg weight and chick weight increased from week 29, with the heaviest eggs ($P < .01$) laid by older hens, followed by middle-aged and younger hens. Older hens showed higher rejection rates for eggs and chicks and lower hatchability. Middle-aged hens demonstrated the best overall performance, with the highest hatchability and lowest rejection rates. Chick weight and length varied significantly among age groups, with older hens producing the longest and heaviest chicks. Egg and chick rejection increased from weeks 42 and 45, respectively, while hatchability peaked at week 33, remained stable until week 43, and then declined. Maintaining a balanced population of middle-aged hens in the flock provides optimum hatchability and quality chicks with minimal cooperation between the trade-off of younger and older hens.

KEYWORDS: Age, Chick, Egg, Hatchability, Length



[1]Faculty of Agriculture, University of Ruhuna, Mapalana, Kamburupitiya, Sri Lanka; [2]Hatchery Plant, Pussalla Meat Producers (Pvt) Ltd, Koswatta Road, Hadapangoda, Sri Lanka

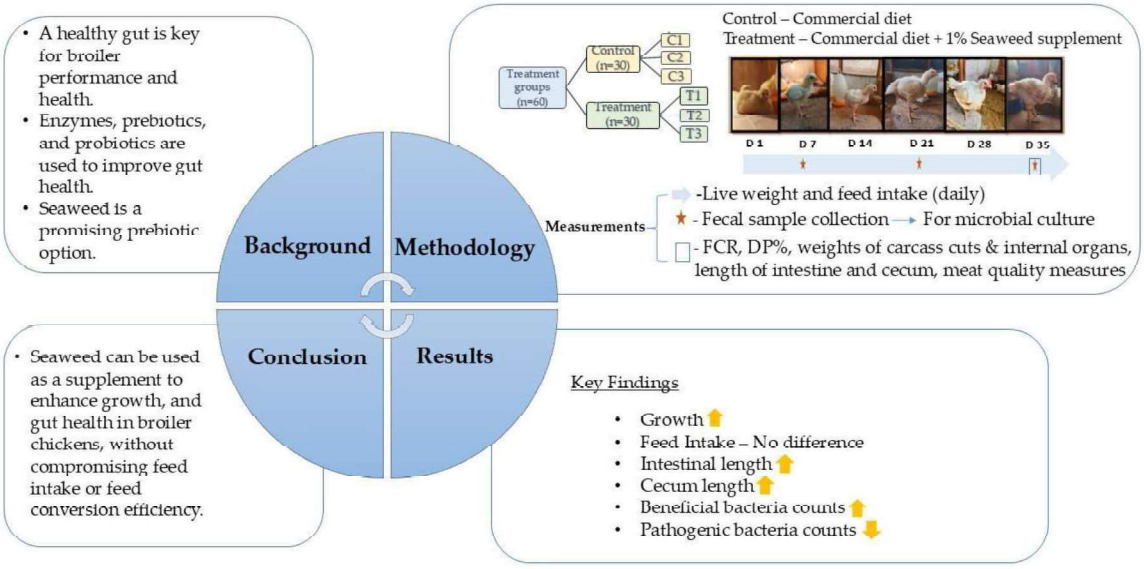
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Effects of Dried Seaweed Supplementation on Growth Performance and Gastrointestinal Development of Broiler Chicken in Sri Lanka

W. A. P. D. THARUSHIKA and K. A. H. T. KODITHUWAKKU*
*Corresponding Author: heshank@wyb.ac.lk

A healthy gastrointestinal system is crucial for optimal broiler performance. Enzymes, prebiotics, and probiotics are commercially used to enhance gut health. Seaweed can be a promising candidate with prebiotic properties. This study evaluated the effects of dried seaweed supplementation on broiler performance and gut health. Sixty, one-day-old Ross 308 broiler chicks were randomly assigned to two dietary treatments in a 35-days feeding trial. The control group (CON) received a commercial broiler diet while the treatment group (SWS) received the same diet supplemented with 1 % of a dried seaweed flake. Each treatment had three replicates of 10 chicks. Seaweed supplementation significantly increased ($P < .05$) live weight of SWS from day 21 to day 35 compared to the CON. Additionally, SWS birds tended ($P = .07$) to have heavier whole leg meat, compared to CON. Although cumulative feed intakes were the same ($P > .05$) among groups, the SWS group exhibited a numerically lower feed conversion ratio. Notably, seaweed supplementation promoted gastrointestinal development, as indicated by significantly longer ($P < .05$) cecum and intestinal lengths at day 35, which may have improved digestion. This was supported by lower crude protein content in the faeces (SWS: 28.16 % vs. CON: 36.16 %, DM basis). Furthermore, seaweed exhibited prebiotic effects by significantly increasing ($P < .05$) *Lactobacillus* spp. and reducing ($P < .05$) *Escherichia coli* counts in faeces. These findings suggest that dried seaweed can be a beneficial feed supplement to enhance broiler growth and gut health without compromising feed intake or feed conversion efficiency.

KEYWORDS: Beneficial bacteria, Broiler performance, Gut health, Prebiotic, Seaweed



Acknowledgement: This study was partly funded by Carbon Blueprint Pvt Ltd, Sri Lanka.

Department of Livestock & Avian Sciences, Faculty of Livestock Fisheries & Nutrition, Wayamba University of Sri Lanka, Makandura, Gonawila (NWP), Sri Lanka, 60170

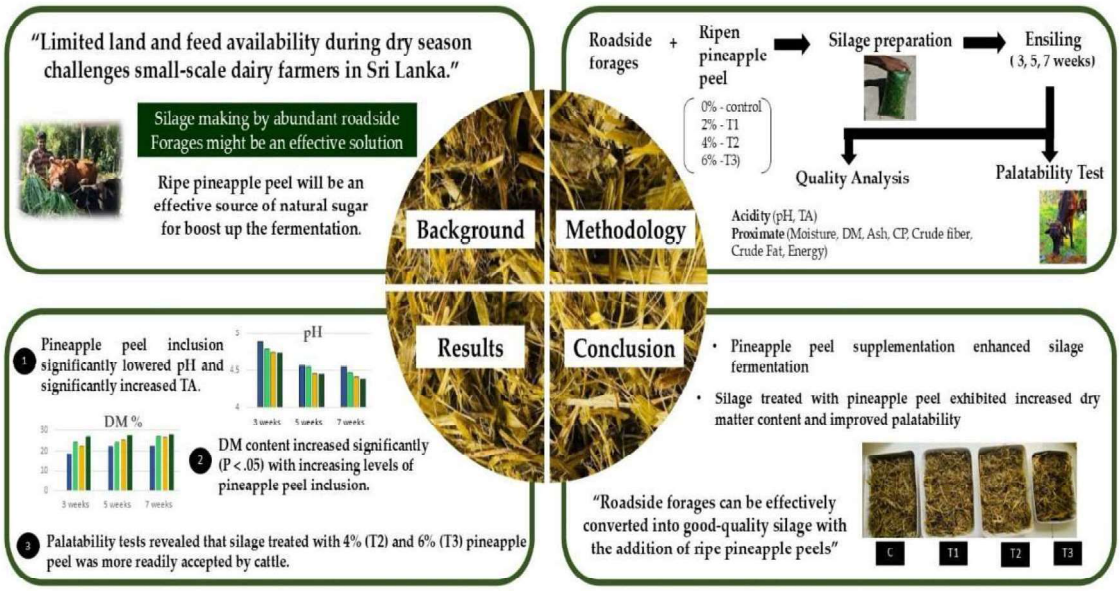
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Roadside Forage Silage with Pineapple Peel: A Cost-Effective Strategy to Address Forage Shortages in Sri Lanka

K. G. V. DISSANAYAKE, H. M. T. O. VITHANA, G. A. PRATHAPASINGHE and K. A. H. T. KODITHUWAKKU*
*Corresponding Author: heshank@wyb.ac.lk

Smallholder dairy farmers in Sri Lanka face a persistent shortage of quality forage, particularly during droughts. Roadside forage (RSF), consisting of a mix of grasses and broadleaf plants, an underutilized but readily available resource, could serve as a viable solution for forage shortage if effectively converted into silage. However, their low soluble sugar content limits fermentation efficiency. This study evaluated the potential of incorporating ripe pineapple peels, rich in soluble sugars, to enhance the fermentation and improve the quality of RSF silage. Silage samples were prepared by mixing chopped RSF with different proportions of pineapple peel: 0 % (Control), 2 % (T1), 4 % (T2), and 6 % (T3). Samples were analysed for acidity, proximate composition, and cattle acceptability at 3-, 5, and 7-week post-ensiling. A two-way analysis of variance revealed that both pineapple peel addition and storage duration significantly ($P < .05$) influence silage acidity, energy, and all the measured proximate composition parameters (dry matter, crude protein, and ether extract) except for crude fibre ($P > .05$) content. Increasing pineapple peel levels lowered silage pH while enhancing titratable acidity, indicating improved fermentation. Additionally, gross energy content and dry matter content significantly ($P < .05$) increased with pineapple peel incorporation. Notably, cattle showed a clear preference for T2 and T3 silage over the Control and T1. These findings demonstrate that RSF can be effectively converted into high-quality silage with the addition of ripe pineapple peels. Further research should confirm the silage stability and evaluate its impact on milk yield and composition in dairy cattle.

KEYWORDS: Dairy farming, Forage shortage, Pineapple peel, Roadside forage, Silage



Department of Livestock & Avian Sciences, Faculty of Livestock, Fisheries and Nutrition, Wayamba University of Sri Lanka, Makandura, Gonawila (NWP), Sri Lanka, 60170

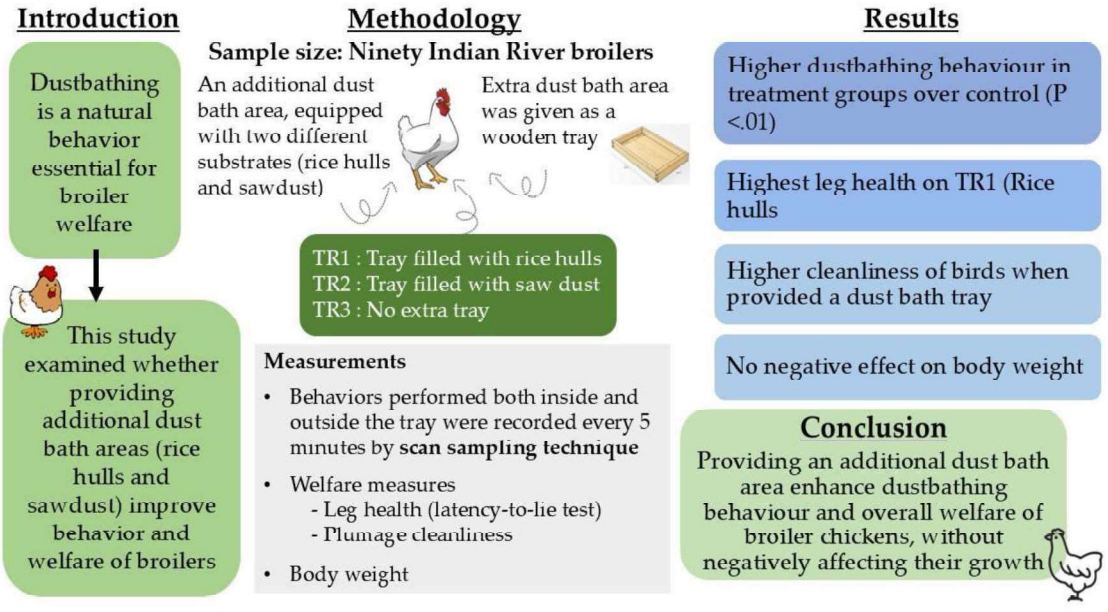
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Provision of an Additional Dust Bath Area to Enhance the Welfare of Broiler Chickens

K. M. N. I. ABEYRATHNE[1*], R. M. A. S. BANDARA[1] and M. P. SENANAYAKE[2]
*Corresponding Author: nipunikaindumini97@gmail.com

Dustbathing is a natural behaviour essential for broiler welfare. This study investigated the impact of providing an additional dust bath area, equipped with two different substrates (rice hulls and sawdust) on the dustbathing behaviour, welfare parameters and body weight of broilers in a closed-house system. Ten days old 90 broiler chicks were randomly assigned to three groups of two replicates (n=15): three experimental treatments (extra tray filled with rice hulls – TR1 and extra tray filled with sawdust – TR2 and TR3 – no extra tray and only with the bedding). All three groups had rice hull bedding. Behaviours were observed by scan sampling at 5-minute intervals. Welfare parameters, including leg health (via a latency-to-lie test), plumage cleanliness (via 2- and 4-point scoring systems), and other behavioural traits were assessed until 36 days. Data was analysed using generalized linear model and Kruskal-Wallis tests (SAS 9.4/IBM SPSS Statistics). Dustbathing behaviour was significantly higher ($P < .01$) in both TR1 and TR2 compared to TR3. The latency-to-lie test revealed significant differences ($P < .05$), with TR1 showing the longest standing time, followed by TR2 and TR3 showing the shortest. Extra dust bath area improved plumage ($P < .01$) and abdominal cleanliness ($P < .01$). However, there was no effect on body weight ($P = .57$). In conclusion, providing an additional dust bath area either with rice hulls or sawdust enhances dustbathing behaviour and welfare of broilers, without affecting their body weight.

KEYWORDS: Behaviour, Body weight, Broiler chickens, Dustbathing, Welfare



[1]*Department of Livestock Production, Faculty of Agricultural Sciences, Sabaragamuwa University of Sri Lanka, Belihuloya;* [2]*JP Poultry Farm, JP Poultry Products (Pvt) LTD, Kotadeniyawa, Sri Lanka*

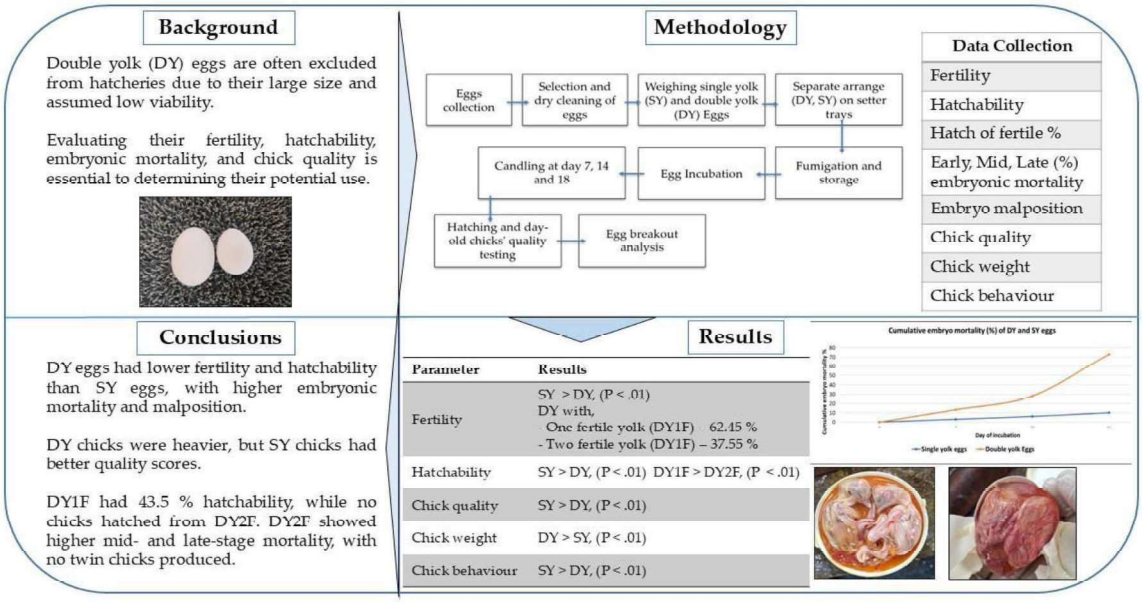
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Hatchery Performance, Embryonic Development and Chick Quality in Double Yolk Eggs of Layer Breeder Chickens

M. A. H. S. MORAGODA[1*], R. M. A. S. BANDARA[1] and J. MAHINDARATHNA[2]
*Corresponding Author: hirushamoragoda@gmail.com

Double-yolk (DY) eggs are produced when ovulation irregularities cause two yolks to become encased within a single eggshell. In this study, a total of 690-layer breeder eggs were used across three incubation cycles, with each cycle comprising 115 single yolk (SY) eggs as the control group and 115 double-yolk eggs as the treatment group. Hatching eggs were sourced from a 25-week-old, H&N layer breeder flock. Data were analysed using the student's t-test, generalized linear model, and Mann-Whitney U test. Double yolk eggs were identified through pre-incubation candling, with DY1F (one fertile yolk) and DY2F (two fertile yolks) classifications determined on the 7th day after incubation. Further candling was conducted on the 14th and 18th days. Single yolk eggs exhibited significantly higher fertility (93.6 %) compared to DY eggs (78.0 %, $P < .01$). Additionally, SY eggs showed notably higher hatchability (84.1 %) compared to DY eggs (21.2 %, $P < .01$). Within DY eggs, DY1F eggs achieved a hatchability rate of 43.5 %, while DY2F eggs failed to hatch entirely (0 %). Early (day 1-7), mid (day 8-15), and late (day 16-21) embryonic mortality rates were significantly higher in DY eggs compared to SY eggs ($P < .01$). Double yolk eggs with two fertile embryos had significantly higher mid-stage ($P < .01$) and late-stage ($P < .01$) embryonic mortality compared to those with one fertile embryo. Chick quality was higher in chicks from SY eggs where chicks from SY eggs had significantly higher Tona scores ($P < .01$) and behavioural scores ($P < .01$) compared to chicks from DY1F eggs. Additionally, DY1F chicks (43.61 ± 5.78 g) had significantly higher birth weights ($P < .01$) than SY chicks (35.36 ± 4.11 g).

KEYWORDS: Chick quality, Double yolk, Embryonic development, Fertility, Hatchability



[1]Department of Livestock Production, Faculty of Agricultural Sciences, Sabaragamuwa University of Sri Lanka, Belihuloya, 70140, Sri Lanka; [2]Marawila NLDB Farm, Marawila, 61210, Sri Lanka

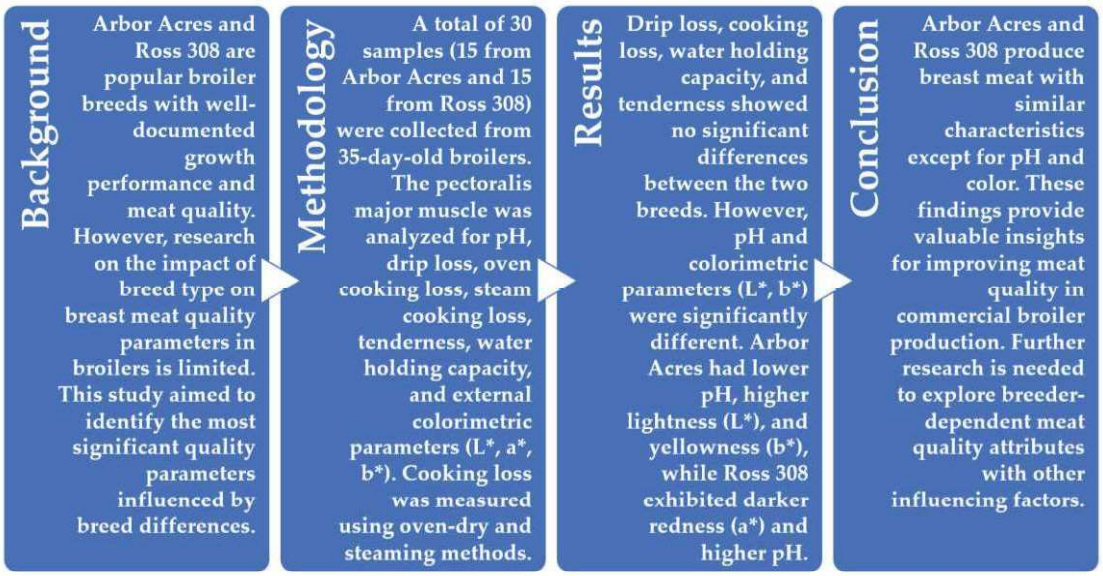
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

The Impact of Broiler Breed Types on Breast Meat Quality Parameters

M. G. N. T. WIJERATHNA[1*], D. M. A. GUNARATNE[1] and W. G. M. ZOYZA[2]
*Corresponding Author: mgntwijerathna@std.agri.sab.ac.lk

Arbor Acres and Ross 308 are popular broiler breed types. Their growth performances and meat quality are well documented. However, the impact of breed type on breast meat quality parameters in broilers is limited. The present study aimed to identify the most significant meat quality parameters influenced by breed differences. A total of 30 samples (35 days old birds) were used, taking 15 samples from each breed. The pectoralis major muscle was used to analyse pH, drip loss, oven cooking loss, steam cooking loss, tenderness, water holding capacity, and external colorimetric parameters (Lightness: L*, Redness: a*, Yellowness: b*). Cooking loss was measured using both oven-dry and steaming methods. Drip loss, cooking loss, water holding capacity, and tenderness were not significantly different between the two breeds whereas pH values and external colorimetric parameters were significantly different between the two breeds. Arbor Acres breed meat had a lower pH, higher L*, and higher b* compared to Ross 308, which had a darker a*, and higher pH. The present study revealed that both Ross 308 and Arbor Acres breeds produce meat with similar characteristics except for pH and colour. These differences make a practical significance on consumer preferences and purchasing decisions with pH and colour influence. These insights may help producers optimize breeding and marketing strategies to meet consumer demands and improve meat quality in commercial broiler production. Further, systematic explorations are needed to understand the breeder-dependent meat quality attributes with more breeds and other meat quality dependent factors.

