



Biotechnology Industrial Training - 2025

Executive Summaries

BIT - 2025



Department of Biotechnology
Faculty of Agriculture and Plantation Management
Wayamba University of Sri Lanka



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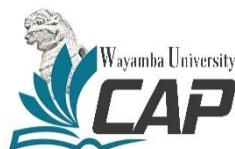
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- Head, Quality Assurance Department, Dominos Sri Lanka, Kelaniya, Sri Lanka



Message from the Vice-Chancellor, Wayamba University of Sri Lanka

It is with great pleasure that I convey my best wishes to the Department of Biotechnology on the publication of the Biotechnology Industrial Training 2025 *Executive Summaries* (BIT 2025) Booklet. This initiative, which brings together the case study abstracts of the final-year students, reflects the Department's continued commitment to fostering experiential learning and strengthening University–Industry linkages.

Industrial training provides students with a vital platform to apply theoretical knowledge in real-world settings, thereby developing the professional skills, confidence, and innovative mindset essential for their future careers. The experiences gained through such training not only enhance employability but also contribute to the advancement of the field of biotechnology and related industries in Sri Lanka.

I commend the academic staff of the Department of Biotechnology for their dedication and guidance in mentoring the students throughout this programme. I also extend my appreciation to the partner organizations that have provided valuable opportunities for our students to gain practical exposure.

I congratulate all students whose work has been featured in this publication and wish them every success in their professional journeys.

Prof. L.D.R.D. Perera
Acting Vice-Chancellor, Wayamba University of Sri Lanka



Message from the Dean, Faculty of Agriculture and Plantation Management

It is my great pleasure to contribute this message to the in-plant training booklet of the Department of Biotechnology. This booklet serves as a record of the invaluable experiences our students have gained during their in-plant training, an essential part of their academic journey. In-plant training offers a unique opportunity for our students to translate classroom knowledge into real-world applications, preparing them to meet the challenges of the biotechnology industry with confidence and competence.

Biotechnology is a field that constantly pushes the boundaries of innovation, and I am proud to see our students immersing themselves in cutting-edge research, industry practices, and new technologies during their training. Their efforts, documented in this booklet, reflect not only their commitment to their personal growth but also their contribution to the advancement of biotechnology.

I would like to extend my sincere thanks to all the industry partners, research institutions, and mentors who have provided our students with the opportunity to learn and grow under their guidance. Your support is integral to their development as skilled professionals ready to make meaningful contributions to the world of biotechnology.

To our students, this in-plant training experience is a significant milestone in your academic and professional careers. The knowledge, skills, and insights you have gained will be the foundation upon which you build your future endeavors. I encourage you to continue pushing the boundaries of innovation and to remain curious, creative, and driven as you embark on your careers.

Congratulations on completing this important phase of your education. I wish you all the best in your future endeavors and hope that the lessons learned during this training will inspire you to make impactful contributions to the biotechnology sector.

Prof. J.C. Edirisinghe
Dean, Faculty of Agriculture and Plantation Management



Message from the Head, Department of Biotechnology

In-plant training forms a vital component of our academic curriculum, effectively bridging the gap between theoretical learning and its practical application in the field of biotechnology. This hands-on experience enables students to engage with real-world industrial challenges, refine their problem-solving abilities, and apply their knowledge in meaningful and impactful ways.

It is with great pleasure that I present this collection of forty-four student case study abstracts, representing the culmination of their in-plant training experiences. These works reflect not only the depth of knowledge and technical competence our students have acquired but also their creativity and capacity to adapt to professional environments.

I extend my sincere appreciation to our partners in the government and private sectors for providing these invaluable training opportunities. My heartfelt gratitude is also extended to the Vice Chancellor, Professor L.D.R.D. Perera, and the Dean, Faculty of Agriculture and Plantation Management, Professor J.C. Edirisinghe, for their steadfast support and encouragement. In-Plant Training Coordinator 2025, Dr. M.J.M. S. Kurera, is highly acknowledged for his dedicated support and commitment throughout the in-plant training programme, and the academic staff of the Department of Biotechnology provide necessary guidance, supervision, and editorial contributions. Special thanks are extended to the academic-supportive and non-academic staff for their dedicated assistance throughout this endeavour.