KEYWORDS: Arbor Acres, Meat quality, Pectoralis major, Ross 308



Acknowledgement: Pussalla Meat Producers (Pvt) Ltd, Ganewatte, Sri Lanka

[1]Department of Livestock Production, Faculty of Agricultural Sciences, Sabaragamuwa University of Sri Lanka, Belihuloya, Sri Lanka; [2]Pussalla Meat Producers (Pvt) Ltd, Kosgama, Sri Lanka

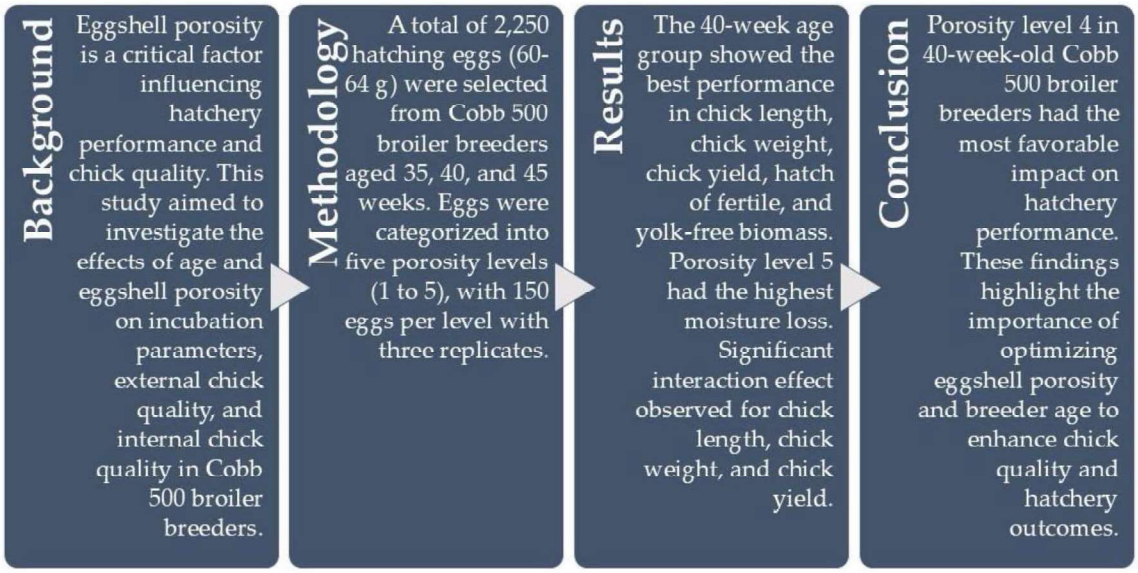
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Effect of Eggshell Porosity for the Hatchery Performance with the Age of Cobb 500 Broiler Breeders

D. D. T. M. HEMARATHNA[1*], M. A. J. P. MUNASINGHE[1], L. SANDARUWAN[2] and P. KOSPALAWATHTHE[2]
*Corresponding Author: dewnitm@gmail.com

Eggshell porosity plays a critical role in determining hatchery performance and chick quality. This research was carried out to investigate the effect of age and eggshell porosity on incubation parameters (hatchability, hatch of fertile, chick yield, moisture loss, and embryonic mortality), external chick quality parameters (chick length, chick weight, Tona score) and on internal chick quality parameters (yolk weight and yolk free biomass) of Cobb 500 broiler breeders. A total of 2250 hatching eggs (60–64 g) were selected from breeders aged 35, 40, and 45 weeks. 150 eggs were selected with three replicates for five porosity levels (1 to 5), based on the pore concentration on the shell from each age group. During the incubation of 21 days and within one day of post-hatch, parameters were taken to determine the effect on hatchery performance. Two-way ANOVA revealed a significant effect ($P < .05$) of age group was observed in chick length, chick weight, chick yield, hatch of fertile, and yolk-free biomass. Porosity level effect on moisture loss was highest in porosity level 5. The interaction effect between age group and porosity level was significant ($P < .05$) for chick length, chick weight, and chick yield. Age group, porosity level, and their interaction has no effect on hatchability, Tona score, yolk weight, and embryo mortality of chicks. Based on the results, Cobb 500 broiler breeders at 40 weeks of age with porosity level 4 showed the best hatchery performances, with highest yolk-free biomass, chick yield, and chick weight which could improve chick quality and hatchery profitability.

KEYWORDS: Breeder age, Cobb 500, Eggshell porosity, Hatchery, Porosity level



Acknowledgement: Hatchery Complex, New Anthoney's Farms (Pvt) Ltd, Hanwella, Sri Lanka

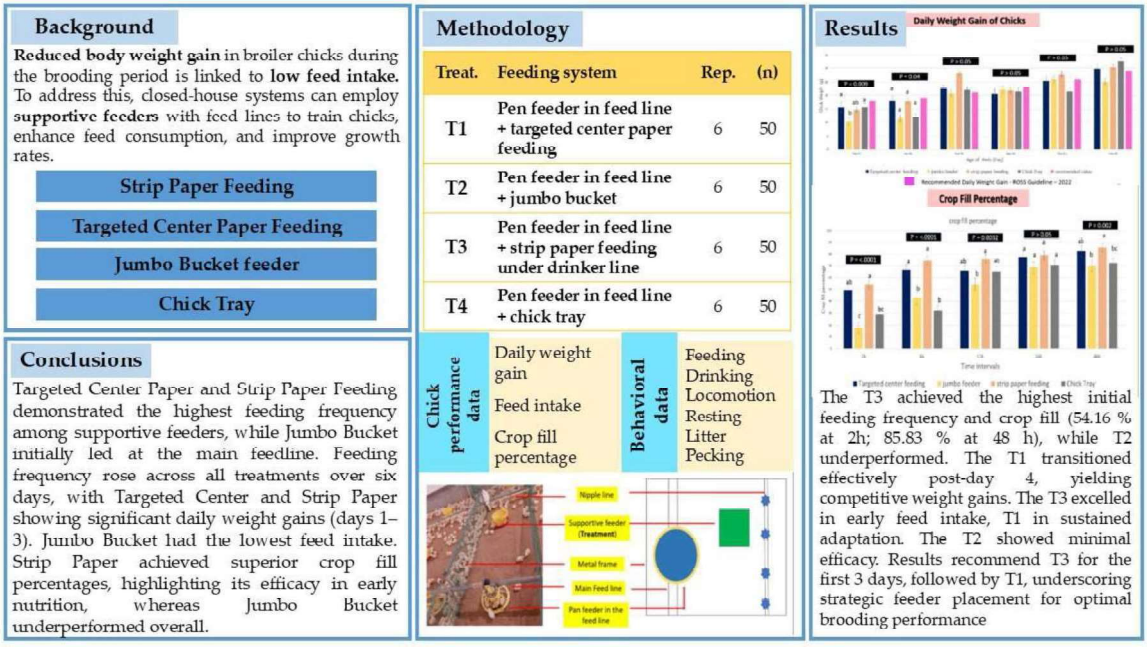
[1]Department of Livestock Production, Faculty of Agricultural Sciences, Sabaragamuwa University of Sri Lanka, Belihuloya, Sri Lanka; [2]Hatchery Complex, New Anthoney's Farms (Pvt) Ltd, Hanwella, Sri Lanka

Efficiency of Different Supportive Feeders on Training Broiler Chicks for Feeding in the Brooding Period

E. G. S. D. PREMARATHNA[1*], R. M. A. S. BANDARA[1] and D. G. WELAGEDARA[2]
*Corresponding Author: egsdpremarathna@std.agri.sab.ac.lk

The brooding period is crucial for broilers, and efficient supportive feeders help chicks to start consumption of starter feed and transition to the main feed line. Compared four supportive feeders: targeted centre paper feeding (TCPF), jumbo bucket feeder (JBF), strip paper feeding under drinker line (SPF), and chick tray (CT) were assessed on growth performance, feed intake (FI) and other behaviours, and crop fill percentage (CFP). In total 1200-day-old broiler chicks were placed in treatment pens with six replicates (n=50). Behaviour was observed over 10 days by using scan sampling technique. Results revealed that from day 0 to 6, exhibited the highest feeding frequency (FF) was observed in TCPF ($P > .05$). Though JBF initially showed the highest FF at the main feed line, after 4 days, TCPF was the highest. Chicks in all treatments gradually transitioned from supportive feeders to the main feed line. The frequency of drinking behaviour was highest in TCPF. The JBF group showed higher locomotion, litter pecking, and resting behaviours. Days 1 to 3 showed a significant increase in daily weight gain (DWG) in both TCPF and SPF. From days 4-6, no significant differences were found in the DWG among the treatments. During days 0–3, the lowest feed intake was observed in the JBF. The CFP was higher for TCPF and SPF after 2, 8, 12, 24, and 48 h post-placement. Results revealed that TCPF and SPF were the most effective supportive feeders for broiler chicks during the brooding stage.

KEYWORDS: Broiler chicks, brooding period, Feeding behaviour, Growth performance, Supportive feeder



[1]Department of Livestock Production, Faculty of Agricultural Sciences, Sabaragamuwa University of Sri Lanka, Belihuloya, Sri Lanka; [2]Pussalla Meat Producers (Pvt) Ltd, Kosgama, Sri Lanka

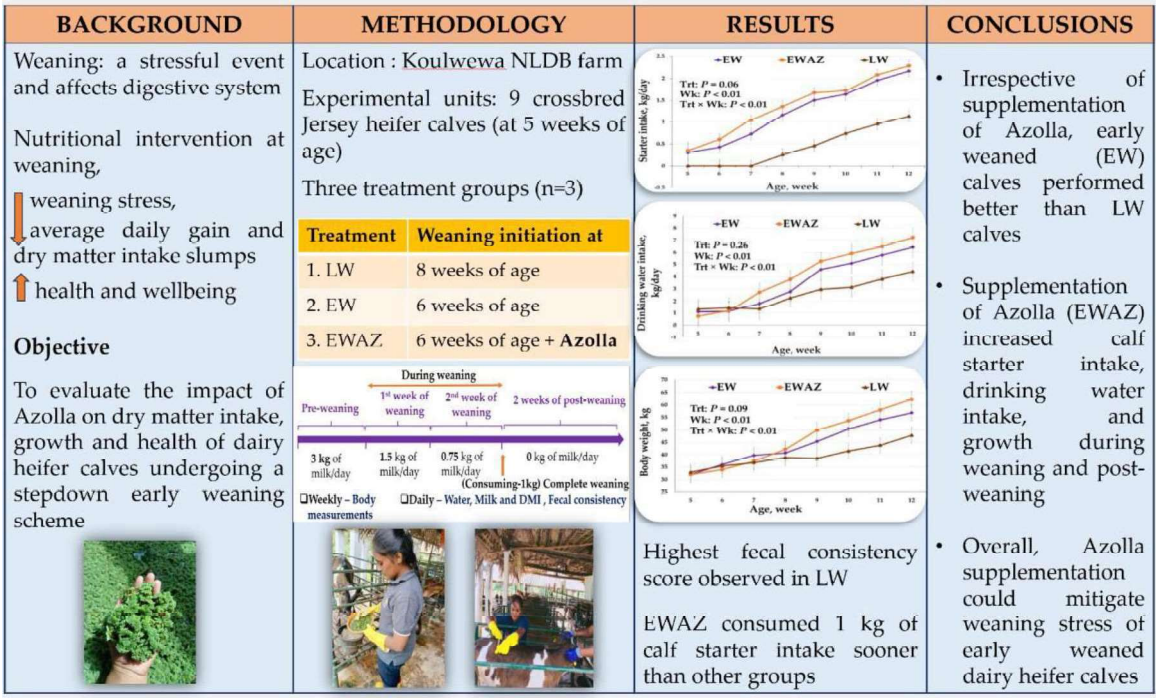
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Impact of *Azolla pinnata* (Azolla) Supplementation on Crossbred Jersey Heifer Calves Undergoing a Stepdown Early Weaning Scheme

I. P. S. PERERA and H. K. J. P. WICKRAMASINGHE*
*Corresponding Author: janakap@wyb.ac.lk

The present study investigated the effect of *Azolla pinnata* (Azolla) supplementation on the dry matter intake (DMI), growth, and health characteristics of dairy heifer calves with the implementation of step-down early weaning scheme. Nine crossbred Jersey heifer calves at 5 weeks of age were randomly assigned to three treatment groups (n=3): (1) initiating weaning at 8 weeks of age (LW), (2) initiating weaning at 6 weeks of age (EW), and (3) EW with Azolla as a supplement (5 % of DMI, EWAZ). Weaning commenced at 6 weeks of age with an abrupt cut down of milk allowance from 3.0 kg/d to 1.5 kg/d for EW and EWAZ calves. The LW calves received 3.0 kg/d of daily milk allowance until 8 weeks of age, and the weaning commenced thereafter. Azolla was provided for EWAZ throughout the weaning period. It was assumed that the weaning was completed when calf starter intake (CSI) reached 1.0 kg/d or higher. The results manifested that EW achieved better growth (P = .04), dry matter intake (P = .05) and lower faecal consistency scores (P < .01) than LW calves regardless of Azolla supplementation. Furthermore, EWAZ accomplished better during weaning and post-weaning periods and reached the threshold level of CSI (1.0 kg/d) quicker than others. Overall, results revealed that early weaning (6 vs. 8 weeks) had no adverse effects and potential of Azolla as an inexpensive supplement to enhance growth and health in crossbred Jersey heifer calves during and postweaning.

KEYWORDS: Azolla, Faecal consistency, Feed intake, Growth, Weaning stress



Department of Plantation Management, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka, Makandura, Gonawila (NWP), 60170, Sri Lanka

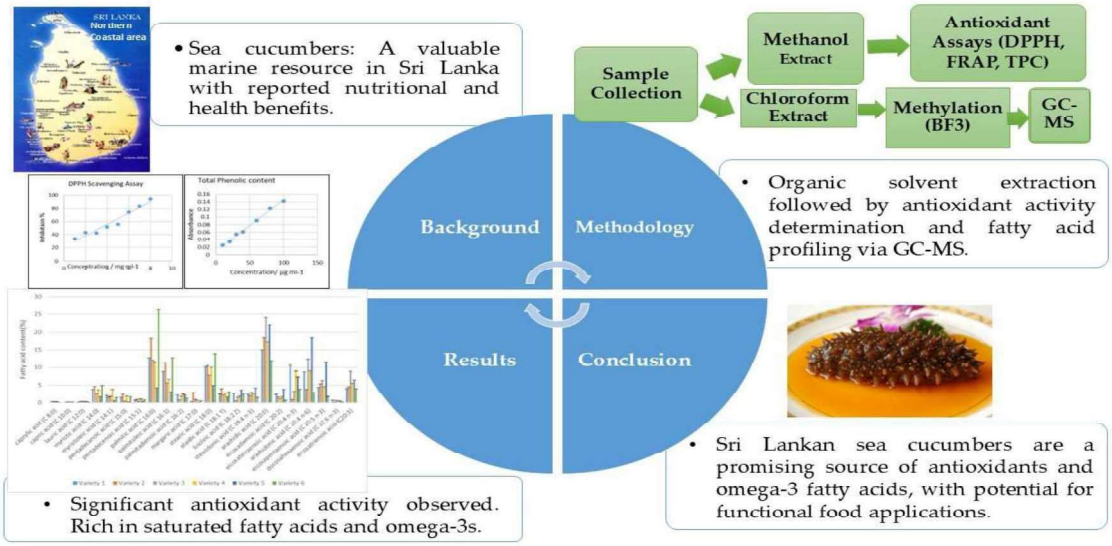
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Assessment of Fatty Acid Profile and Antioxidant Properties of Sea Cucumber Obtained from Northern Coastal Areas of Sri Lanka

A. A. H. I. ATHAUDA[1], D. S. SHANUKE[1], W. M. M. D. BANDARA[1], G. NISHANTHAN[2] and H. A. RATHNAYAKE[1*]
*Corresponding Author: hrathnay@tec.rjt.ac.lk

This study analysed the fatty acid (FA) profile and antioxidant properties of six sea cucumber species (*Stichopus naso*, *Holothuria spinifera*, *Bohadschia marmorata*, *Holothuria scabra*, *Thelenota ananas*, *Bohadschia vitiensis*) sourced from the Northern coastal areas in Sri Lanka (e.g., Jaffna). The antioxidant properties were evaluated using total phenolic content (TPC), 1,1-diphenyl-2-picryl-hydrazyl (DPPH), and ferric reducing antioxidant power (FRAP) assays. The FA profile was determined through methylation followed by gas chromatography-mass spectroscopy (GC-MS) analysis on organic extracts. The extracts exhibited FRAP value varying from 5.36 μmol Trolox equivalent/g dry weight (μmol TE/g dw) to 6.67 μmol TE/g dw with no difference ($P > .05$) among six species. The DPPH assay exhibited IC_{50} value 2.69-4.41 mg/mL, indicating moderate antioxidant activity with no difference ($P > .05$). The TPC ranged from 0.28 mg gallic acid equivalent/g (mg GAE/g) to 0.41 mg GAE/g, with no difference ($P > .05$). The FA analysis identified saturated FA in every species, including caprylic acid (0.04-0.32 %), capric acid (0.05-0.20 %), lauric acid (0.09-0.38 %), myristic acid (1.68-4.97 %), palmitic acid (4.28-26.14 %), stearic acid (4.92-13.85 %), and arachidic acid (11.82-24.02 %). Unsaturated FA included eicosapentaenoic acid (EPA, 1.75-11.35 %) and docosahexaenoic acid (DHA, 0.12-0.66 %). Omega-3 FA such as EPA and DHA, alongside antioxidant activity, position them as functional foods with applications in the food industry. It underscores their economic value, use in nutraceuticals and health-promoting products.

KEYWORDS: Antioxidant, GC-MS, Holothuroidea, Polyphenolic content



Acknowledgement: Financial assistance was provided by Research and Publication Committee, Rajarata University of Sri Lanka, through the grant ID, RJT/R&PC/2024/R/FOT/05.

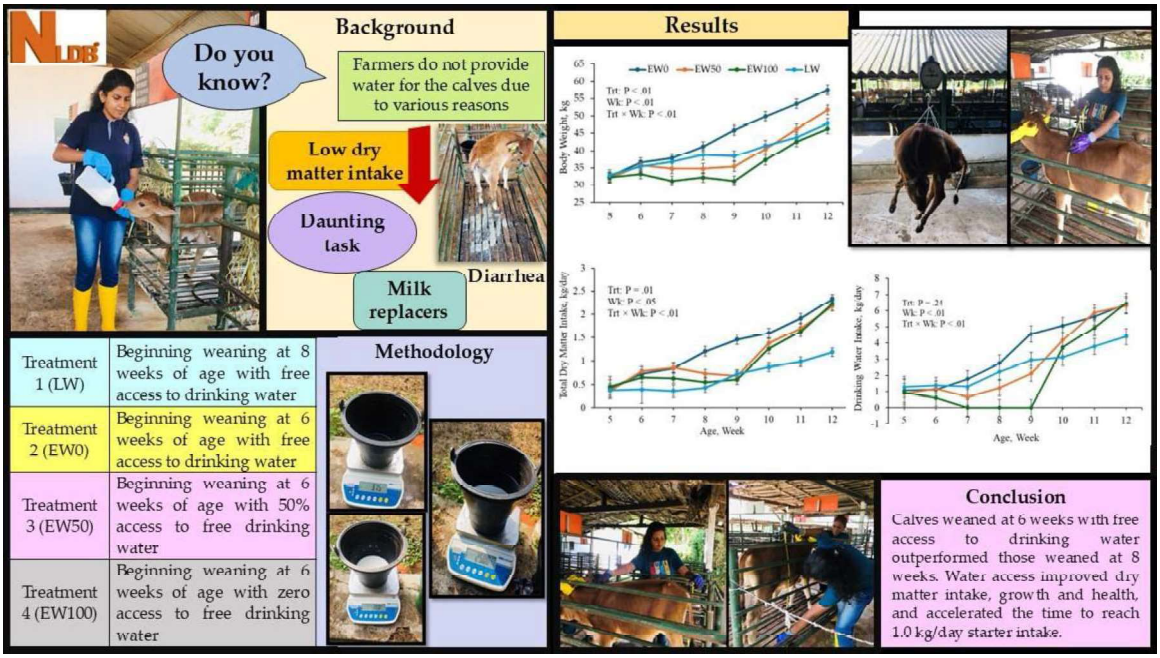
[1]Department of Food Technology, Faculty of Technology, Rajarata University of Sri Lanka, Mihintale, Sri Lanka; [2]Department of Aquaculture and Fisheries, Faculty of Livestock and Fisheries, Wayamba University of Sri Lanka, Makandura, Gonawila (NWP), Sri Lanka

Impact of Free Access to Drinking Water on Starter Intake, Growth, and Health of Crossbred Jersey Heifer Calves Undergoing a Stepdown Early Weaning Transition

O. N. M. PERERA and H. K. J. P. WICKRAMASINGHE*
*Corresponding Author: janakap@wyb.ac.lk

This study evaluated the impact of free access to drinking water on starter intake (CSI), growth, and health of crossbred dairy heifer calves (Friesian × Jersey) undergoing stepdown early weaning. Twelve calves (5 weeks old) were randomly assigned to four treatments (n = 3): 1) beginning weaning at 8 weeks of age with free access to drinking water (LW), 2) beginning weaning at 6 weeks of age (EW) with free access to drinking water (EW0), 3) EW with 50 % access to free drinking water (EW50), and 4) EW with zero access to free drinking water (EW100). Weaning involved gradually restricting milk allowance from 3.0 to 1.5 kg/day at 8 and 6 weeks for LW and EW groups, respectively. Calves were considered weaned once CSI reached 1.0 kg/day. The CSI increased in all calves during the first week of weaning, regardless of the treatment, with further increases observed with free water access. At 9 weeks, a significant increase in CSI was observed in the EW50 and EW100 groups, indicating a positive relationship between CSI and water intake. The EW0 group reached 1.0 kg/day CSI in 14 days, while EW50 and EW100 required 26.8 and 27.5 days, respectively. Final body weights indicated better growth in calves with free access to water. Health status was monitored using fecal scores and physical appearance, show no adverse effects from early weaning. The study highlighted the importance of free access to drinking water in enhancing starter intake, growth, and overall wellbeing during early weaning of dairy calves.

KEYWORDS: Body weight, Calf diarrhea, Starter intake, Water, Weaning stress



Department of Plantation Management, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka, Makandura, Gonawila (NWP), 60170, Sri Lanka

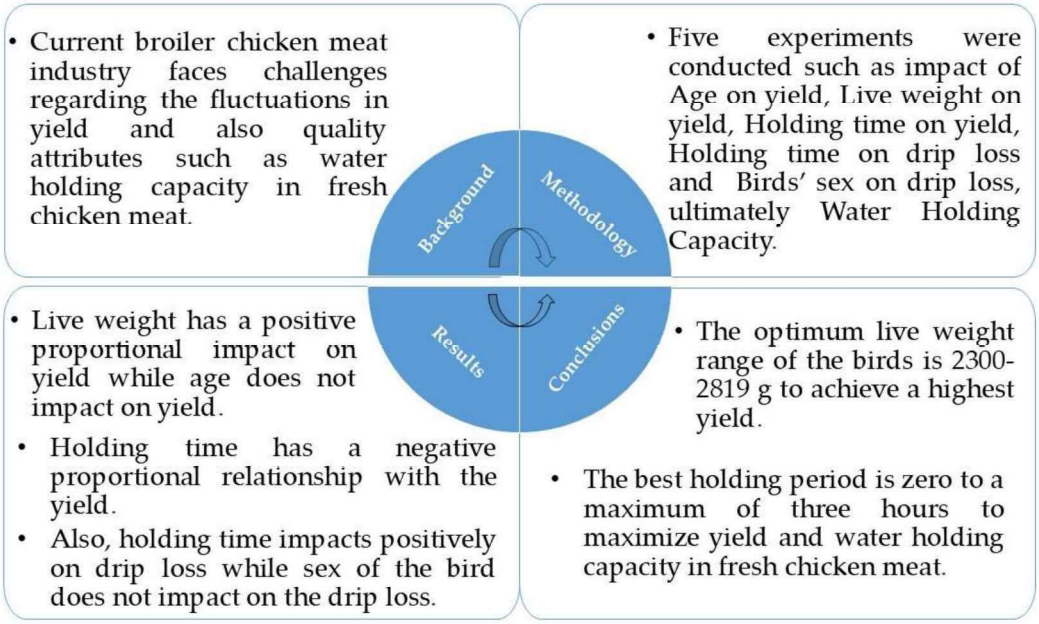
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Impact of Age, Sex, Live Weight, Holding Time at Lairage on Carcass Yield and Water Holding Capacity in Cobb 500 Broilers

P. K. HITIGE[1*], M. A. J. P. MUNASINGHE[1] and T. A. W. AYONA[2]
*Corresponding Author: pamodahitige99@gmail.com

The Sri Lankan broiler industry faces challenges related to the normal distribution of carcass yield and fresh meat quality attributes. Therefore, this study investigated the impact of age, live weight and holding time at lairage (HTL) on the yield of Cobb 500 broilers. It also examined the influence of HTL and the birds' sex on drip loss, which is a crucial parameter for determining the water holding capacity in fresh chicken meat. This study also aimed to determine the optimum age, live weight, HTL and the most suitable sex of the birds, to obtain a high yield and good quality meat. Five experiments were conducted using Cobb 500 broilers (n=415) in a completely randomized design. Experiments 1-3 assessed the impact of age, live weight and HTL on carcass yield, respectively. Experiments four and five were focused on the influence of HTL and the birds' sex on drip loss. The study found that live weight and HTL influence on carcass yield and HTL also influences drip loss. Age and sex showed no impact on yield and drip loss, respectively. The findings indicate that the higher live weights (2300-2819 g) result in higher yield, while an optimal HTL of 0 to a maximum of 3 hours maximizes yield and the water-holding capacity, contributing to improved broiler meat yield and quality.

KEYWORDS: Drip loss, Broilers, Lairage, Live weight, Meat yield



Acknowledgement: Bairaha Farms PLC, Sri Lanka for providing the necessary samples and support during the study.

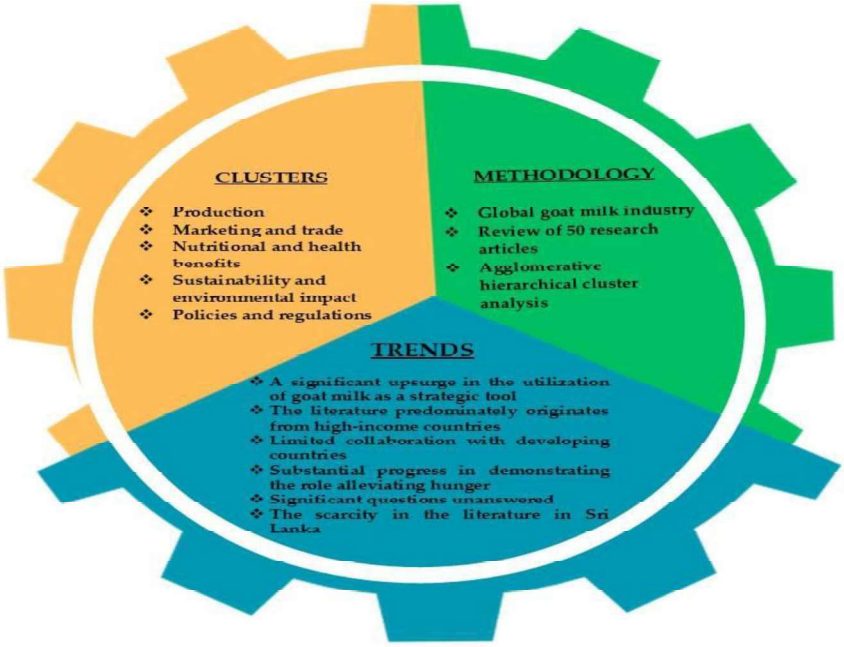
[1]Department of Livestock Production, Faculty of Agricultural Sciences, Sabaragamuwa University of Sri Lanka, Belihuloya, 70140, Sri Lanka; [2]Bairaha Farms PLC, 407, Galle Road, Colombo 03, Sri Lanka

Exploring the Global Goat Milk Industry Through Cluster Analysis: A Comprehensive Review for Uncovering Regional Insights

E. J. S. ROCHELLE*, H. K. D. M. P. L. DIVARATHNA, I. V. KURUPPU and T. P. S. R. GURUGE
*Corresponding Author: sharochelle1221@gmail.com

The global goat milk industry has emerged as a vital segment of the dairy sector, reinforcing its presence in the global dairy market. This study presents the findings of a systematic review of 50 research articles, systematically analyzing the current state of the global goat milk industry using Agglomerative Hierarchical Cluster Analysis. Literature was sourced using keywords such as "goat milk," "dairy goat," and "food security" across databases including Scopus, Web of Science, and Google Scholar. The search was limited to studies published in the past ten years, from an initial pool of 200 publications. The review identifies five key thematic clusters: Production, Marketing and Trade, Nutritional and Health Benefits, Sustainability and Environmental Impact, and Policies and Regulations. It highlights a significant increase in the use of goat milk as a tool for improving nutrition and food security. However, research is largely concentrated in high-income countries, revealing disparities likely linked to differences in research infrastructure, funding availability, and policy prioritization in developing nations. Furthermore, limited research collaboration with developing countries hampers the broader application of goat milk in addressing food security. In the Sri Lankan context, the limited body of literature may reflect both a lack of focused research initiatives and the relatively underdeveloped nature of the goat milk industry itself. Additionally, persistent challenges such as scalability of production, environmental sustainability, and market volatility raise concerns about the long-term viability of the sector. Addressing these knowledge gaps and fostering international collaboration will be crucial for enhancing the goat farming industry.

KEYWORDS: Cluster analysis, Food security, Goat milk, Livestock sustainability



Department of Agribusiness Management, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka, Makandura, Gonawila (NWP), 60170, Sri Lanka

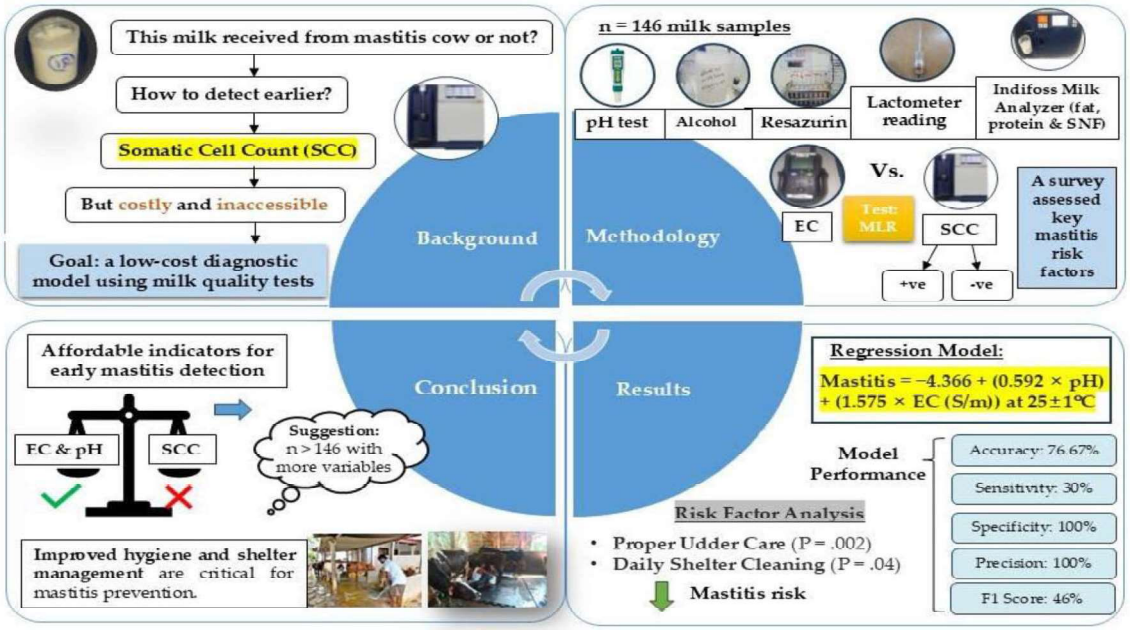
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Development of a Low-Cost Diagnostic Model for Early Mastitis Detection in Small-Scale Dairy Farms Using Milk Quality Parameters

M. N. F. SHASWIN[1], D. S. PERERA[2], P. A. D. JANAKA PRIYADARSHANA[2], U. G. S. CHINTHAKA[2] and K. A. H. T. KODITHUWAKKU[1*]
*Corresponding Author: heshank@wyb.ac.lk

Early detection, especially of subclinical mastitis, is essential for effective control, with somatic cell count (SCC) as the most reliable indicator, though its detection requires expensive equipment often inaccessible to small-scale farmers and milk collecting centers (MCCs). This study evaluated correlations between standard milk quality tests [pH, lactometer reading, electrical conductivity (EC), alcohol, resazurin], milk composition (fat, protein, solid non-fat), and SCC to develop a cost-effective diagnostic model and assess risk factors of mastitis. Milk samples from 146 lactating cows in Kurunegala were transported to MCCs in coolers and tested within 2 hours. SCC correlated moderately with EC ($r = 0.21$, $P = .01$) and weakly with pH ($r = 0.15$, $P = .08$). A regression model predicted mastitis: [Mastitis = −4.366 + (0.592 × pH) + (1.575 × EC), (25°C ± 1 °C)], with EC ($P < .01$) and pH ($P = .03$) as significant predictors ($R^2 = 0.126$). A survey identified key risk factors, including poor udder care ($P < .01$), inadequate shelter cleaning ($P = .04$), wet/muddy floors ($P = .01$), and inadequate bedding ($P < .01$). Conversely, sand bedding ($P < .01$) and grazing ($P = .02$) were found to be protective. Results suggest EC and pH could serve as cost-effective indicators for mastitis. Integrating this model into MCCs and farm testing could help small-scale farmers detect mastitis earlier. Improved hygiene and shelter management are key to prevention. Larger studies could refine the model.

KEYWORDS: Dairy, Diagnostic model, Electrical conductivity, Mastitis, Milk quality



[1]Department of Livestock & Avian Sciences, Faculty of Livestock, Fisheries and Nutrition, Wayamba University of Sri Lanka, Makandura, Gonawila (NWP), Sri Lanka, 60170; [2]Fonterra Brands Lanka (Pvt) Ltd, No. 100, Delgoda Road, Biyagama, Sri Lanka, 11650

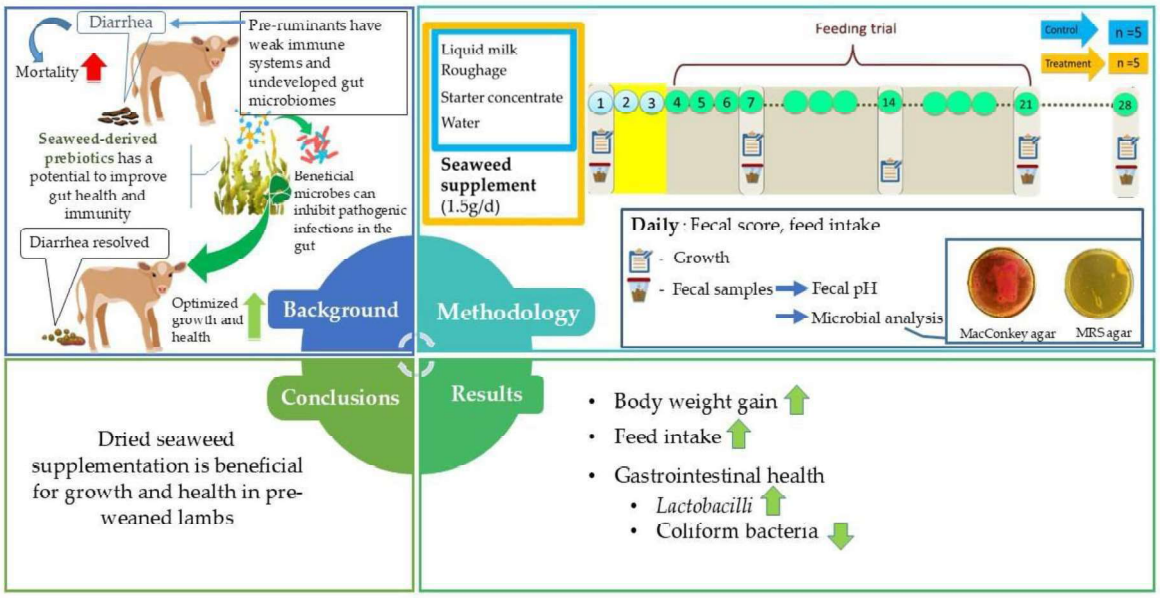
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Effect of Dried Seaweed Supplementation on Growth Performance and Hindgut Environment of Pre-Weaning Lambs

P. D. R. FERNANDO, M. R. F. SAMLA and K. A. H. T. KODITHUWAKKU*
*Corresponding Author: heshank@wyb.ac.lk

Pre-weaning health is vital for the future production of ruminants. Prebiotic supplementation can influence the gastrointestinal microbiome and enhance gut health during this critical period. This study investigated the effect of dried seaweed (SW) supplementation, rich in prebiotics, on the growth and hindgut environment of pre-weaning lambs. Ten newborn Madras-Red lambs were randomly assigned to control (CON) and treatment (SWS) groups. Both groups were fed ewe's milk and the commercial cattle feed. Additionally, the SWS group was orally administrated 1.5 g of dried SW daily from days 3 to 21. The SWS group showed higher ($P < .05$) concentrate feed intake until day 28 and higher body weights ($P < 0.1$ on day 21 and $P < .05$ on day 28) compared to the CON group. However, the SWS group exhibited significantly lower ($P < .05$) fecal pH on day 7, with no difference at later time points. Furthermore, fecal *Lactobacilli* populations were significantly higher in the SWS group on day 7 ($P < .05$) and showed a trend towards an increase on day 21 ($P < .01$). By day 28, coliform bacteria, including *Escherichia coli*, were significantly reduced in the SWS group ($P < .01$), whereas lactose-negative enterobacteria showed no notable reduction ($P > .05$). These findings indicate that dried seaweed supplementation in pre-weaning lambs can improve growth performance while positively influencing the hindgut microbiota. By promoting beneficial bacteria and reducing pathogenic bacteria, dried SW exhibits potential as a natural prebiotic supplement for improving early-life gut health and growth performance in lambs.

KEYWORDS: Diarrhea, Gut microbiota, Pre-weaning lambs, Seaweed, Weight gain



Acknowledgement: This study was partially supported by Carbon Blueprint Pvt Ltd., Sri Lanka and Fonterra Brands Lanka Pvt Ltd., Sri Lanka.

Department of Livestock & Avian Sciences, Faculty of Livestock, Fisheries and Nutrition, Wayamba University of Sri Lanka, Makandura, Gonawila (NWP), Sri Lanka, 60170

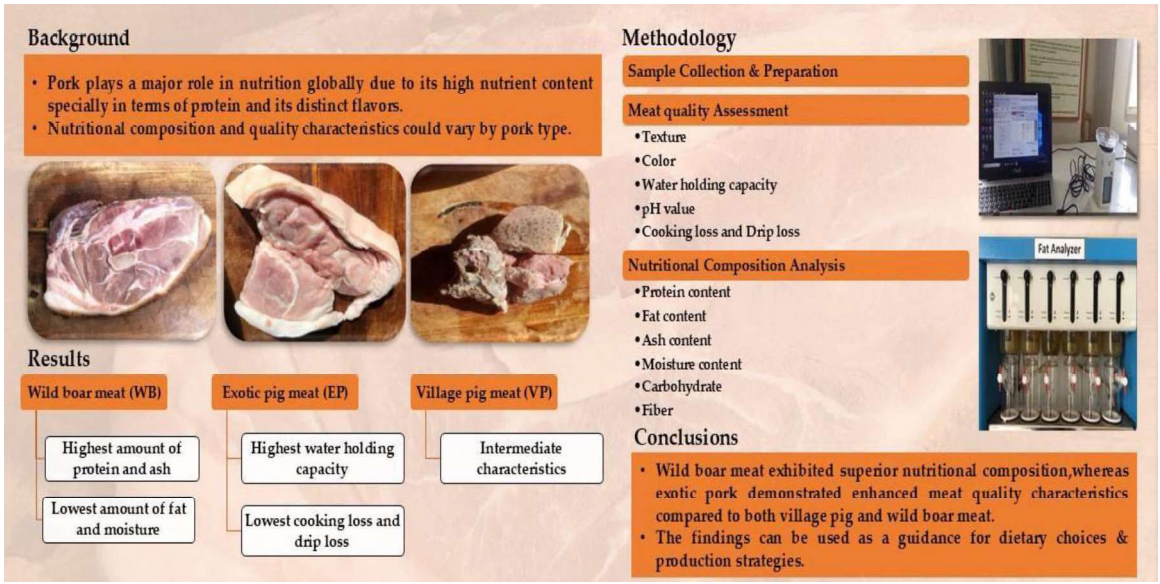
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

A Comparative Analysis of Nutritional Composition and Meat Quality Characteristics of Commonly Consumed Pork Types in Sri Lanka

M. P. T. P. COORAY and G. A. PRATHAPASINGHE*
*Corresponding Author: gamika@gmail.com

This study aimed to compare the nutritional composition and quality characteristics of pork types in Sri Lanka. Raw leg meat samples from thigh area (n = 3) of wild boar (WB), village pig (VP) and Large White breed (EP) were collected and proximate composition, texture, water holding capacity (WHC) and colour were analysed. The data were analysed using SPSS. The WB contained higher (P < .05) crude protein (22.86 ± 0.01 g/100g), and crude ash (2.55 ± 0.01 g/100g) than VP and EP. However, higher (P < .05) crude fat (10.15 ± 0.02 g/100g) and moisture (68.20 ± 0.02 g/100g) were observed in EP. The EP also showed lower (P < .05) crude fibre content (0.14 ± 0.01 g/100g) than WB (0.27 ± 0.01 g/100g) and VP (0.22 ± 0.02 g/100g). The WB showed higher (P < .05) cohesiveness (1.58 ± 0.04 g/100g), gumminess (2.46 ± 0.01 g/100g), chewiness (2.3 ± 0.01 g/100g) and hardness (3.63 ± 0.05 g/100g) than VP and EP. The CIE, L* a* b* of EP showed higher (P < .05) L* (45.40 ± 0.11) and b* (8.32 ± 0.04) but a lower a* (3.73 ± 0.08) than VP and WB. The WB showed higher (P < .05) cooking loss and drip loss (44.83 ± 0.83% and 3.68 ± 0.12%, respectively) than VP and EP. In contrast, EP showed higher (P < .05) WHC (65.40 ± 0.9 g/100g) than VP and WB. These findings suggest that commonly consumed pork types in Sri Lanka differ in nutritional composition and meat quality characteristics.

KEYWORDS: Exotic pig, Meat quality, Nutritional composition, Village pig, Wild boar



Department of Livestock & Avian Sciences, Faculty of Livestock, Fisheries & Nutrition, Wayamba University of Sri Lanka, Makandura, Gonawila (NWP), Sri Lanka, 60170

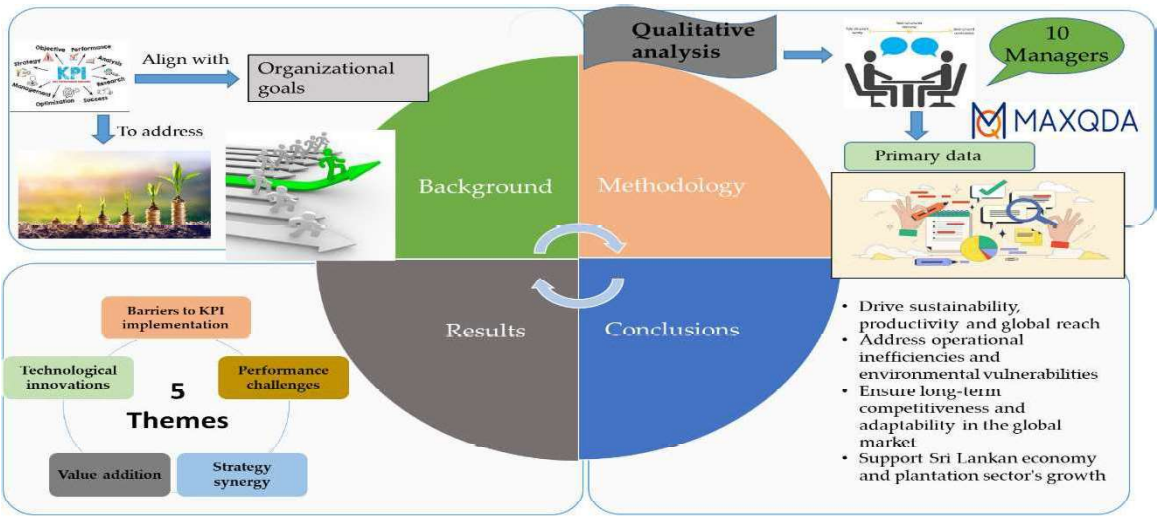
Agricultural and Resource Economics and Policy

Value Addition through Technological Innovation: KPIs as Catalysts for Growth in Sri Lanka's Export-Oriented Plantation Sector

S. N. S. FERNANDO[1*], P. C. ABEYSIRIWARDANA[2] and U. K. JAYASINGHE-MUDALIGE[1]
*Corresponding Author: nilakshifernando246@gmail.com

Key Performance Indicators (KPIs) aligned with Specific, Measurable, Achievable, Relevant, Time-bound (SMART) objectives are crucial for evaluating the performance of, and fostering sustainability, in export-oriented firms in the plantation sector. In light of that, this study was directed to investigate the formulation, implementation, and measurement of KPIs, in which qualitative methods were utilized hugely. Semi-structured interviews (n=10) with senior managers of these firms were conducted via online video conferencing facility. The attitudinal data gathered was transcribed and analysed using MAXQDA 2024 software through thematic analysis, which materialized five critical themes, including: barriers to KPI implementation; performance challenges; strategy synergy; value addition to the market, and technological innovations for optimization. The outcome of analysis indicated that issues related to performance like declining productivity and labour inefficiencies require adaptive KPI systems to address rapid KPI fluctuations and knowledge gaps. Barriers to KPI implementation highlighted the need for digital solutions and stakeholder engagement. Strategy synergy emphasized aligning KPIs with organizational goals to optimize resources and competitiveness. Value addition brought to the importance of diversification and innovation to drive profitability and market share. Finally, technological innovations were identified as essential for real-time monitoring and sustainable practices. The study concludes that KPIs, when strategically connected with innovation, increase productivity, profitability, and global competitiveness. Addressing operational inefficiencies, mitigating environmental vulnerabilities, and integrating green ideas ensures the plantation industry's long-term adaptability and sustainability. Improving KPI-driven decision-making can significantly contribute to make the industry resilient and support economic growth.