As you read through these abstracts, I invite you to appreciate the diversity of topics and perspectives presented by our students. I am confident that their experiences will continue to inspire them toward excellence and innovation in their future professional pursuits.

Dr. Priyanwada Warakagoda
Head, Department of Biotechnology



Message from the In-Plant Training Coordinator

It is my great pleasure to deliver this message to the executive summary collection, “Biotechnology Industrial Training 2025 (BIT- 2025).” This volume captures the inspiring journeys, discoveries, and accomplishments of our students as they stepped beyond the classroom into the vibrant world of biotechnology. Throughout this year, our aspiring biotechnologists have engaged with diverse industries, research institutions, and innovation-driven environments, applying their academic knowledge to real-world challenges and transformative projects. Their experiences reflect the evolving frontiers of biotechnology, where science, creativity, and perseverance unite to address global needs in areas such as sustainable agriculture, healthcare, and environmental conservation.

Each summary in this collection tells a story of curiosity, collaboration, and growth, highlighting the technical expertise, innovative thinking, and problem-solving abilities our students have developed. More importantly, it celebrates their passion for discovery and their readiness to contribute meaningfully to a more sustainable and resilient future through biotechnology.

I extend my heartfelt appreciation to our industry partners for their invaluable mentorship and collaboration, which have been instrumental in shaping the next generation of biotechnology innovators. My sincere gratitude also goes to the Vice-Chancellor of Wayamba University of Sri Lanka, the Dean of the Faculty of Agriculture and Plantation Management, the Head of the Department, and the academic staff of the Department of Biotechnology for their unwavering commitment and leadership that ensure the continued excellence of this program.

To our graduating students, take immense pride in your achievements and let this milestone mark the beginning of your lifelong pursuit of discovery. Embrace challenges, lead with curiosity and integrity, and continue to make a lasting impact in the biotechnology sector and beyond.

Dr. Shehan Kurera

In-Plant Training Coordinator- 2025, Department of Biotechnology

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A STUDY ON FERTILIZER USAGE PATTERNS AND MARKET DYNAMICS IN THE KALPITIYA AGRICULTURAL REGION

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

Abstract

This study examined fertilizer usage patterns and market dynamics in the Kalpitiya region. The field survey was conducted from 27th August to 19th September 2025, and responses were collected from 40 farmers and 9 fertilizer dealers across five villages in the Kalpitiya region. The farming community was predominantly male representation (98%) with notable participation from the 20-29 years age category (27%). The major crops that are cultivated in Kalpitiya include beetroot, cabbage, chili, and onion, with beetroot having the largest cultivation area among surveyed farmers. Results revealed strong farmer preference for granular fertilizers (90%), with Yaramila fertilizers as widely utilized products. Cultivation practices typically commence by applying about 200 packs of cow dung (about 30 kg/pack) per acre, followed by inorganic fertilizer applications, initially with urea, then balanced NPK formulations in mid-season, and potassium-rich products at the end of the cycle. Yield performance is the decisive factor in product selection (77.5%), exceeding the consideration of cost and speed of fertilizer responsiveness factors. Trusting in fertilizer brands was primarily built through direct field experience (85%) rather than any other external factors. Dealers revealed that 60-70% of annual sales occur from September through March, with 30:10:10 compound fertilizers and Urea, showing robust market movement, while Baylawn led the liquid fertilizer category. The findings suggest demonstration-based marketing approaches and technical support programs offer greater market penetration potential than conventional advertising methods. Providing dealers with extended credit terms, competitive margins, and regular promotional material updates will also impact the product movement in the area.