KEYWORDS: Export-oriented firms, Key Performance Indicators (KPIs), Performance evaluation, Plantation sector, Sustainability



[1]Department of Agribusiness Management, Faculty of Agriculture and Planation Management, Wayamba University of Sri Lanka, Makandura, Gonawila (NWP), 60170, Sri Lanka; [2] Ministry of Science and Technology, Sethsiripaya, Battaramulla, Sri Lanka

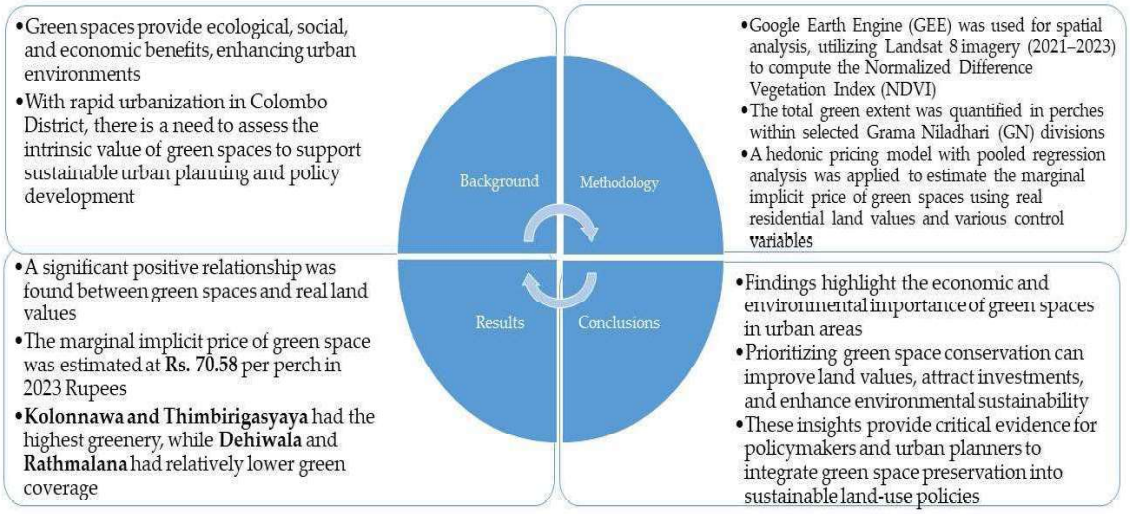
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Uncovering the Economic Value of Green Spaces: A Land Valuation Study in Colombo District, Sri Lanka

D. M. W. S. H. DISSANAYAKE[1*], W. A. M. FERNANDO[2] and J. C. EDIRISINGHE[1]
*Corresponding Author: sewmihansika@gmail.com

Green spaces provide essential ecological, social, and economic benefits to enhance urban environments, yet rapid urbanization has placed increasing pressure on their conservation risking the provision of critical ecosystem services such as carbon sequestration, air purification, water regulation, and biodiversity preservation. This study assesses the total value of green spaces in Colombo district, Sri Lanka, using a hedonic pricing model and remote sensing techniques. Spatial analysis conducted in Google Earth Engine utilized high-resolution 30 m Landsat satellite imagery from 2021, 2022, and 2023 to compute the Normalized Difference Vegetation Index, which served as a relative measure of green extent across selected Grama niladhari divisions. Real residential land prices per perch were obtained from the Government Valuation Department for the same period. A pooled regression analysis estimated the marginal implicit value and total value of green spaces, controlling for variables such as population density, access to infrastructure including transport hubs, hospitals and banks, social issues including drug prevalence, and environmental risks including flooding and pollution. Results indicate a significant positive correlation between green spaces and land values, with the marginal implicit price of green space estimated at LKR 70.58 per perch in 2023. Findings reveal that Kolonnawa and Thimbirigasyaya exhibited more greenery due to structured urban planning and the presence of public green areas, whereas Dehiwala and Rathmalana showed less greenery due to high population density and commercial expansion. Prioritizing green space conservation in land-use policies can enhance environmental quality, increase property values, attract investment, and ensure sustainable urban development.

KEYWORDS: Google earth engine, Green spaces, Hedonic model, Land prices, Marginal implicit price



[1]Department of Agribusiness Management, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka, Makandura, Gonawila, Sri Lanka; [2]Department of Nano Science Technology, Faculty of Technology, Wayamba University of Sri Lanka, Kuliyapitiya, Sri Lanka

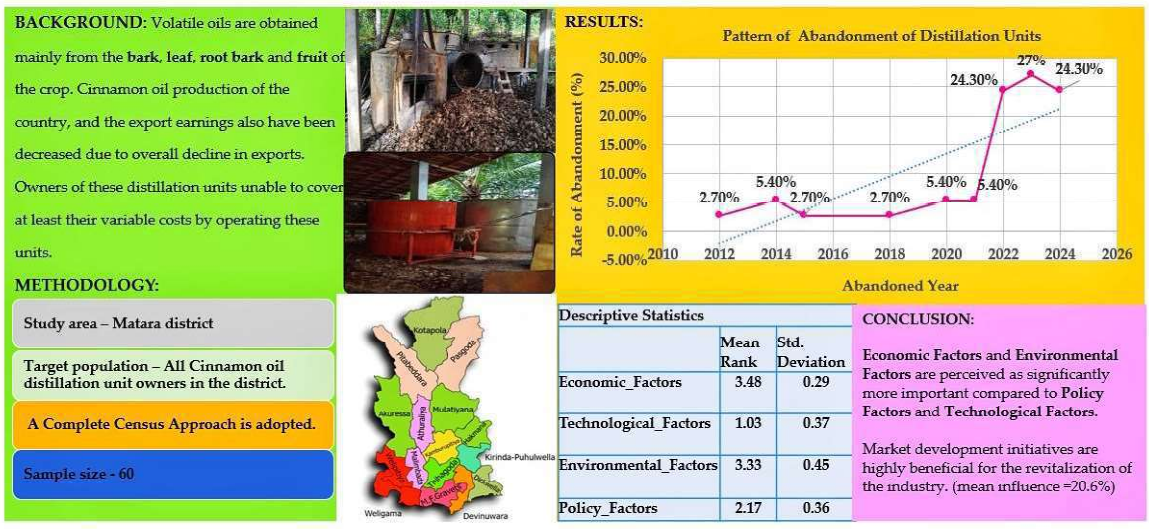
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Factors Influencing the Abandonment of Cinnamon Oil Distillation Units in Matara District, Sri Lanka: A Comprehensive Analysis

S. M. JAYASINGHE[1*], A. L. SANDIKA[1] and C. U. WIDANAPATHIRANA[2]
*Corresponding Author: smihiranjayasinghe@gmail.com

This research investigates the factors behind the abandonment of cinnamon oil distillation units in the Matara District, Sri Lanka, a region known for its significant contribution to the cinnamon oil industry. The study examines how economic, environmental, technological, and policy factors contribute to this abandonment. Data were collected from all 60 distillation unit owners using pre-tested structured questionnaires, employing a complete census approach to gather information on stakeholder roles, operational challenges, and community perceptions. The statistical analysis involved reliability testing, factor analysis, Spearman correlation, and the Friedman test. Findings indicate that 61.7% of surveyed distillation units were abandoned, primarily due to economic challenges such as price fluctuations, high production costs, market monopolies, and restricted access to financing. Economic factors had the highest mean rank influence ($\bar{X}$=3.48), followed by environmental factors ($\bar{X}$=3.33), including adverse weather patterns and waste management inefficiencies. Technological challenges, including limited automation and continued use of outdated equipment, along with policy-related barriers, including stringent export regulations and sanitary requirements, significantly contributed to abandonment. The findings emphasize that revitalization strategies focusing on policy reforms, technological advancements, and sustainable practices are crucial for the industry's revival. Economic challenges, such as market monopolies and restricted financing, highlight the need for targeted financial support and market expansion initiatives. Enhancing stakeholder collaboration and expanding market opportunities are key to foster regional economic growth and ensuring industry's sustainability. This comprehensive analysis provides actionable insights for policymakers and industry stakeholders, contributing to long-term viability of Sri Lanka's agricultural economy and the cinnamon oil industry.

KEYWORDS: Abandonment, Cinnamon oil, Economic factors, Sustainability, Technology adoption



[1] Department of Agricultural Economics and Agribusiness, Faculty of Agriculture, University of Ruhuna, Mapalana, Sri Lanka; [2]National Cinnamon Research and Training Centre, Palolpitiya, Matara, Sri Lanka

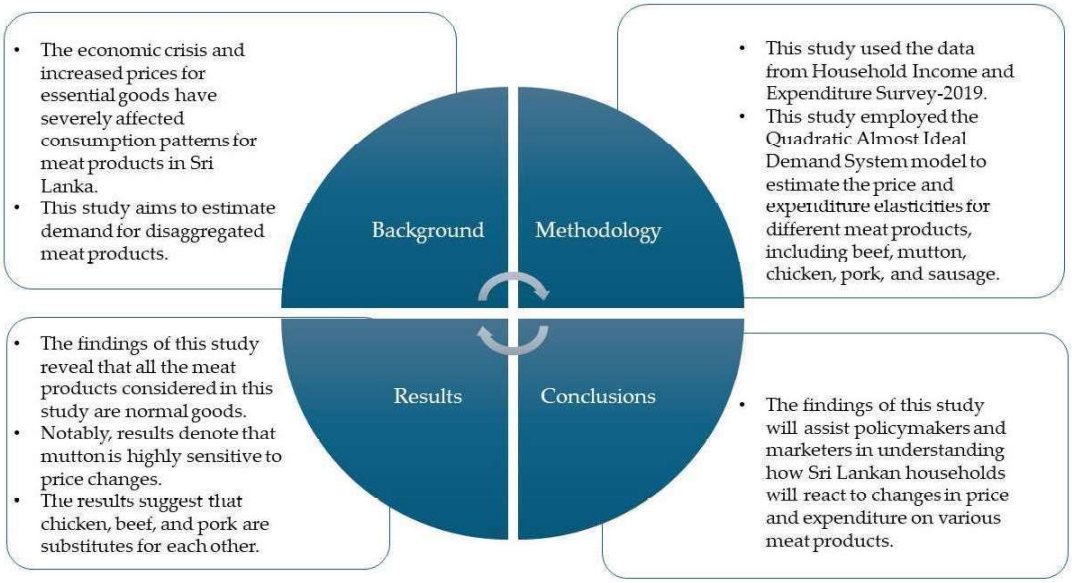
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Households' Demand for Disaggregated Meat Products in Sri Lanka: A Censored Quadratic Almost Ideal Demand System Model

B. MUSTHIFA, S. SIVASHANKAR*, K. SOORIYAKUMAR and S. SARUJAN
*Corresponding Author: ssivashankar@univ.jfn.ac.lk

The economic crisis and increased prices for essential goods have severely affected consumption patterns of meat products in Sri Lanka. Therefore, this study aims to estimate demand for disaggregated meat products. This study used the data from Household Income and Expenditure Survey-2019 and employed the Quadratic Almost Ideal Demand System model to estimate the own-price, cross-price, and expenditure elasticities for different meat products, including beef, mutton, chicken, pork, and sausage. To correct the zero-consumption, the consistent two-step estimation procedure was used. The findings of this study revealed that all the meat products considered in this study are normal goods; however, beef (1.202) and chicken (1.076) are more sensitive to changes in expenditure than mutton (0.692), pork (0.609), and sausages (0.456). Also, own-price elasticities indicated that mutton (-3.491), beef (-1.993), sausages (-1.551), and chicken (-1.073) have elastic demand, while pork (-0.789) has inelastic demand. Notably, results denoted that mutton is highly sensitive to price changes than other meat products in this study. The estimated cross-price elasticities exhibit substitute and complementary relationships between meat products; however, mainly substitute relationships are identified among them. The results suggest that chicken, beef, and pork are substitutes for each other. Further, the cross-price elasticities show that sausages are substitutes for chicken and mutton, while complements for beef and pork. Therefore, the findings of this study will assist policymakers and marketers in understanding how Sri Lankan households will react to changes in price and expenditure on various meat products.

KEYWORDS: Consistent two-step estimation, Expenditure elasticity, Meat products, Own-price elasticity, Quadratic almost ideal demand system



Department of Agricultural Economics, Faculty of Agriculture, University of Jaffna, Jaffna, Sri Lanka

ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Market Dynamics and Strategic Growth Opportunities in Sri Lanka's Floriculture Export Sector

H. M. K. A. HEENKENDA[1], K. A. D. P. WANSHAJA[1], I. V. KURUPPU[2]* and T. P. S. R. GURUGE[2]
*Corresponding Author: virajithkuruppu@wyb.ac.lk

This study utilizes Revealed Comparative Advantage (RCA), Revealed Symmetric Comparative Advantage (RSCA), and the Trade Balance Index (TBI) to assess Sri Lanka's competitive standing in global floriculture markets. Data were collected through quantitative surveys of 55 exporters registered with the Export Development Board (EDB), secondary sources, and qualitative interviews with industry experts. The study also explores Sri Lanka's floriculture export sector using the Structure-Conduct-Performance (SCP) framework, company strategies, market dynamics, and industry outcomes. RCA and RSCA metrics demonstrate Sri Lanka's slight comparative edge in live plants but a disadvantage in bulbs and tubers, where it remains a net importer. However, Sri Lanka exhibits strong performance in foliage exports, with positive RSCA and TBI values, highlighting its specialization in tropical foliage. Despite low RCA scores, cut flowers maintain a positive trade balance, indicating growth potential in niche export varieties. TBI results confirm that while Kenya and the Netherlands dominate cut flowers and bulbs in the world market, Sri Lanka's competitive strength lies in foliage exports, leveraging biodiversity and a tropical climate. Additionally, a Concentration Ratio (CR) of 31% and Herfindahl-Hirschman Index (HHI) of 0.056 indicate a transition toward a weak oligopoly between 2014 and 2023. The study offers lessons for emerging economies on using biodiversity and climatic strengths to enhance global competitiveness, particularly by focusing on specialized exports like foliage, despite competition from larger exporters.

KEYWORDS: Comparative advantage, Export performance, Floriculture industry, Structure-Conduct-Performance

[1]*Department of Agribusiness Management, Faculty of Agriculture, Aquinas College of Higher Studies, Colombo, Sri Lanka;* [2]*Department of Agribusiness Management, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka, Makandura, Gonawila, Sri Lanka*

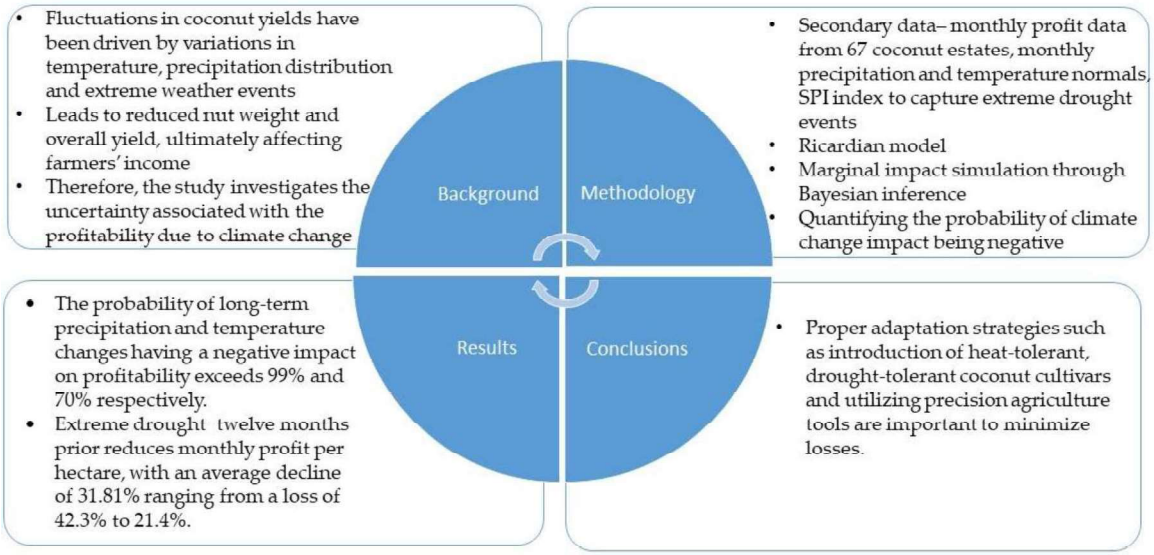
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Assessing Climate Uncertainty in Coconut Farming: A Bayesian-Ricardian Study on Sri Lanka's Coconut Triangle

G. N. I. WIMALAWEERA* and J. C. EDIRISINGHE
*Corresponding Author: nawaniimeshika@gmail.com

Coconut is a rain-fed crop which is highly vulnerable to climate change. In Sri Lanka, fluctuations in coconut yields have been driven by variations in temperature, precipitation distribution, and extreme weather events including floods and droughts. This leads to reduced nut weight and overall yield, thereby affecting farmers' income ultimately. Therefore, this study is aimed at quantifying the impact of climate change on coconut profitability in coconut estates in the coconut triangle using the Bayesian-Ricardian approach which uniquely captures the uncertainty associated with the profit due to climate change. Previously collected monthly profit data from 67 coconut estates, for the period 2002 to 2018 were analysed using a Ricardian framework with a pooled regression model estimated through Bayesian methods. Trace plots confirmed successful parameter convergence, and non-informative priors were used due to lack of prior knowledge. The study revealed that climate change results in significant losses for coconut estates. The probability of long-term precipitation and long-term temperature changes having a negative impact on profitability exceeds 99% and 70% respectively, across given scenarios. Extreme droughts occurring twelve months prior significantly reduce monthly profit per hectare, with an average decline of 31.81% ranging from a loss of 42.3% to 21.4% at a 95% credible interval. As climate projections suggest increasing temperature, precipitation variability and frequent droughts in major coconut growing areas, including Kurunegala, Chilaw and Gampaha, estate holders will experience greater profit losses. Therefore, adopting climate-resilient strategies including heat-tolerant and drought-tolerant coconut cultivars and precision agriculture tools is crucial to minimize losses.

KEYWORDS: Drought, Negative, Precipitation, Profitability, Temperature



Acknowledgement: Financial assistance by the National Science Foundation of Sri Lanka (grant number: NTRP/2017/CC&ND/TA-02/P-02/01)

Department of Agribusiness Management, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka, Makandura, Gonawila (NWP), 60170, Sri Lanka

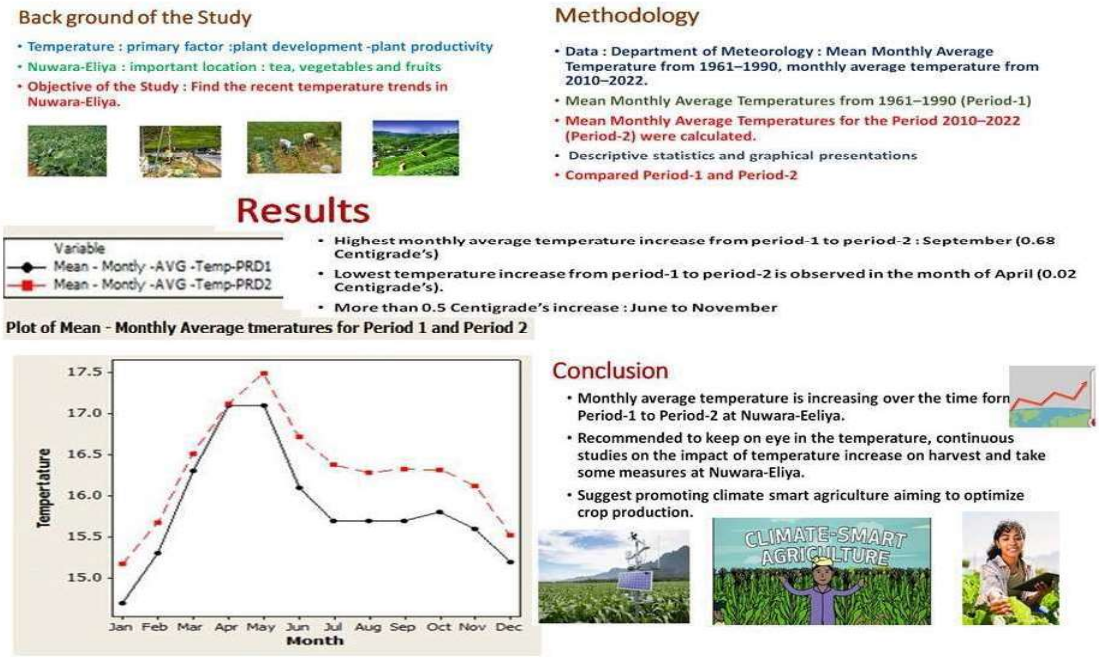
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

An Assessment of Recent Temperature Trends in Nuwara Eliya, Sri Lanka

K. D. V. F. SIRIWARDANA
Corresponding Author: kdsir@ou.ac.lk

Temperature is a primary factor affecting the rate of plant development and plant productivity. Nuwara Eliya is an important location for tea, vegetables and fruits production in Sri Lankan Agriculture. Hence a study on temperature trends at Nuwara-Eliya is very important. According to the literature the ten warmest years in the historical recorded have all occurred since 2010 globally. Objective of the study is to identify the recent temperature trends in Nuwara Eliya. Mean monthly average temperature from 1961–1990, monthly average temperature from 2010–2022 were obtained from the Department of Meteorology. Mean monthly average temperatures for the period 2010–2022 (Period-2) were calculated and compared with the mean monthly average temperatures for period 1961–1990 (Period-1). Descriptive statistics and graphical plots clearly showed that the monthly average temperature has been increasing over the time from Period-1 to Period-2 in Nuwara Eliya. Highest and lowest monthly average temperature increase from period-1 to period-2 is observed in months of September (0.68 °C) and April (0.02 °C). Increase of monthly average temperature is higher than 0.5 °C in the five months period; June to November, indicates fast temperature increase, which may influence to the agriculture production in Nuwara Eliya posing implication to the economy of Sri Lanka. The study recommends further research to study temperature patterns regularly, conduct studies on the impact of temperature increase on yield in Nuwara Eliya to propose suitable measures. It further suggests promoting climate smart agriculture aiming optimized crop production.

KEYWORDS: Nuwara Eliya, Temperature, Temperature increase, Trends



Department of Mathematics, Open University of Sri Lanka, Nawala, Nugegoda, Sri Lanka

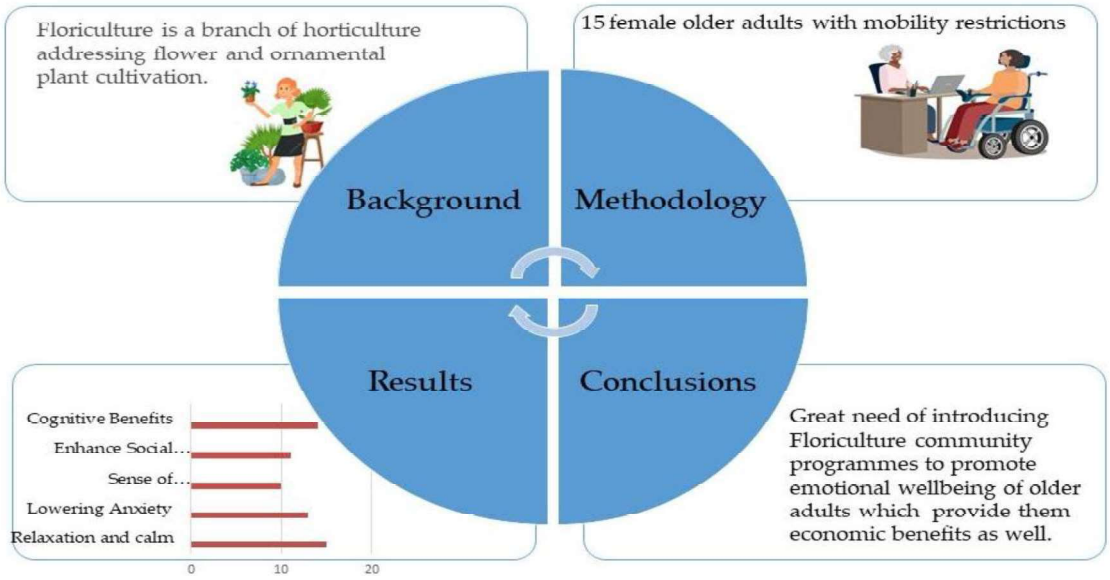
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

They need Flowers, not for Wreaths: Floriculture as a Therapeutic Tool for Enhancing Emotional Wellbeing of Older Female Adults with Mobility Restrictions

T. M. R. P. K. TENNAKOON
Corresponding Author: renuka@slf.lk

The aim of the study was to recognize the importance of floriculture as a therapeutic tool to promote emotional wellbeing of the elderly females with age related difficulties. Floriculture is a branch of ornamental horticulture that involves growing and marketing flowers, flower arrangement and plants for human enjoyment. As floriculture accompanies number of simple tasks from growing to creating greeting cards with dried flowers, it also suits older adults with physical and cognitive limitations. Fifteen older female adults with mobility restrictions between 60–84 years were selected considering their interest and engagement in floriculture for the research. Five respondents were restricted to wheelchairs. Interviews based on a guideline designed to identify emotional benefits of floriculture were utilized to collect data. Planting seeds, trimming plants and just spending time in a garden were gardening activities that promoted calm and relaxation by lowering stress and anxiety levels to the respondents. Such activities provided a concrete sense of achievement. Seeing plants sprout from seed and flourish could recall their child bearing and rearing periods. Buying and selling plants, exchanging seeds, sharing cultivation tips and specially joining floriculture Facebook groups enhanced their social relationships. Maintaining records of the growth and changes in plants offered significant cognitive benefits like enhanced memory retention, sharpened attention and fostered critical thinking skills. The research suggests that emotional wellbeing of the older adults is promoted by floriculture. Study concludes the need for introducing floriculture community programmes which can promote emotional wellbeing of older adults while providing economic benefits.

KEYWORDS: Emotional wellbeing, Floriculture, Older adults



Sri Lanka Foundation Institute, Social and Institutional Development Unit, 100, Padanama Mawatha, Colombo 07, Sri Lanka

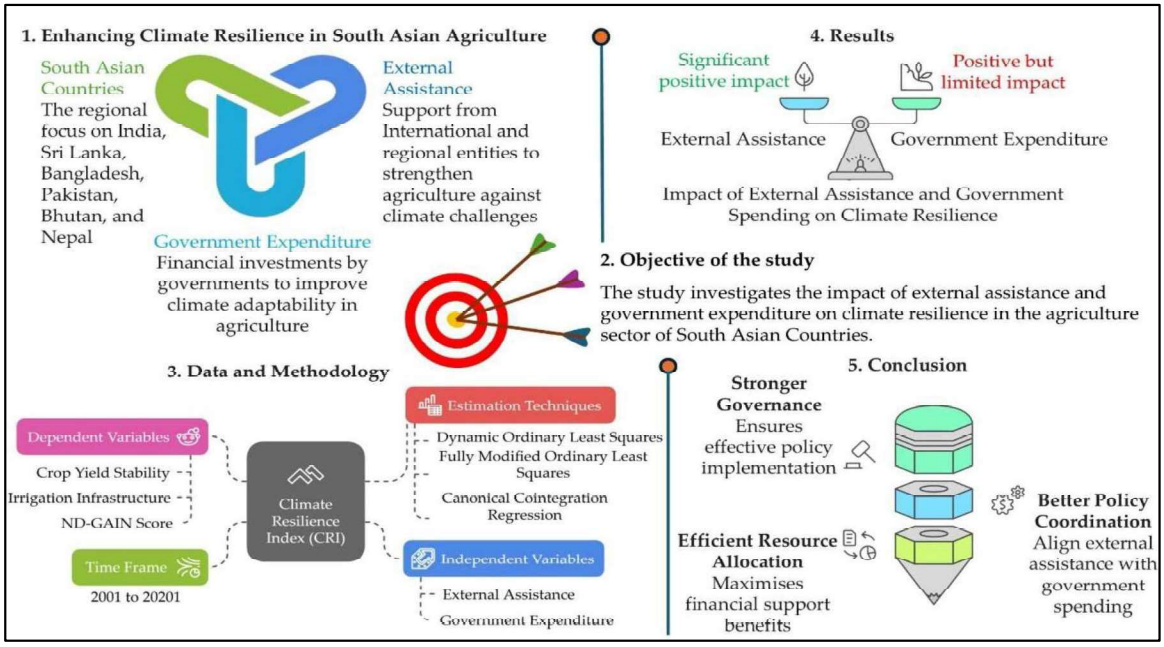
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

External Assistance and Government Expenditure for Building Climate Resilience and Adaptation: A Study of the Agriculture Sector in South-Asian Countries

J. AHMAD
Corresponding Author: jamilahmad786@gmail.com

This study investigates the impact of external assistance and government expenditure on climate resilience in the agriculture sector of India, Sri Lanka, Bangladesh, Pakistan, Bhutan, and Nepal from 2001 to 2021. Climate resilience is evaluated using a composite index constructed from normalized values of three key indicators. The index incorporates crop yield stability (measured in kg per hectare), irrigation infrastructure (measured as the percentage of cultivated land equipped for irrigation), and the ND-GAIN score, which assesses a country's vulnerability to climate change and its adaptive capacity. In this analysis, the climate resilience index serves as the dependent variable, while the independent variables include external assistance (measured in USD) and government expenditure (expressed as a percentage). The Dynamic Ordinary Least Squares (DOLS) results show that external assistance significantly and positively affects climate resilience in India, Bhutan, Sri Lanka, and Nepal, while its impact is negative and statistically insignificant in Bangladesh and Pakistan. Government expenditure, on the other hand, supports climate resilience in India, Bangladesh, Bhutan, and Pakistan but does not have a meaningful effect in Sri Lanka and Nepal. Moreover, the DOLS findings are further supported by Fully Modified Ordinary Least Squares (FMOLS) and Canonical Co-Integration Regression (CCR). Overall, the study emphasizes the need for stronger governance, better policy coordination, and efficient resource allocation to maximize the impact of external assistance and government spending on climate resilience in South Asia.

KEYWORDS: Climate resilience, Agriculture, South Asian countries



Acknowledgement: Financial assistance by Aligarh Muslim University

Department of Economics, Aligarh Muslim University, Aligarh, Uttar Pradesh, India

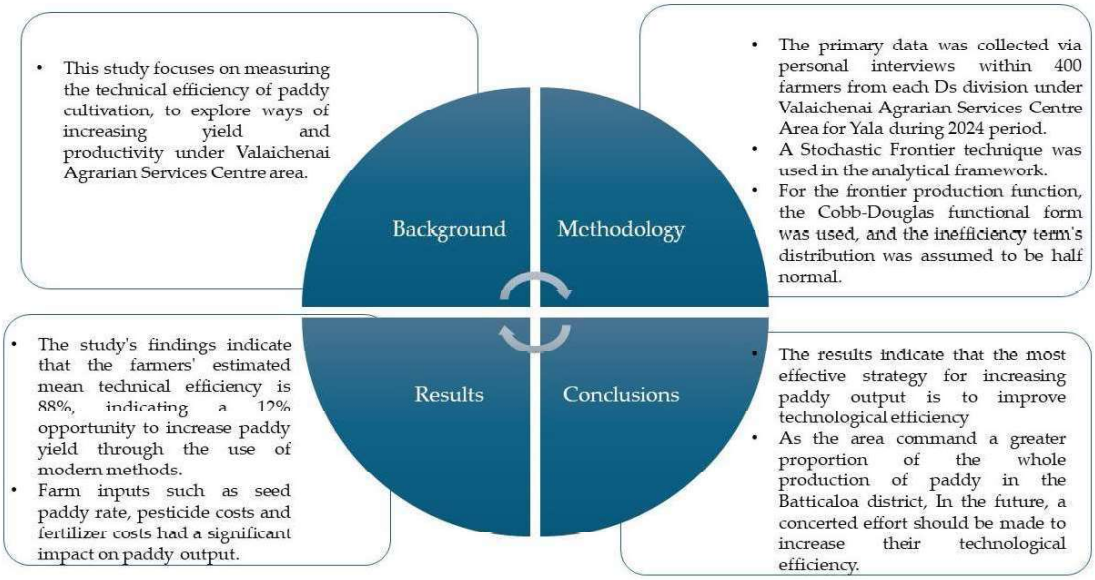
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Production Efficiency of the Local Paddy Cultivation Under Valaichenai Agrarian Services Centre Area

M. RIMSATH, K. SOORIYAKUMAR, S. SARUJAN* and S. SIVASHANKAR
*Corresponding Author: ssarujan@univ.jfn.ac.lk

This study focuses on measuring the technical efficiency of paddy cultivation, to explore ways of increasing yield and productivity under Valaichenai agrarian services centre area. Primary data was used in this study. The primary data was collected using well-structured and pre-tested questionnaires administered across 400 farmers from each district secretariate division under Valaichenai agrarian services centre area for *Yala* during 2024 period. The district secretariate divisions selected for field survey were Koralai pattu, Koralai pattu south, Koralai pattu west and Koralai pattu central. A stochastic frontier technique was used in the analytical framework. For the frontier production function, the Cobb-Douglas functional form was used, and the inefficiency term's distribution was assumed to be half normal. The study's findings indicate that the farmers' estimated mean technical efficiency is 88%, indicating a 12% opportunity to increase paddy using modern methods such as adoption of labour-saving technologies, single-nutrient fertilisers, high yielding varieties, and improve soil management practices. Farm inputs such as seed paddy rate, pesticide costs and fertiliser costs had a significant impact on paddy output. Paddy farmer's technical efficiency is positively influenced by farming experience. The results indicate that the most effective strategy for increasing paddy output is to improve technological efficiency under Valaichenai agrarian services centre area. As the area command a greater proportion of the whole production of paddy in the Batticaloa district, In the future, a concerted effort should be made to increase their technological efficiency.

KEYWORDS: Cobb-Douglas Functional form; Paddy cultivation; Production efficiency; Stochastic frontier technique; Technical efficiency



Department of Agricultural Economics, Faculty of Agriculture, University of Jaffna, Jaffna, Sri Lanka

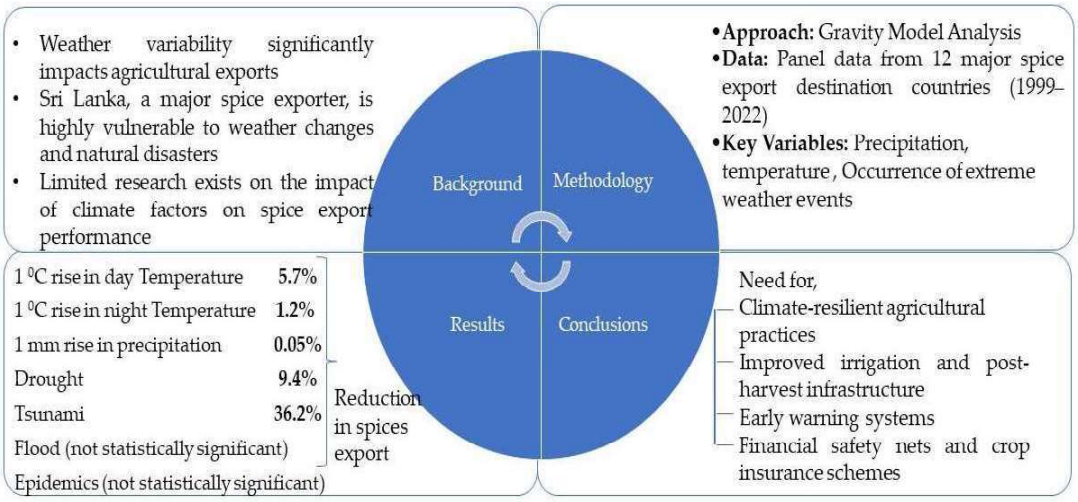
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

An Econometric Analysis of the Impact of Weather and Natural Disasters on Sri Lankan Spice Exports: A Gravity Model Approach

S. A. C. S. SEANAYAKA* and J. C. EDIRISINGHE
*Corresponding Author: sandunika327@gmail.com

Variations in weather and natural disasters are a significant challenge in agricultural production, especially in those countries which grow climate-sensitive crops. Although there is extensive research on the general impact of climate change on agriculture, a limited attention has been placed on the export performance of key agricultural commodities. Therefore, this study attempts to fill this gap by using an empirical analysis of the impact of weather condition and natural disasters on spice export from Sri Lanka, a major global exporter of spices. Sri Lanka serves as a critical context for this study due to its heavy reliance on agricultural exports and its vulnerability to climate variability. Using the Gravity Model approach, the analysis incorporated panel data from 12 primary spice export destination countries from 1999 to 2022. The findings revealed that weather factors, such as deviations in precipitation and temperature, significantly reduced spice exports. In addition, increasing frequency of extreme weather events such as droughts aggravated these challenges. Interestingly, the model highlighted a potential mitigating effect: sufficient rainfall can partially offset the adverse impacts of rising temperatures, highlighting a complex interplay between weather variables. The results of the study highlighted the importance of climate resilient agricultural practices, enhancements to irrigation and post-harvest infrastructure, implementation of early warning systems, establishment of financial safety nets and crop insurance schemes to mitigate the expected future impacts.

KEYWORDS: Extreme weather events, Gravity model, Natural disasters, Spice exports, Weather patterns



Department of Agribusiness Management, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka, Makandura, Gonawila (NWP), Sri Lanka

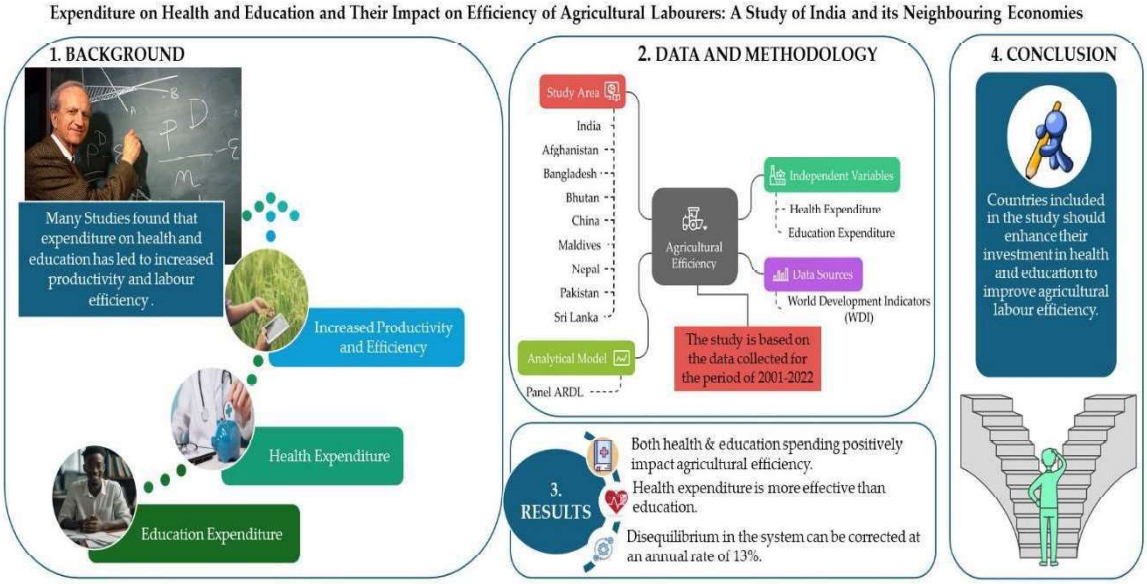
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Expenditure on Health and Education and Their Impact on Efficiency of Agricultural Labourers: A Study of India and its Neighbouring Economies

I. AHMAD, R. QASIM, W. FAHEEM, F. IMTEYAZ and D. ALAM*
*Corresponding Author: dastgir_alam@rediffmail.com

Many studies found that expenditure on health and education has led to increased productivity and labour efficiency. To understand its implication for agriculture sector, the present research paper examines the impact of expenditure on education and health on agricultural efficiency in India and its neighbouring economies. Efficiency of agricultural labourers is measured with agricultural value added per worker and considered as independent variable and expenditure on education and health is regressed on it. The secondary data for above variables are collected for Afghanistan, Bangladesh, Bhutan, China, India, Maldives, Nepal, Pakistan and Sri Lanka for the period of 2002-2022. To measure the impact panel Autoregressive Distributed Lag (ARDL) model is used. The results of ARDL model shows that both, the expenditure on health as well as education are significantly affecting the efficiency of agricultural labourers in India and its neighbouring countries. Comparative efficacy level of expenditure on health and education in determining the efficiency of agricultural labourers shows that expenditure on health is found to be more effective as compared to expenditure on education. The short run analysis of the study reveals that any disequilibrium can be corrected at the rate of 13 percent annually. The results refer those economies considered in this study should enhance the expenditure on education and health for improving the efficiency of agricultural labourers.

KEYWORDS: Agricultural labour efficiency, Asian nations, Education spending, Health investment



Acknowledgement: Financial assistance by Aligarh Muslim University

Department of Economics, Aligarh Muslim University, Aligarh, Uttar Pradesh, India

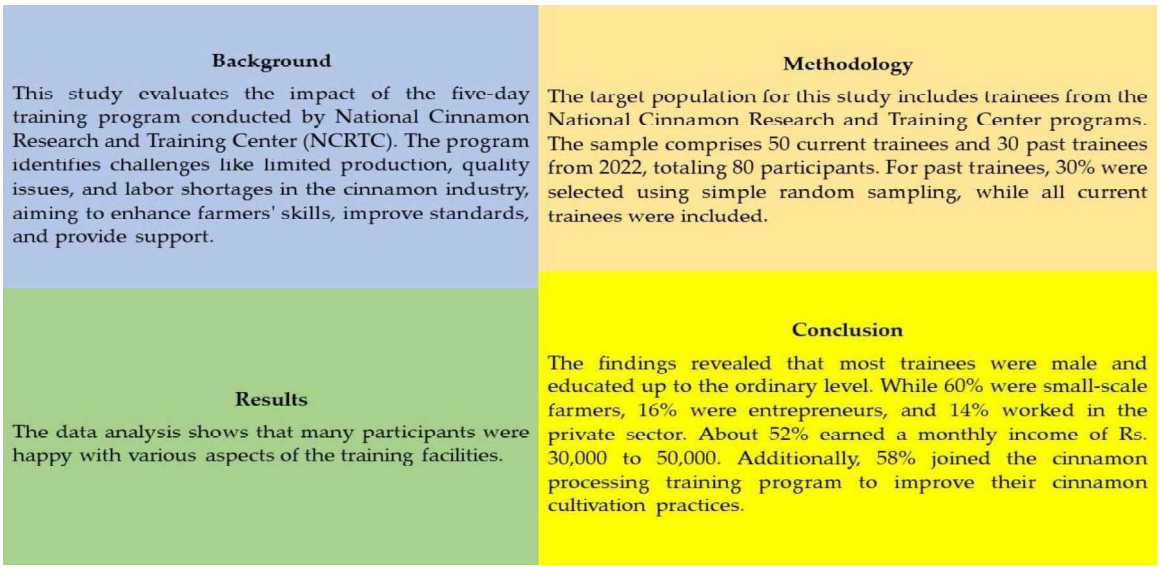
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Effectiveness of the Five-Day Training Programme Conducted by National Cinnamon Research and Training Centre, Sri Lanka

K. N. S. LANKA[1]*, A. L. SANDIKA[1] and C. U. WIDANAPATHIRANA[2]
*Corresponding Author: kgnsewwandilanka@gmail.com

This study evaluates the effectiveness of the five-day cinnamon processing training programme conducted by the National Cinnamon Research and Training Centre (NCRTC), focusing on three main objectives: assessing participant satisfaction, measuring the impact on knowledge, skills, and livelihood development, and providing recommendations for improvement. The programme aims to enhance participants' cinnamon processing skills, with a focus on Good Manufacturing Practices (GMP) and livelihood development. Data were collected from 80 participants, including 50 current attendees and 30 past trainees from year 2022, using both quantitative and qualitative methods such as surveys, knowledge assessments, and discussions with past trainees. Hence, trainees' perception on knowledge gain and skill development was measured using a 5-point Likert scale. All participants were highly satisfied with the training content, and 50% were highly satisfied with the training facilities. While 38% were satisfied and 13% had neutral responses. The result showed how the training content had improved trainees' knowledge. The majority 70% of the respondents, indicated that the training had been effective. While 30% of the respondents stated that it had been very effective. This shows that most participants believe the training has helped them to improve their knowledge. Before the training, mean annual income of these 30 trainees was LKR 195,983 from cinnamon processing. Two years after completing the programme, their income increased to LKR 247,467. This represents a 26.26% increase in income. Overall, practical sessions are strongly beneficial, while other factors show more neutral or limited effect on the training experience.