External Supervisor: *Mr. V. Edirisooriya, Assistant Manager, Regulatory Affairs, Lankem Ceylon P.L.C, Sri Sangaraja Mawatha, Colombo 10.*

Internal Supervisor: *Dr. D.R. Gimhani, Senior Lecturer, Department of Biotechnology, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka.*

OPTIMIZING FATTY ACID COMPOSITION ANALYSIS IN HIGH FFA CRUDE PALM OIL DERIVATIVES USED IN THE FOOD INDUSTRY

P.G.S.C. ARIYARATHNE

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Abstract

Pyramid Wilmar (Pvt.) Ltd. is the leading manufacturer of edible oils and specialty fats in Sri Lanka. The company ensures quality standards, such as ISO 22000:2018, GMP, HACCP, and FSSC 22000, in its products through consistent monitoring by a dedicated chemistry laboratory integrated into the process flow. Precise determination of fatty acid composition is a key analytical test that requires optimization based on the types of fats and oils. The present study was focused on optimizing the preparation of Fatty Acid Methyl Esters (FAMES) from high Free Fatty Acid (FFA) materials, specifically Crude Palm Oil (CPO). Initial sample preparations were conducted using a standard, rapid base-catalyzed methylation with methanolic potassium hydroxide (mKOH). This procedure resulted in the formation of thick emulsions, making the quantitative recovery of FAMES for Gas Chromatography (GC) analysis unsatisfactory. To resolve this issue, an alternative procedure using Boron Trifluoride-Methanol (BF₃-Methanol) was used, which yielded a clean FAME extract suitable for analysis. A low-FFA Refined Palm Oil (RPO) sample was prepared using the BF₃-Methanol method as the control. CPO FAMES (n=3) were analyzed using an Agilent GC-FID (7890A) with a polar capillary column at a temperature of 240 °C and Supelco 37 Component FAME Mix as the standards. The chromatograms indicated major peaks for fatty acids, C16 (palmitate), C18 (stearate), C18:1 (oleate), and C18:2 (linoleate), and a few minor peaks, whereas the chromatogram of RPO indicated peaks for C12 (laurate), C14 (myristate), with the major peaks. Therefore, the optimized BF₃-Methanol method is suitable for FAME preparation in quality testing of high FFA fats and oils.

External Supervisor: *Mr. R.G.L.A. Rajapakshe, Quality Assurance and Quality Compliance Manager, Pyramid Wilmar (Pvt.) Ltd.*

Internal Supervisor: *Prof. B.L.W.K. Balasooriya, Professor, Department of Biotechnology, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka.*

MAXIMIZING THE POTENTIAL OF FLUORESCENCE MICROSCOPY FOR MICROBIAL INVESTIGATIONS

S.M.D.B. ARIYARATHNE

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Abstract

The National Institute of Fundamental Studies (NIFS) is the only government institute in Sri Lanka dedicated to fundamental research. The Microbial Biotechnology Research Program (MBRP) of NIFS stands out for addressing national issues through biofilm-based research. Among its state-of-the-art equipment, the programme possesses a fluorescence microscope, offering significant advantages over conventional light microscopy. In addition to standard light microscopy, the microscope is equipped with adjustable blue and green excitation filters for fluorescence imaging. Fluorescent dyes are used to visualize microorganisms, which absorb particular wavelengths and emit visible fluorescence. However, the use of the fluorescence function has been limited due to the high cost of fluorescent dyes such as SYTO 9 and Propidium Iodide, which are currently being used by the MBRP. In addition, due to advancements in algal biotechnological research at the unit, there is a need for visualizing algae in complex biological systems. Therefore, the present study aimed to enhance the effective use of fluorescence microscopy for microbiological investigations within the programme. Algal Autofluorescence was identified as a potential low-cost strategy for algal visualization. It was then tested under blue light excitation, where viable algae produced a strong red fluorescence in both mono and mixed culture settings, while non-viable (heat-treated) algae did not show a strong red fluorescence, suggesting its potential for future studies. Acquisition of low-cost fluorescent dyes such as Fluorescein Diacetate and Acridine Orange was suggested to maximize the fluorescence microscope's potential and strengthen microbiological research capacity at MBRP of NIFS.