KEYWORDS: Agricultural training, Effectiveness, Skill development, Training outcomes



[1]Department of Agricultural Economics and Agribusiness, Faculty of Agriculture, University of Ruhuna, Mapalana, Sri Lanka; [2]National Cinnamon Research and Training Centre, Palolpitiya, Matara, Sri Lanka

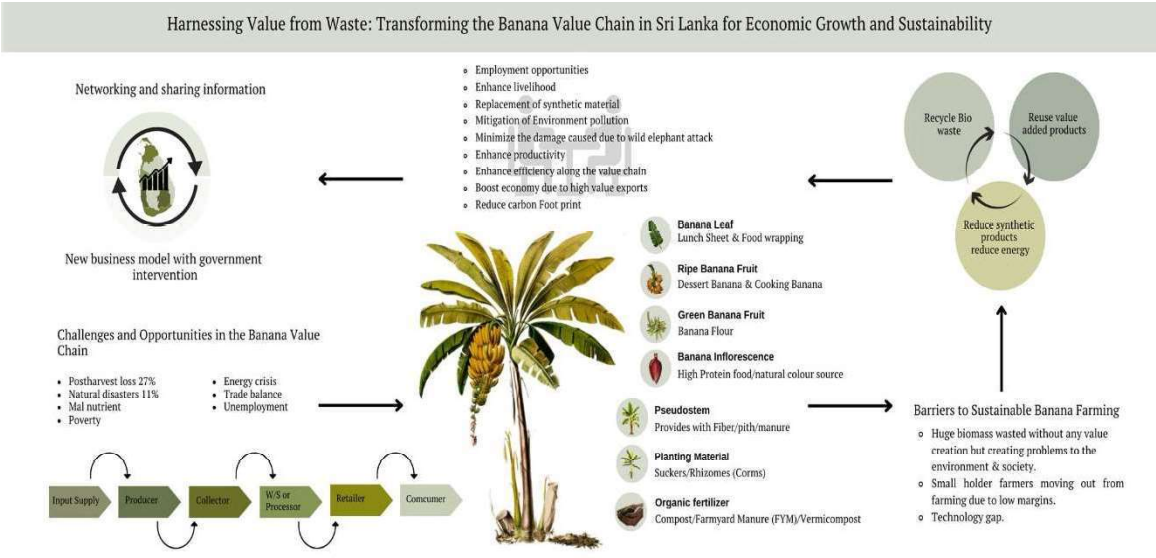
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Harnessing Value from Waste: Transforming the Banana Value Chain in Sri Lanka for Economic Growth and Sustainability

N. G. M. WIJEMANNE[1*] and S. P. PREMARATNA[2]
*Corresponding Author: wijemannemanori@gmail.com

Agriculture significantly contributes to Sri Lanka's economy, yet the banana value chain, despite its potential, faces critical challenges. This study, employing Porter's value chain and circular economy models, investigates the transformation of the banana sector for economic growth and sustainability, focusing on smallholder farmers in five strategically selected districts: Anuradhapura, Rathnapura, Kegalle, Monaragala and Jaffna, representing diverse agro-ecological zones and cultivation practices. Data, gathered from 350 interviews, six focus group discussions, field observations, and secondary sources revealed an unambiguous difference. In Rathnapura and Kegalle, declining cultivation stems from escalating production costs, reduced profitability, and limited to access quality inputs. Conversely, private sector-driven commercial farms in Anuradhapura and Rathnapura demonstrate increased yields through advanced irrigation, fertilisation and large-scale operation. Biowaste defined as discarded banana pseudo-stems, leaves and pith presents a significant opportunity. Value-added products, including fibre-based textiles produce via fibre extraction and weaving, paper products from pith pulping, and bio-fertilisers generated through vermicomposting, offer avenues for enhanced economic sustainability. Utilizing pseudo-stems reduces labour-intensive disposal, while pith processing mitigates reliance on synthetic packaging. Also, vermicompost application reduces chemical fertiliser usage, and generates higher export margins for organic produce. Targeted policy interventions are crucial: subsidized input provision for smallholders, infrastructures investments for efficient biowaste processing facilities, and promotion of market linkages for eco-friendly banana byproducts. This study underscores the need for a holistic approach to transform the banana value chain, fostering economic growth while prioritizing environmental sustainability and improving livelihoods.

KEYWORDS: Banana, Eco-friendly, Pseudo-stem, Recycling, Value chain



[1]*Industrial Technology Institute, Colombo 7, Sri Lanka;* [2]*Department of Economics, University of Colombo, Colombo 03, Sri Lanka*

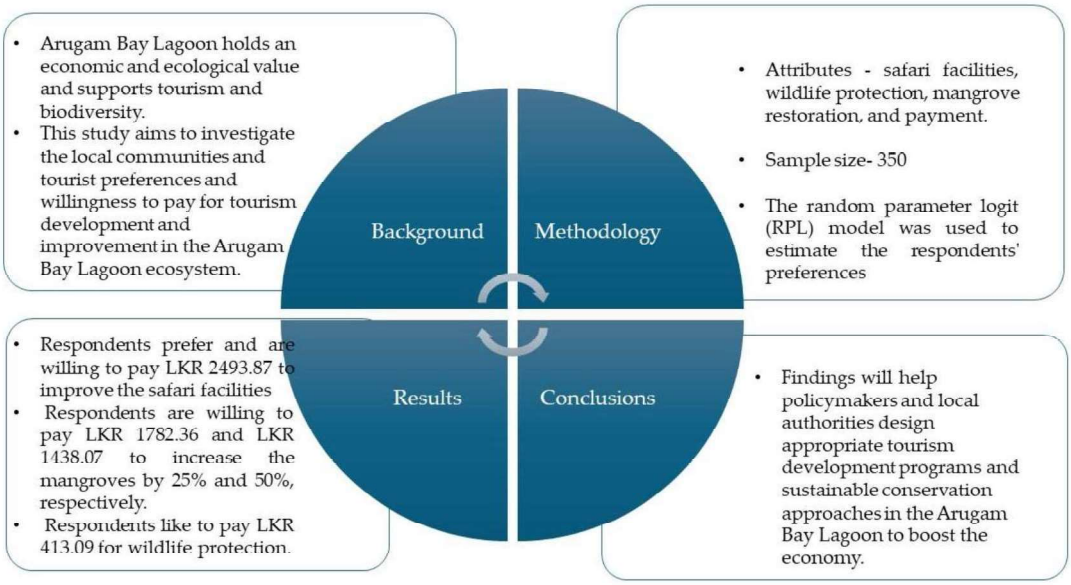
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Local Communities' Preferences and Willingness to Pay for Improving Tourist Facilities and Conservation of Ecosystem in Arugam Bay Lagoon, Sri Lanka

S. L. F. MISFA, S. SIVASHANKAR*, K. SOORIYAKUMAR and S. SARUJAN
*Corresponding Author: ssivashankar@univ.jfn.ac.lk

Arugam Bay lagoon holds an economic and ecological value and supports tourism and biodiversity. This study used the choice experiment approach to investigate the local communities' preferences and willingness to pay for tourism development and improvement in the Arugam Bay lagoon ecosystem. The following attributes were considered in this study: safari facilities, wildlife protection, mangrove restoration, and payment. A random sampling approach was employed, and 350 questionnaires were collected from local communities. The Random Parameter Logit (RPL) model was used to account for preference heterogeneity among the respondents. The results show that respondents prefer and are willing to pay LKR 2493.87 to improve the safari facilities in the area. Also, they are willing to pay LKR 1782.36 and LKR 1438.07 to increase the mangroves by 25% and 50%, respectively. They also like to pay LKR 413.09 for wildlife protection. Further, results indicate that respondents with an education level of grade 11 and above are willing to choose alternatives with improved levels rather than the status quo. These findings will help policymakers and local authorities design appropriate policies that will boost the country's economy by improving tourist facilities.

KEYWORDS: Choice experiment, Random parameter logit model, Tourism, Willingness to pay



Department of Agricultural Economics, Faculty of Agriculture, University of Jaffna, Jaffna, Sri Lanka

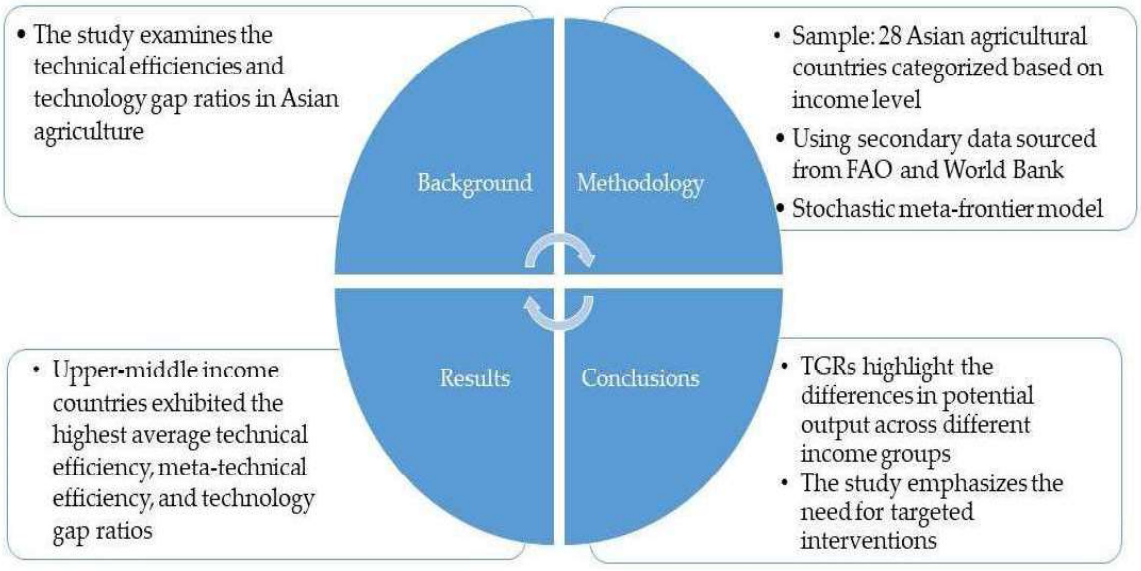
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

A Stochastic Meta-Frontier Analysis of Technical Efficiency and Technology Gaps in Asian Agriculture (1992-2021)

S. D. D. M. MADHUMALI* and J. C. EDIRISINGHE
*Corresponding Author: darshikamalshi2@gmail.com

Agriculture plays a vital role in ensuring food security throughout Asian countries. However, Asian agriculture is facing several challenges that affect its efficiency. Asian countries tend to maximize their output most efficiently to overcome those challenges. This study assesses the technical efficiencies and technology gap ratios in agricultural production across 28 Asian countries from 1992 to 2021. The analysis utilised stochastic meta-frontier incorporating key input and output variables to estimate the efficiencies. Agricultural output is measured using gross production value (USD million), and input variables include land extent (ha), labour force (number of employees), fertilizer use (total N, P_2O5, K_2O in tons), and pesticide use (tons). Production data were sourced from FAOSTAT and the International Labor Organization. According to World Bank income level classification, countries were categorized into high-income, upper-middle-income, and lower-middle-income to assess the differences in efficiency. Results indicate that there is a 46% potential increase in output if all countries produced at their full potential since average technical efficiency is 0.54. Upper-middle-income countries exhibited the highest technical efficiency (0.82), attributed to mechanization, climate-adaptive practices, and farm-size expansion in countries like China, Thailand, and Malaysia. High-income countries achieved an efficiency level of 0.68, and lower-middle-income countries achieved 0.63. Technology gap ratios highlighted the disparities in potential output among three income groups. High-income countries produce 52% of potential output, while upper-middle-income and lower-middle-income countries produce 62% and 49%, respectively. The study highlights the targeted interventions, including policy recommendations to bridge the efficiency gap, especially in lower-middle-income countries.

KEYWORDS: Asian agriculture, Efficiency, Income level, Production frontier



Department of Agribusiness Management, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka, Makandura, Gonawila (NWP), 60170, Sri Lanka

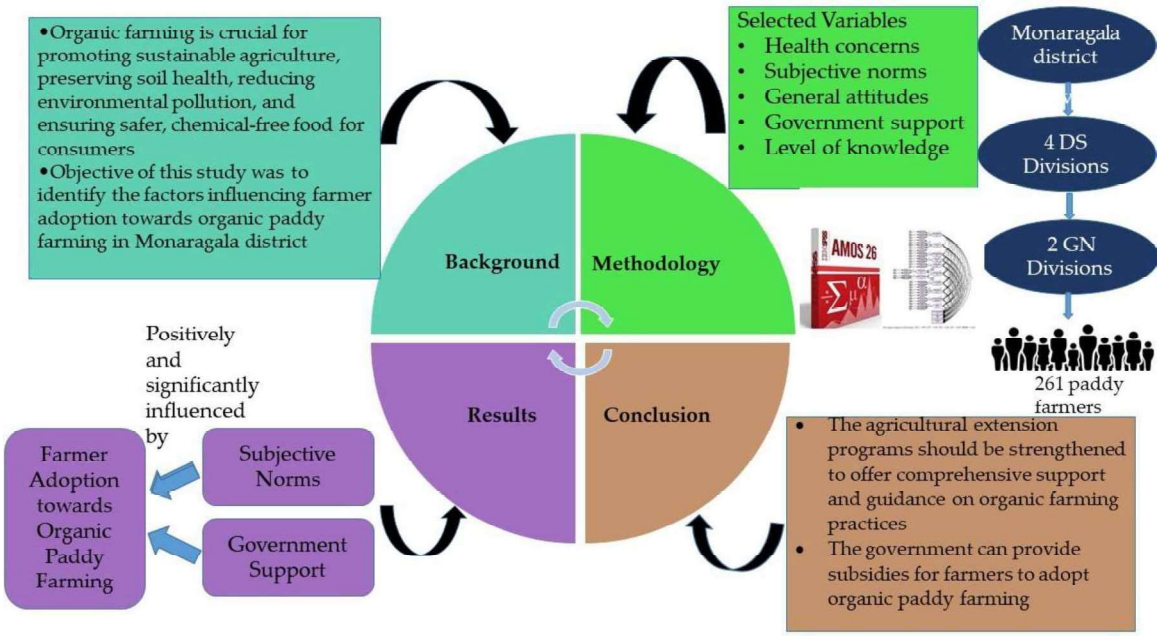
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Factors Influencing Farmer Adoption towards Organic Paddy Farming in Monaragala District, Sri Lanka

J. M. I. A. THILAKARATHNA and A. G. K. WIJESINGHE*
*Corresponding Author: kusum_wijesinghe06@yahoo.com

Due to the benefits of preserving environmental diversity and human health, organic agriculture has attracted worldwide interest as a sustainable alternative to conventional farming. Although Sri Lanka has tremendous potential in organic farming, its practice is at an infancy level. This study assesses the factors influencing farmer adoption towards organic paddy cultivation in Monaragala district. Data were collected through a structured questionnaire from 261 farmers across four divisional secretariat divisions by using simple random sampling method. Data were analysed using descriptive statistics and Structural Equation Modelling (SEM) via AMOS in the SPSS 26 version. The findings reveal that subjective norms and government support are significantly related to farmer adoption towards organic paddy farming. Subjective norms represented the influence of family members, agricultural experts, and extension programs on the adoption of organic paddy farming. Government support consisted of provisions for subsidies, quality seeds, and marketing campaigns to encourage organic paddy cultivation. Health concerns, general attitudes of farmers, and knowledge about organic farming were not significant on farmer adoption. The study highlights the need for a comprehensive intervention to encourage organic farming, pointing out the need for better agricultural extension networks through expert-led community workshops, technical support, and developing dedicated organic paddy marketplaces. Long-term farmer education programs focusing on organic techniques and market accessibility will further support sustainable organic farming practices.

KEYWORDS: Farmer adoption, Organic paddy farming, Structural equation modelling



Department of Agribusiness Management, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka, Makandura, Gonawila, Sri Lanka

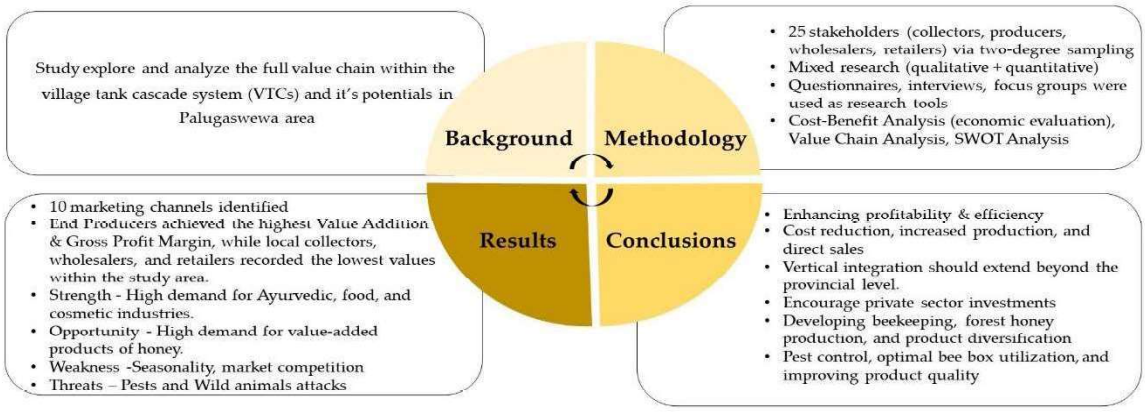
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Unlocking Livelihood Opportunities through Bee Honey Value Chain Development in Village Tank Cascade Systems of Rural Sri Lanka

H. M. L. K. HERATH, I. V. KURUPPU, N. UJANA, A. L. J. BANDARA, and D. C. GURUSINGHE*
*Corresponding Author: dinithic1998@gmail.com

The bee honey value chain within the Village Tank Cascade Systems (VTCs) of rural Sri Lanka has significant economic, cultural, and environmental importance. However, there are limited number of researches conducted on that in the Palugaswewa area. Therefore, this study aimed to explore and analyse the potential for improving livelihoods through the development of an efficient bee honey value chain within VTCs. The study applied a two-degree sampling methodology to determine key stakeholders like collectors, producers, wholesalers, and retailers (n=25). Semi-structured questionnaires, personal interviews, and focus group discussions were used as data collection instruments for both qualitative and quantitative use. Cost-benefit analysis (quantitative), value chain analysis, and SWOT analysis were applied in the analysis process. Analysis identified 10 marketing channels through the value chain map, with intermediaries connecting producers with wholesalers and retailers. The end producers achieved the highest income with a Value Addition (VA) of 8,727 Rs/kg along with a Gross Profit Margin (GPM) of 68.7%, whereas local wholesalers, retailers, and collectors achieved the lowest VA (121.6 Rs/kg) and GPM (9%) owing to fragmented operations along with excessive intermediaries' costs. High demand is indicated by the SWOT analysis, which is strong but suffers from drawbacks like seasonality and low quality. Policymakers must invest in infrastructure, storage, and transport while promoting digital marketing, quality standards and cooperation with the private sector for profitability and market competitiveness. Study recommends that successful policy decisions require location-specific analysis, reflecting agronomic, socio-economic, and political considerations, with implications for enhancing sustainability.

KEYWORDS: Bee honey, Value chain mapping, Value addition, Village Tank Cascade System (VTCs)



Acknowledgement: Financial assistance by Healthy Land Project - Ministry of Environment, South Asia Cooperative Environment Program (SACEP), and UN Environmental Program (UNEP)

Department of Agribusiness Management, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka, Makandura, Gonawila (NWP), 60170, Sri Lanka

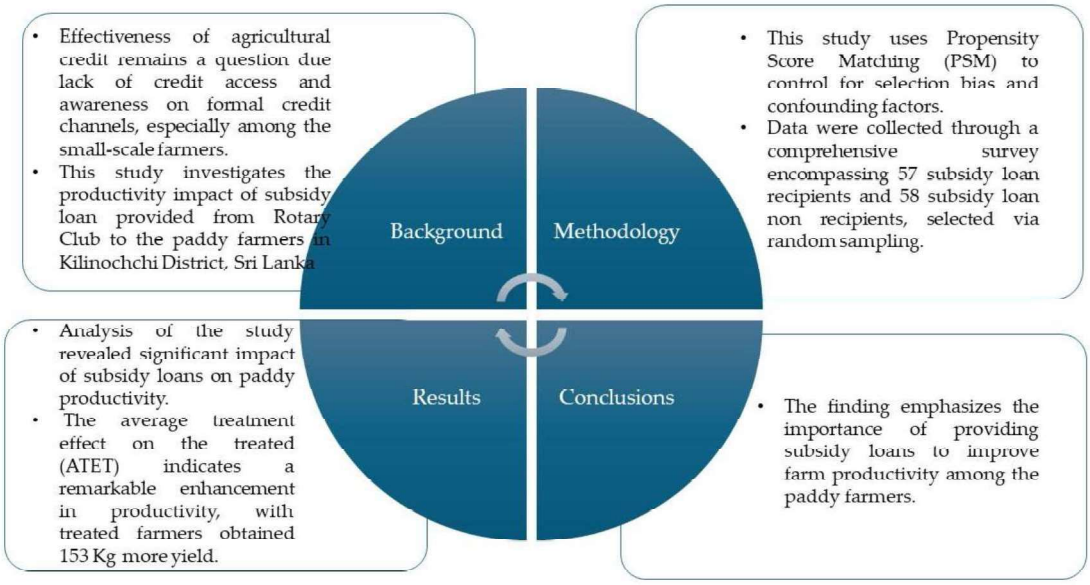
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Assessing the Impact of Subsidy Loans from Rotary Club on Paddy Farmers Productivity in Kilinochchi, Sri Lanka

P. RATHEEBAN, K. SOORIYAKUMAR, S. SARUJAN* and S. SIVASHANKAR
*Corresponding Author: ssarujan@univ.jfn.ac.lk

Agricultural credit is aimed to improve farm productivity of small-scale farmers. However, the effectiveness of agricultural credit remains questionable due lack of credit access and awareness on formal credit channels, especially among the small-scale farmers. This study investigates the productivity impact of a loan-scheme with the subsidized interest rate of 4%, provided from Rotary Club to the paddy farmers in Kilinochchi district, Sri Lanka, using Propensity Score Matching (PSM) to control for selection bias (i.e., small-scale farmers who have good contact with the agrarian centres and registered under other incentive schemes are more likely to be chosen as beneficiaries) and confounding factors such as farmer's experience, technology use, access to extension services etc. Data were collected through a comprehensive survey conducted between August and September, encompassing 57 subsidy loan recipients and 58 subsidy loan non-recipients, selected via random sampling. The survey gathered detailed information on demographic characteristics, financial information, inputs for paddy cultivation, and socio-economic variables through personal interviews using a structured questionnaire. Analysis of the study revealed significant impact of subsidy loans on paddy productivity. The average treatment effect was not significant effect in paddy productivity whereas The Average Treatment Effect on the Treated (ATET) indicates a remarkable enhancement in productivity, with treated farmers obtained 153 kg/acre more yield. The finding emphasizes the importance of providing subsidy loans to improve farm productivity.

KEYWORDS: Treatment effect; Paddy farmers; Paddy productivity; Propensity score matching; Subsidy loan



Department of Agricultural Economics, Faculty of Agriculture, University of Jaffna, Jaffna, Sri Lanka

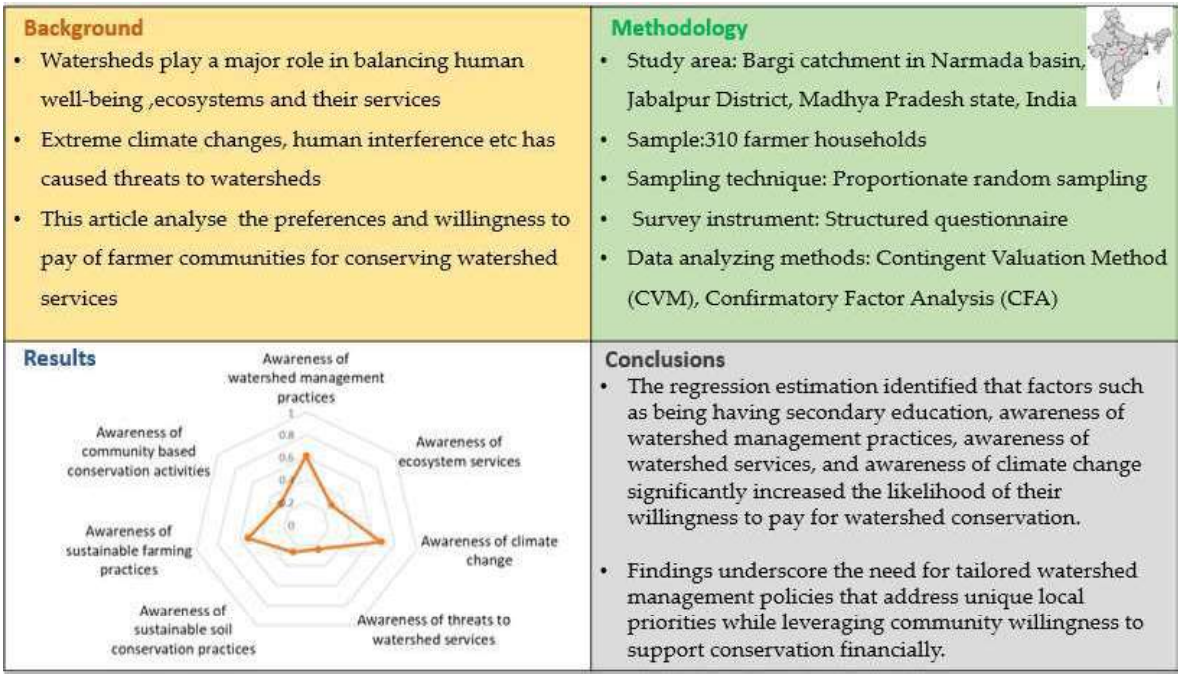
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Exploring Farmer Preferences for Watershed Conservation: A Case Study of Bargi Dam, India

S. S. K. T. SEELANATHA[1]*, M. THANGAVEL[2] and J. M. M. UDUGAMA[1]
*Corresponding Author: kaushiseelanatha@gmail.com

Watersheds across the globe are increasingly threatened due to extreme climate changes and human activities. This article employs a Contingent Valuation model to assess the preferences and Willingness-to-Pay (WTP) of farmer communities in the Bargi catchment (Narmada river basin) in Jabalpur District, Madhya Pradesh, India to conserve watershed services. Primary data were collected from a randomly selected sample of 310 farmer households using proportionate random sampling technique. The majority of respondents were farmers (61.29%) primarily in the 45 to 60 age group (46.77%) with a monthly gross income of less than Rs 35,000 (40.32%). A binary logistic regression was estimated to analyse data. Results indicate that farmers in this area generally have low awareness of threats to watershed services and sustainable soil conservation practices but demonstrate relatively higher awareness of sustainable farming practices, importance of watershed management and impact of climate change. The regression estimation identified that factors such as being having secondary education, landholding size, awareness of watershed services, and awareness of climate change impacts significantly increased the likelihood of their willingness to pay for watershed conservation. Findings underscore the importance of context-specific, tailored watershed management policies that align with local priorities to encourage community conservation efforts.

KEYWORDS: Bivariate logit model, Contingent valuation model, Watershed services



Acknowledgement: Financial assistance by School of Social Sciences and Humanities, IIT Indore, Madhya Pradesh, India

[1]Department of Agribusiness Management, Faculty of Agriculture and Plantation Mgt., Wayamba University of Sri Lanka, Makandura, Gonawila (NWP), Sri Lanka; [2]School of Humanities and Social Sciences, Indian Institute of Technology Indore, Simrol, Indore, Madhya Pradesh 453552, India

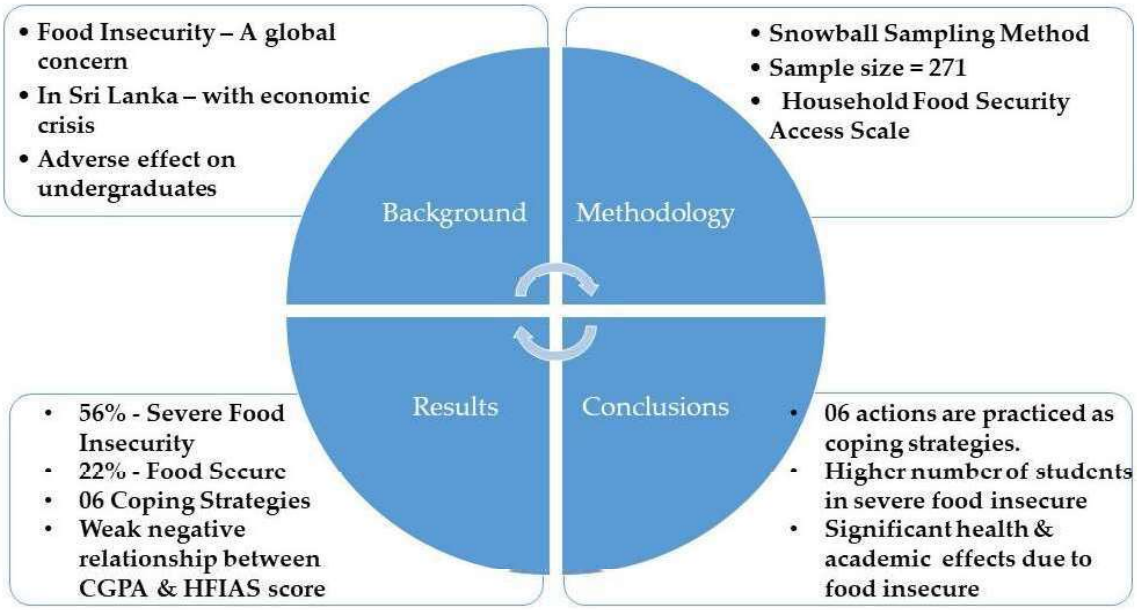
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

An Assessment of Food Security among Undergraduates in Sri Lankan State Universities during the Economic Crisis

W.M.H. WEERASINGHE, H.I. LAKSHANI*, M.A.M. IHLAS and U.B.E. SASANKA
*Corresponding Author: isharalakshani.hathamuna@gmail.com

Food insecurity can simply be recognized as the lack of access to affordable nutritious food. This scenario is also prevalent among different socio-demographic cohorts in the society globally, where there is no exception among Sri Lankan undergraduates specially during the prevailing economic crisis, due to their high economic dependence and low purchasing power. The current study investigated the prevalence and severity of food insecurity among undergraduates covering all public universities in Sri Lanka. Using the Household Food Insecurity Access Scale (HFIAS), this study classified a sample of 271 undergraduates contacted through the snowball sampling technique, into levels of food insecurity. Data were analysed using descriptive statistics and correlational analysis. The results revealed that 56% of participants experienced severe food insecurity and only 22% were food secure. Many students reported difficulty in concentrating, skipping classes, and experiencing physical symptoms such as weakness and weight loss probably due to insufficient food. A weak negative correlation ($r = -0.235$ $p < .05$) was observed between food insecurity and academic achievement. Further, participants adopted four coping strategies: consuming less preferred food (74%), burrowing food (48%), limiting portion size (67%), and skipping meals (30%) as buffers for the prevailing situation. The study also implies recommendations including ensuring the availability of nutritious food in university canteens, introducing financial aid programs, and creating part-time employment opportunities for students. These measures will improve food security and reduce the negative effects of food insecurity on students' academic and personal well-being.

KEYWORDS: Academic performance, Coping strategies, Food insecurity, Household Food Insecurity Access Scale (HFIAS), University students



Department of Agribusiness Management, Faculty of Agricultural Sciences, Sabaragamuwa University of Sri Lanka, Belihuloya, 70140, Sri Lanka

The Recent Trends of Tea Research and Industry in Korea

K. J. SONG[1]*, S. J. KIM[2], and H. R. HONG[2]
*Corresponding Author: kwansong@jejunu.ac.kr

Recent advancements in the Korean tea industry focus on cultivar breeding, climate change adaptation, production optimization, and processing innovations. The country's tea cultivation area expanded slightly from 2,509 ha in 2004 to 2,624 ha in 2023, while production increased from 2,703 to 4,185 tons. However, a recent decline in cultivated areas highlights the need for enhanced yield efficiency. The increasing frequency of extreme weather events, particularly frost and cold damage, has led to fluctuations in production volumes. To mitigate these impacts, research efforts focus on developing cold-resistant cultivars and integrating smart agricultural technologies to improve cultivation efficiency. Climate change projections suggest that by 2050, suitable tea cultivation zones will shift to higher latitudes, necessitating adaptive strategies for sustainability. Meanwhile, powdered green tea production has expanded significantly. In 2023, the Hadong area recorded production of 100 tons, a 67% increase from the previous year. Jeju, a major tea-producing region, allocates most of its production to powdered green tea, with 593 ha under cultivation, representing 21.8% of the national total, and an annual output of 1,517 tons (35% of Korea's total tea production). These research initiatives and industry trends are crucial for ensuring long-term sustainability and enhancing the quality of teas. Moving forward, advanced cultivation techniques and global market expansion will be key to the industry's continued growth.

KEYWORDS: Climate change, Cold damage, Industrial sustainability, Powdered green tea

■ Major tea production regions in Korea

Region	Cultivation area (ha)	Production (t)	Farmhouse
Gyeongnam	854(32.5)	1,389(33.2)	1,136(41.8)
Jeonnam	1,123(42.8)	1,854(44.3)	1,493(54.9)
Jeju	**565(21.5)**	**876(20.9)**	**48(1.8)**
Others	82(3.1)	66(1.6)	43(1.6)
Total	**2,624(100)**	**4,185(100)**	**2,720(100)**

Acknowledgement: Financial assistance by Cooperative Research Program through the grant ID PJ011964, Rural Development Administration and the RDA Fellowship Program of NIHHS, Rural Development Administration, Republic of Korea

[1]Sustainable Agriculture Research Institute, Jeju National University, Jeju 63243, Korea; [2]Research Institute of Climate Change and Agriculture, NIHHS, RDA, Jeju 63240, Korea

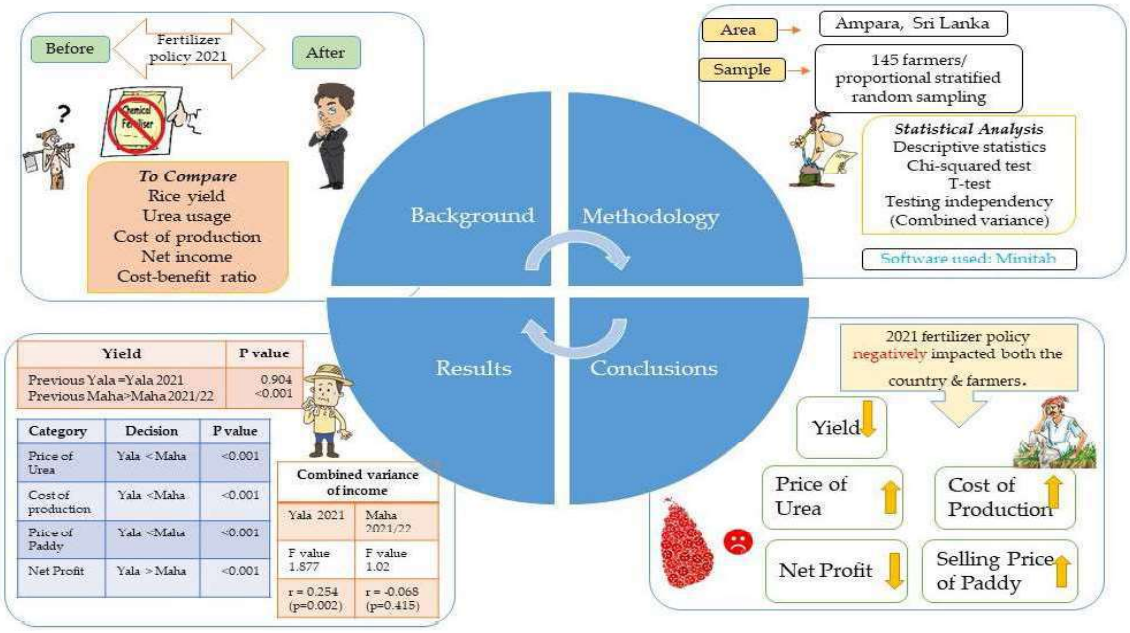
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Impact of Fertiliser Policy Implemented in 2021 on Rice Production in the South Coastal Region of the Ampara District, Sri Lanka

D. M. P. S. DISANAYAKA*, A. M. A. C. BANDARA and A. M. RAZMY
*Corresponding Author: pspurni97@gmail.com

Ampara district plays a key role in paddy production in Sri Lanka. But there was a noticeable decrease in paddy production during the *Maha* season of 2021/2022. The purpose of this study was to conduct a comparative analysis of the decline in rice production in the south coastal region of the Ampara district during the *Maha* season, which might be attributed to the fertiliser policy implemented in 2021. Data for this study were gathered using a structured questionnaire. Using the stratified random sampling method, 145 farmers were selected from each divisional secretariat in the coastal region of the Ampara district. This study examines various aspects of paddy cultivation, including yield, urea usage, production costs, paddy prices, income, net profit, and cost-benefit ratios. Data were analysed using descriptive statistics, one-sample t-tests, paired-sample t-tests, and combined variance methods. The analysis reveals a significant decline in both paddy yield and urea usage during the *Maha* 2021/2022 season compared to previous *Maha* seasons and *Yala* 2021. The fertiliser policy in 2021 caused a significant rise in the cost of production, paddy prices, and urea prices. Average income in *Maha* 2021/2022 was observed to be higher than in *Yala* 2021 due to higher paddy prices, with little income variation between seasons and greater paddy price variation in *Yala* 2021. Despite higher income, net profit and return on investment were lower in *Maha* 2021/2022 compared to *Yala* 2021 due to increased production costs. Harm caused by the fertiliser policy on farmers (reduced profit and return on investment) was somewhat recovered through the increased selling price.

KEYWORDS: Ampara district, Fertiliser policy, *Maha* season, Paddy production, *Yala* season



Acknowledgement: Financial assistance by South Eastern University of Sri Lanka

Department of Mathematical Sciences, Faculty of Applied Sciences, South Eastern University of Sri Lanka, Sammanthurai, Sri Lanka

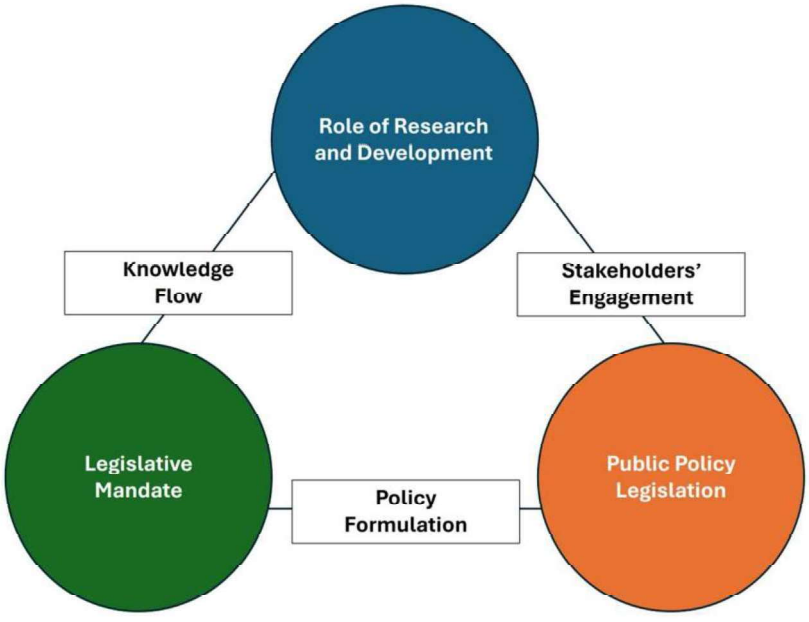
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Surfacing R&D in the Legislative Process: An Ethnomethodological Analysis of the Journal of Proceedings of a City Government's Committee Hearing on an Agricultural Ordinance

J. A. P. CLAUS
Corresponding Author: jpclaus@up.edu.ph

This study investigates the pivotal role of research and development (R&D) in shaping local legislative policymaking, with a particular focus on formulation of organic agriculture implementation within a Local Government Unit (LGU). It examines how R&D shapes decision-making process, informs policy formulation, and enhances governance. The research identifies existing gaps in integrating R&D into legislative frameworks and explores strategies for evidence-based policymaking. Employing ethnomethodology is apropos as the study analyses the committee hearing conducted on November 24, 2023, and legislative interactions related to the proposed ordinance institutionalizing organic agriculture in Batangas City and to understand how policymakers incorporate research findings into ordinance development. Qualitative approach highlights the social organization of legislative processes and the informal yet vital influence of R&D in crafting agricultural policies. Findings suggest that while R&D is not always formally structured within the city council, its impact is evident in the knowledge, discourse, and decision-making patterns of council members. The study underscores the significance of institutionalizing R&D in legislative functions to improve policy effectiveness, ensure sustainable agricultural practices, and enhance economic resilience. By embedding systematic R&D processes in policymaking, LGUs can formulate data-driven policies that drive economic growth and community development. Strengthening the link between research and legislation fosters innovation, improves governance efficiency, and contributes to the economic sustainability of the local government unit of Batangas City.

KEYWORDS: Agricultural policy, Governance, Local government units, Policymaking, Research and development



University of the Philippines Open University, Los Baños, Laguna, Philippines

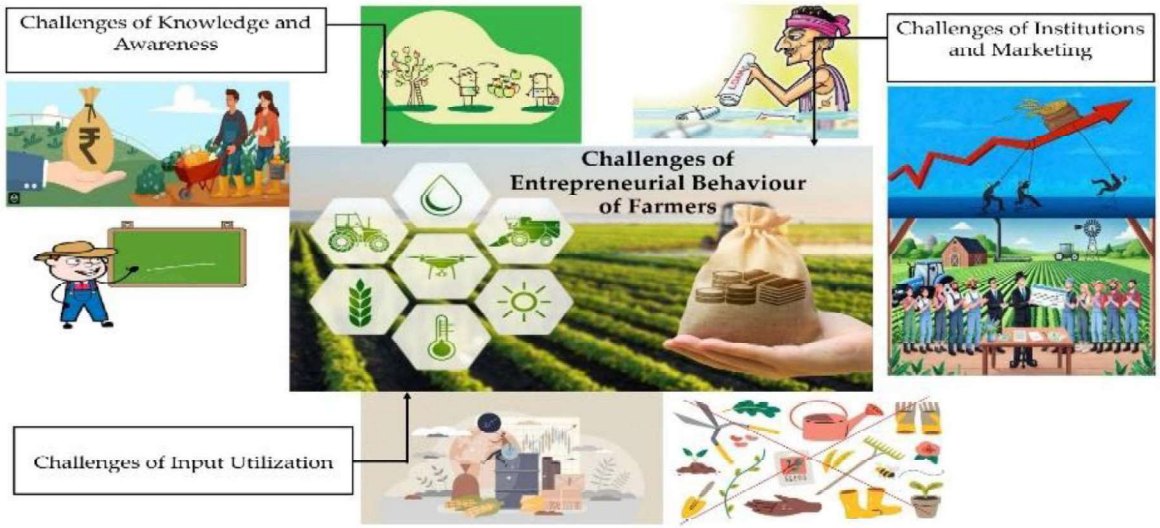
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Why Does Entrepreneurship Remain a Challenge? Insights From Farmers in the Ratnapura District, Sri Lanka

S. D. D. RATHNACHANDRA[1*], S. H. P. MALKANTHI[2], M. ESHAM[2] AND G. R. S. R. C SAMARAWEERA[3]
*Corresponding author: dilinirathnachandr92@gmail.com

The study aimed to identify these constraints and explore potential strategies for overcoming them. The research focused on a group of farmers who participated in agricultural training programmes organised by the provincial department of agriculture in Sabaragamuwa province. A sample of 392 farmers was selected from the 35,464 of farmer population through the Krejcie & Morgan table, using a non-proportionate random sampling technique, ensuring statistical reliability and confidence without compromising accuracy. Primary data was collected through a field survey using a structured questionnaire between March and August 2024, with analysis conducted using Garrett's Ranking method. This method effectively prioritised challenges based on respondents' perceptions, aiding decision-making by highlighting critical issues. Additionally, thematic analysis was performed on data gathered from two focus group discussions, each involving ten farmers. The findings revealed knowledge and awareness-related challenges including a limited understanding of market linkages, financial institutions, and modern farming practices, which restricted access to markets, and credit, and hindered creativity and innovation. Institutional and market-related challenges included difficulties in obtaining loans, competition from larger enterprises, and inadequate marketing infrastructure. Input-related challenges involved high raw material costs and inconsistent labour and material availability, disrupting farming schedules and reducing profitability. A collaborative, multi-stakeholder approach is therefore crucial for fostering entrepreneurial behaviour and ensuring sustainable agricultural development in the region.

KEY WORDS: Challenges, Entrepreneurial behaviour, Farmers, Ratnapura district, Sri Lanka



[1]*Faculty of Graduate Studies, Sabaragamuwa University of Sri Lanka, Belihuloya, Sri Lanka;* [2]*Faculty of Agricultural Sciences, Sabaragamuwa University of Sri Lanka, Belihuloya, Sri Lanka* [3]*Faculty of Social Sciences & Languages, Sabaragamuwa University of Sri Lanka, Belihuloya, Sri Lanka*

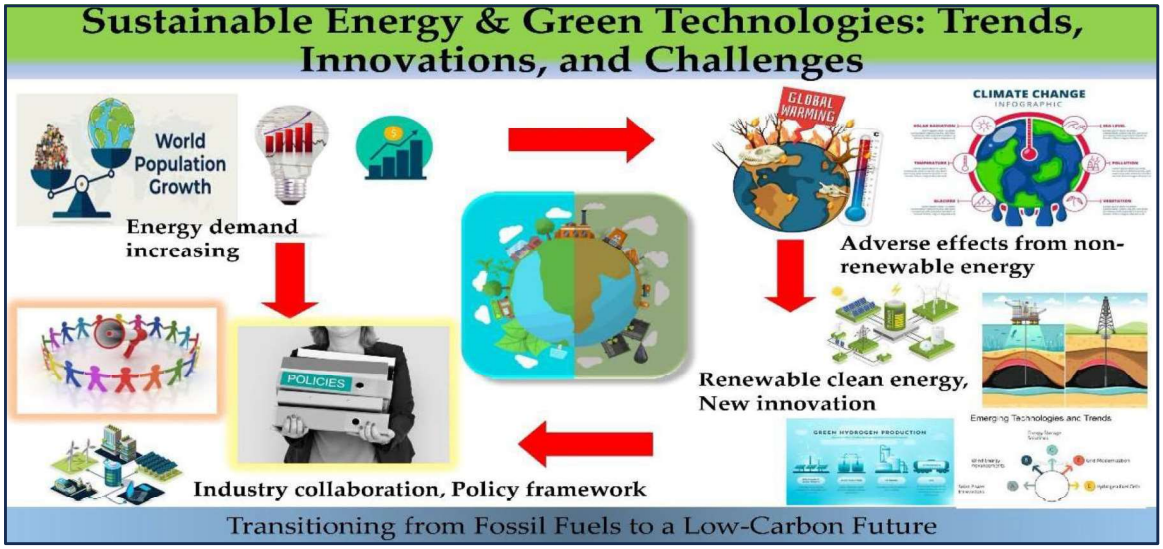
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Global Energy Transition Towards a Sustainable Future: A Comprehensive Review of Renewable Technologies, Innovations, and Policy Frameworks for Sustainable Energy Demand

M. A. D. K. JAYATHILAKA*, T. S. UKWATTE and G. Y. JAYASINGHE
*Corresponding Author: jayathilaka11gt@ags.ruh.ac.lk

With the increase of global population, there has been an increase of energy consumption by 2 % which reached 620 EJ in the year 2023. This spike worsens the scenario of global warming, climate changes and socio-economic problems, making it better realized that there has to be an evolution towards the use of renewable energy and green technologies. In this review, global energy consumption trends are comprehensively analyzed along with the associated environmental, social and economic challenges. As the bulk of the country's energy demand tilts toward renewable sources, it assesses the prospects of solar, wind, tidal, hydropower, geothermal, and hydrogen energy: all potentially viable options. Informed by the PRISMA guidelines, 20 peer-reviewed, English language articles that are range from 2010 – 2024 were selected from Google Scholar and ResearchGate and Scopus with Boolean operators ("AND," "OR"). These findings show how fossil fuels can be transitioned to renewable sources. For instance, an efficiency of 1.46 L/L.d of biogas and 0.508 L/L.d of biohydrogen was achieved from biohydrogen production from bakery waste. Further, it is found that the hybrid of geothermal energy and wastewater recovery performs better than conventional desalination processes in terms of both cost effectiveness and environmental impact. The review also highlights the importance of Energy Storage Systems (ESS), Hybrid Renewable Energy Sources (HRES) and underground green hydrogen storage for improving energy security and sustainability. Decentralized solar photovoltaic systems and direct ethanol fuel cells are two examples of promising innovative technologies towards a low carbon future. For this transition to be accelerated, robust policy frameworks instance of carbon taxes, government subsidies and higher involvement of both private and public stakeholders become necessary.

KEYWORDS: Carbon neutral energy, Energy efficiency, Green technologies, Renewable energy, Waste to energy



Department of Agricultural Engineering and Environmental Technology, Faculty of Agriculture, University of Ruhuna, Mapalana, Matara-Kamburupitiya Rd, 81100, Sri Lanka.

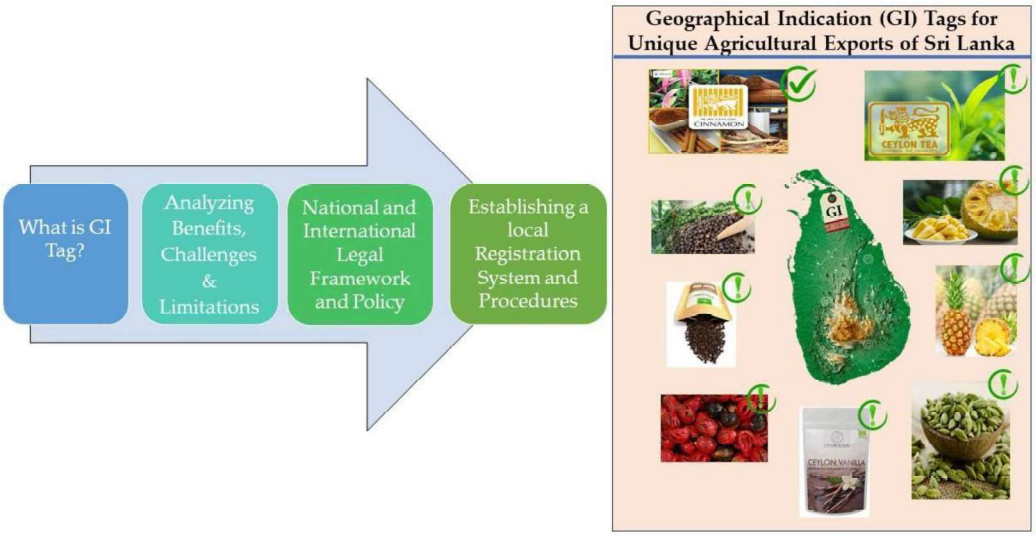
ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Geographical Indication as a Mode of Protection for Agricultural Exports: A Critical Review of the Intellectual Property (Amendment) Act, No. 8 of 2022, Sri Lanka

W. A. Y. W. VITHARANA[1,2]
Corresponding Author: yoshinivith@gmail.com

Geographical Indications (GI) are defined as a sign that shows quality attributes of interest to consumers which are presumed linked to the specific geographic origin of the good. The unique agricultural products of Sri Lanka have long been facing great risks at the international markets due to the counterfeit products. This study investigated the effectiveness of the Intellectual Property (Amendment) Act, No. 8 of 2022, Sri Lanka focusing on GI ensuring protection of unique agricultural export products such as Ceylon tea. Subsequently, a comparative analysis made between the Sri Lankan vs Indian jurisdictions on GIs. The 'doctrinal', and the 'explorative' methods of qualitative research were used on primary and secondary legal sources along with certain other secondary data sources. The study found that the Amendment Act 2022 has brought significant positive aspects such as a sui generis registration system, definitions for new terms, application process, and enforcement procedures. However, the study highlighted several deficiencies including the use of concise definition for GIs which could limit applicability in agricultural exports. Further, important terms such as 'authorized user' have not been elaborated and the provisions granted for previous trademark registration must have been repealed to avoid conflicts. In comparison, India has used its laws pertaining to GIs to provide a fully facilitated legal framework that would positively affect its agricultural exports. This review underscores sufficiency and issues of legal framework focusing on GI to ensure protecting the unique agricultural exports in international markets and ultimately to uplift the economy of the country.

KEYWORDS: Agricultural exports, Geographical indications, Intellectual property, Sri Lanka



1

[1]APIIT Law School Sri Lanka - Staffordshire University, United Kingdom; [2]Intelectual Property Group Legal, MAS Holdings, Battaramulla 10120, Sri Lanka

ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

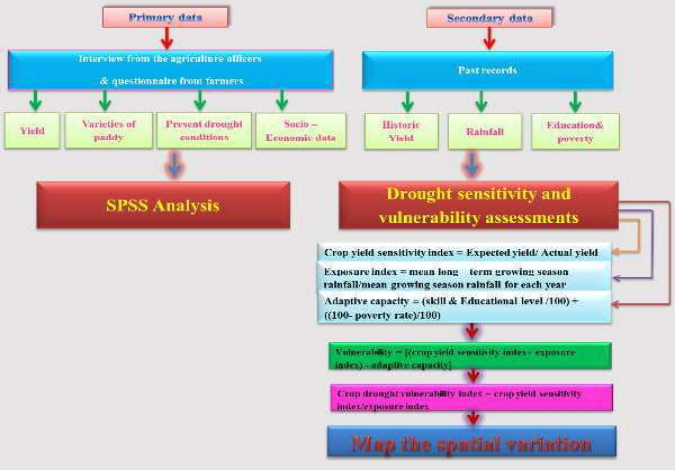
Spatial Pattern of Crop Vulnerability to Drought in Jaffna District, Sri Lanka

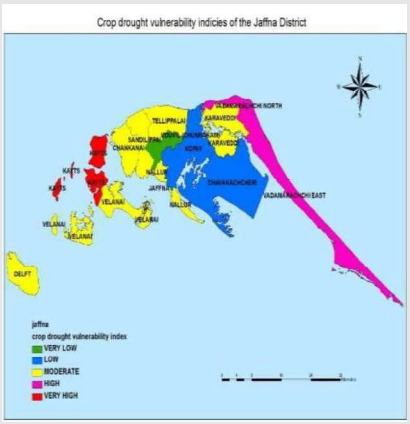
S. KAYATHRI[1], and C. DISHANI[2]*
*Corresponding Author: kayusaran87@gmail.com

Drought is a disastrous natural phenomenon and is generally viewed as a sustained and regionally extensive occurrence of below average natural water availability either in the form of rainfall, river runoff, or groundwater. Droughts are defined by various factors, and effective management depends on accurate assessment. This study assessed the vulnerability of crop production to drought using multi-scale, multi-indicator methods. In addition, a cluster sample of 250 paddy farmers was conducted, with qualitative data analysed using SPSS and MS Excel. Yield, rainfall, and socio-economic data were used to assess crop drought vulnerability and map it in a GIS environment. It does this by identifying differences across and within fourteen divisional secretariat divisions to reflect the three components of vulnerability: exposure, sensitivity, and adaptive capacity. In addition, overall mean vulnerability of a particular region was estimated. Agricultural crop drought vulnerability was mapped and classified into five categories: very low, low, moderate, high, and very high. Kayts division is highly vulnerable to drought, influenced by distinct geographical and socioeconomic factors. Three factors such as very high sensitivity indices, very high exposure indices and low adaptive capacity indices are contributing to this regions' vulnerability. The crop vulnerability to drought can be a step towards mitigation-oriented drought management and aid in reducing the impacts associated with drought.

KEYWORDS: Adaptive capacity, Crop drought, Exposure, Sensitivity, Vulnerability

- **Background** → Rainfall decline → Water scarcity → Socio economic condition → Paddy cultivation decline → High vulnerability
- **Methodology** → Spatial mapping & secondary data analysis → Drought vulnerability map (Colour-coded) questionnaire survey for farmers → Probability sample→ Descriptive summary





- Highest vulnerability: Kayts (High exposure, low adaptive capacity)
- Survey insights: 66% rely solely on rainfall; 72% depend on loans & fertilisers

[1]Department of Indigenous Medicine, Northern Province, Jaffna, Sri Lanka; [2]Governor's Secretariat, Jaffna, Sri Lanka

ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Author Index

A

Aberathne AHMNR....99
Abeyrathne KMNI....146
Abeysekera WKSM....72
Abeysinghe DC....52
Abeysiriwardana PC....161
Abeysundara HTK....102
Abeysuriya APHI....92
Abijah P....71
Ahmad I....172
Ahmad J....169
Aimen S....124
Akbar M....105
Akhtar R....95
Akshana RS....68
Alam D....172
Aluthge ADRP....96
Amarasena NDUD....113
Amath SM....49
Anasooya R....47
Anushika CM....133
Asif U....105
Asio MT....56
Atapattu NSBM....143
Athauda AAHI....152
Athukorala ADSNP....100, 104
Attanayaka DPSTG....52
Attanayake AMAS....121
Awanthi MGG....61
Ayona TAW....154
Aziz A....124

B

Baguma JK....46
Bai S....98
Balakrishna P....68
Balasooriya BLWK....109
Bamunuarachchige TC....108
Bandara RMAS....146
Bandara ALJ....178
Bandara AMAC....183
Bandara BGRR....65
Bandara KMNPK....67
Bandara NGCA....109
Bandara RMAS....147, 150
Bandara RMUS....15
Bandara WMMD....152
Basnayake BMVS....96
Benaragama CK....5
Bhagya KADL....91
Binduhewa AMCU....77
Bokanda BWGVV....67
Boyagoda SH....102
Buttibwa M....46, 56

C

Chandana MKL....127
Changxin-Yang....114
Chathuranga HN....127
Chen DY....28
Chen Q....51
Chen W....24
Chen ZY....31
Chi N....42
Chinthaka UGS....156
Claus JAP....185
Cooray MPTP....158
Costa AMKCJ....103

D

Damayanthi MMN....5
Darvin SS....67
Dasanayake ADSL....24
Dasanayaka D....37
Dasanthi HPM....138
Dassanayaka SM....26, 35
De Silva ACL....104
De Silva DADV....112
De Silva NMT....12
De Silva SHNP....136

ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

De Soysa EJS 8
De Zoysa D 127
Dharmakeerthi RS 11
Dilanka LBT 10, 27
Disanayaka DMPS 183
Dishani C 184
Dissanayake DCT 136
Dissanayake DMPKGND 62
Dissanayake DMWSH 162
Dissanayake KGV 145
Dissanayake PK 74
Divarathna HKDMPL 155
Dong X 33
Duan F 25, 36
Duminda DMS 126

E

Edirisinghe JC 162, 166, 171, 176
Eeswara JP 121
Egodawatta WCP 18
Ekanayake JB 5
Ekanayake LDS 88
Ekman J 74
Elapatha GS 87
Esham M 186
Eyokia M 46

F

Faheem W 172
Fahmidha HF 79
Fang Z 41
Ferdinand JJMN 106, 111
Ferdosi MFH 129
Fernando DHML 14
Fernando GSN 65, 69, 78
Fernando HRP 70
Fernando MDM 72
Fernando PDR 157
Fernando SNS 161
Fernando TD 53
Fernando THPS 99
Fernando WAM 162
Fletcher A 3
Fonseka CLIS 15
Fonseka DLCK 9, 19

G

Gajapathy K 48, 133, 134
Galappaththi SV 103
Gamage DNV 23
Geekiyanage S 57
Gefei-Hao 114
Gimhani HNC 6
Gnanavelrajah N 115
Godakumbura PI 77
Gonagala KB 16
Gu H 4
Gunarathne DMA 86
Gunaratne A 66
Gunaratne AMTA 102
Gunaratne DMA 148
Gunasekara MS 108
Gunathilaka LAC 66
Gunathilaka MDKA 78
Gunawardana WGDI 104
Gunawardhana D 11
Guo W 37
Gupta C 82
Guruge KC 22
Guruge TPSR 155, 165
Gurusinghe DC 178

H

Haakkil NM 142
Halloluwa T 15
Han S 54
Han Y 31
Hao G 7, 29, 32
Hao GF 28
Hapugaswaththa HMSS 89
Harshani HBC 112
Heenkenda HMKA 165
Hemachandra KS 27, 123
Hemarathna DDTM 149
Hennayake HMNDB 62
Herath HMDN 128
Herath HMIK 3, 22
Herath HMLK 178

ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Herath HMSN....45
Herath HMSP....22
Herath HMSWK....64
Herath HMT....78
Herath US....18
Hettiarachchi DK....108
Hettiarachchi HAPW....71, 113
Hewagamagea KP....15
Hewajulige IGN....74
Hitige PK....154
Hong HR....182
Hu F....35, 37
Hu S....63
Huang LY....44

I

Idamgedara CM....89
Ihlas MAM....181
Imteyaz F....172
Indramali OS....5
Indumini MVC....66
Indumini UAR....109
Iqbal J....124

J

Janaka Priyadarshana PAD....156
Jans HM....92
Javaid A....95, 129
Javaid MH....124
Jayamanne D....138
Jayaprada NVT....45
Jayarathne DGD....96
Jayarathne DGDDS....74
Jayasekara SJBA....52
Jayasinghe GY....187
Jayasinghe MA....75
Jayasinghe PS....61
Jayasinghe SM....163
Jayasinghe UAD....132
Jayasinghe WH....10
Jayasinghe-Mudalige UK....161
Jayasooriya MCN....86
Jayasumana AHAR....115
Jayathilaka MADK....187
Jayathilake C....75
Jayawardana HMAS....52, 135, 137
Jayaweera MPHK....27
Jeewanthi PBD....83
Jiang B....98
Jin L....17, 26, 34, 37
Jin LH....35

K

Kalpani DKS....84
Kandanapitiya MS....6
Kandegama WMWW....14, 24, 32, 37
Kannanthudawa KVG....86
Kariali E....50
Karunarathne JMGMT....14, 24
Karunarathne MDK....67
Karunarathne SB....130
Kaushalya KC....83
Kaviththira P....53
Kayathri S....184
Khalil T....105
Kilalo D....56
Kim SJ....182
Kirisan A....115
Kishanthan A....48
Kodikara KMS....21
Kodithuwakku KAHT 141, 144, 145, 156, 157
Kosgallane MP....20
Kospalawaththe P....149
Kottearachchi NS....6, 49, 80
Kularathna ENT....65
Kulasiri AH....23
Kumara KLW....101
Kumarasinghe HKMS....13
Kumarasiri LPM....49
Kumari SS....121
Kumarihami HMPC....5
Kuruppu IV....155, 165, 178
Kusalani TLCN....45
Kusumsiri WBU....128

L

Lageeshan V....142

ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Lakchani DT 132
Lakshani HI 181
Lamo J 46
Lanka KNS 173
Leelamanie DAL 110
Lewkebandara HG 11
Li JY 98
Li LX 98
Li S 26, 34
Li X 7
Liang Y 63
Liang YR 42, 43, 44
Lin H 51
Liu GP 98
Liu Y 30
Liyanaarachchi GD 80
Liyanage GLRP 73
Liyanage R 75
Liyanage TDP 110
Liyanarachchi HLANT 52, 135, 137
Lu J 41, 42, 63
Lu JL 43, 44
Lyu QH 98

M

Madawala HMSP 102
Madhubhashini ETS 122
Madhumali SDDM 176
Madhushani DRI 106, 111
Madola I 130
Madujith T 79
Madushani WGI 19
Maduwanthi SDT 113
Mahindarathna J 147
Maithreepala RA 132
Malkanthi SHP 186
Manamperi NP 11
Manoranjan T 117, 131
Marikkar JMN 79
Mclaren S 3
Mendis HSC 8
Mikunthan G 47
Misfa SLF 175
MLMCDissanayake 96
Mohotti AJ 5
Mohotti KM 5
Moragoda MAHS 147
Munasinghe MAJP 149, 154
Munasinghe T 11
Musthifa B 164
Muthumal TGM 74

N

Nagahawaththa NKMC 113
Namakula BF 56
Nanayakkara BS 102
Nia MRF 131
Nimesha HJR 61
Nirmani NS 75
Nishanthan G 152
Nugaliyadde L 27

O

Oh EU 54
Ojara N 56
Onyango S 56

P

Pabasara GVS 72
Pathiraje PMHD 88
Pathirana MGSP 45
Pathirana RPPS 49
Pathmasiri PAM 87
Perera DS 156
Perera IPS 151
Perera ONM 153
Perera PHK 143
Perumpuli PABN 62, 70
Pitawala HMTGA 116
Piyumal MDR 13
Ponnegipprenthiraraja A 48
Prasadi BAD 21
Prasadini WGD 19
Prathapasinghe GA 145, 158
Praveen C 141

ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Premachandra EGSM 83
Premachandra MVN 102
Premadasa AGSK 45
Premanandarajah P 20
Premarathna EGSD 150
Premarathna KGSS 87
Premarathne US 125
Premaratna SP 174
Premasiri SBWD 91
Premasiri WMAC 9
Premathilake KCMC 125
Pushpitha NPG 142

Q

Qasim R 172
Qin L 33

R

Rajapaksha DSW 89
Rakulini S 90
Ramodya MPSK 101
Ranasinghe A 18
Ranasinghe BGRT 69
Ranasinghe P 77
Ranathunga RAA 62
Ranawaka RAAK 57
Ranaweera AL 143
Ranaweera B 135, 137
Rangika RN 67
Rasika DMD 64, 76, 81, 84, 85
Ratheeban P 179
Rathnachandra SDD 186
Rathnapala JMSN 69, 103
Rathnayaka RMDJ 91
Rathnayake HA 152
Rathnayake NRRWS 110
Rathnayake R 101
Rathnayake RMD 109
Rathnayake U 15
Razmy AM 183
Ren X 17
Rienzie KDRC 106, 111
Rimsath M 170
Robika K 68
Rochelle EJS 155
Ruan R 17

S

Sahoo MR 55
Sajiwanie JWA 68
Samarakoon DMAD 18
Samaranayake KGD 73
Samaranayake L 5
Samaraweera GRSRC 186
Samaraweera VD 136
Samla MRF 157
Sampath KHHU 13
Sandadevani KS 27
Sandamali WHP 87
Sandamini PKD 57
Sandaruwan L 149
Sandaruwan MAT 87
Sandika AL 163, 173
Sankalana KMV 127
Sanuja RG 69
Sarathchandra SR 27
Sarujan S 164, 170, 175, 179
Sasanka UBE 181
Sazna MFF 79
Seanayaka SACS 171
Seelanatha SSKT 180
Senanayake FR 127
Senanayake MMV 12
Senanayake MP 86, 146
Senarathne SMACU 73
Senosy I 32
Sewwandi DDP 74
Shanu MSF 97, 112
Shanuke DS 152
Shao KM 35
Shaswin MNF 156
Shijie-Chen 114
Shoaib A 95
Silva DADV 97
Silva MDS 126
Siriwardana KDVF 167
Sivashankar S 164, 170, 175, 179
Song KJ 54, 182

ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Sooriyakumar K 164, 170, 175, 179
Srivijeindran S 68
Sulakshana T 134
Sun XY 98
Suriyagoda LDB 5, 116

T

Tan DKY 74
Tang R 37
Tennakoon TMRPK 168
Terensan S 9, 48, 133, 134
Thalagala TDV 123
Thalpavila TS 97
Thangavel M 180
Tharaka KS 100
Tharindi PWM 96
Tharushika WAPD 144
Thavaranjit AC 117
Thilakarathna JMIA 177
Thiruchchelvan N 47
Thudugala PK 70
Tian JY 35
Tissera WMW 76
Tugume A 46

U

Udayakumari LAMH 91
Udugama JMM 180
Ujana N 178
Ukwatte TS 187
Ulrich U 132

V

Vibhushana WGC 23
Vidanapathirana PS 138
Vihangi RGM 85
Vithana HMTO 145
Vitharana WAYW 188

W

Wagaba H 46, 56
Waidyarathna GRNN 91
Wan Q 30
Wan X 4
Wang F 17
Wang H 4, 33
Wang L 4, 14
Wang Q 4, 29, 33
Wang ZY 31
Wanshaja KADP 165
Weerakkody GK 24
Weerakoon WMRW 116
Weerarathna EKWW 14, 24
Weerarathna ID 5
Weerasekara NPMS 81
Weerasinghe OT 112
Weerasinghe WMH 181
Weerasiri KPAK 80
Wei C 38
Welagedara DG 150
Weragoda WGDRS 16
Wickamasinghe I 75
Wickramasinghe HKJP 151, 153
Widanapathirana CU 163, 173
Wijayawardene NN 108
Wijemanne NGM 174
Wijendra WAS 97, 112
Wijerathna MGNT 148
Wijesinghe AGK 177
Wijesinghe RJ 5
Wijesinghe SAEC 138
Wijesuriya W 52, 135, 137
Wijesuriya WMHH 13
Wijetunga ADMAK 128
Wijetunge PMAPK 52, 135, 137
Wijewardhana US 83
Wijewickrama HAS 83
Wimalakeerthi WMB 67
Wimalasiri EM 8, 21
Wimalaweera GNI 166
Withana HN 6
Wu S 63
Wu X 29, 30, 33
Wu Z 107

Y

Yaazmin MJA 117
Yakandawala DMD 130

ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Yakandawala K 128, 130
Yalegama LLWC 65
Yang T 33
Ye J 41
Ye JJ 43
Ye Y 51

Z

Zhang D 30
Zhang H 107
Zhang M 25, 36
Zhang Q 26, 34
Zhang W 41
Zhang XH 44
Zhao D 42
Zhao G 34, 37
Zhao GY 35
Zhao L 4
Zheng X 41, 42, 63
Zheng XQ 43, 44
Zhou X 17, 26, 35, 37
Zoyza WGM 148

ISBN 978-624-6674-07-6 | Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka

Published by :
Faculty of Agriculture and Plantation Management
Wayamba University of Sri Lanka
Makandura, Gonawila 60170, Sri Lanka

ISBN 978-624-6674-07-6