External Supervisor: *Dr. M. Premarathna, Research Fellow, Microbial Biotechnology Unit, National Institute of Fundamental Studies, Kandy, 20000, Sri Lanka.*

Internal Supervisor: *Snr. Prof. N.S. Kottearachchi, Senior Professor, Department of Biotechnology, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka.*

ASSESSING LABOUR SHORTAGE AND INTRODUCING STRATEGIC MEASURES TO IMPROVE FARM PRODUCTIVITY AT ALEX DIMO AGRI TECHNO PARK

N.V. DUNUKEBANDARA

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

Abstract

Diesel and Motor Engineering (DIMO) is a leading conglomerate in Sri Lanka, and its Alex DIMO Agri Techno Park promotes agribusiness initiatives through an integrated 25-acre farm comprising tea plantations, tunnel cultivation, mushroom production, floriculture, and open-field vegetable cultivation. Although the farm employs 33 active labourers, this workforce is insufficient to meet the diverse labour requirements for daily operations. The shortage directly affects timely maintenance, delaying new planting schedules in the tunnel and open-field cultivation. Similarly, delays in harvesting reduce product quality and market value. In the tea sector, prolonged plucking rounds caused by labour scarcity led to over-mature leaves, lowering both yield and quality, thereby affecting the farm's overall profitability. A survey was conducted among the 33 workers to find out the reasons for and key challenges behind the low labour availability on the farm. Findings revealed major issues, including inadequate wages to meet the family expenses, movement of workers to other employment sectors, and a lack of interest in agriculture-based farm activities. To overcome these challenges, several strategic interventions were proposed: implementing automated fertigation systems or drip irrigation systems to minimize manual workload, encouraging youth organizations and women's groups as alternative labour sources through incentive programs; introducing performance-based reward schemes to improve worker motivation and attendance, and adopting tea-plucking machines to reduce labour dependency. These measures are expected to enhance operational efficiency, maintain crop quality, and ensure timely farm activities, ultimately improving productivity, profitability, and long-term sustainability of Alex DIMO Agri Techno Park.

External Supervisor: *Mr. R.M.K.D. Gunarathna, Farm manager, Alex Dimo Agri Techno Park, Lindula, Thalawakele.*

Internal Supervisor: *Dr. D.R. Gimhani, Senior Lecturer, Department of Biotechnology, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka.*

OPTIMIZATION OF BATCH CODE PRINTING IN FOOD PACKAGING PROCESS THROUGH SOP DEVELOPMENT AND EMPLOYEE TRAINING

T.H.M.K.P. BANDARA

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Wayamba University of Sri Lanka, Makandura, Gonawila (NWP), Sri Lanka*

Abstract

CBL Natural Foods (Pvt.) Ltd. is a value-added food export company producing dehydrated fruits, canned foods, coconut smiles, papaya Caricol, spices, desiccated coconut, and Individually Quick Frozen (IQF) products. The packaging section includes operations such as packaging, labeling, and batch code printing, supporting quick and safe packing of the products. Batch code printing machines (Hitachi and Imaje) frequently experience operational errors, resulting in production delays, printing-related waste, and financial losses. The losses are significant, as inks and solvents cost over Rs. 50,000 per set. This study aimed at optimizing batch code printing through developing a standard operating procedure (SOP) and training. The study found that the errors were primarily due to limited technical awareness and communication errors among employees regarding machine operation. Currently, machine maintenance is handled by a third-party service provider, but through this initiative, the maintenance function is planned to be taken in-house by developing an internal team capable of performing routine troubleshooting and maintenance activities. As an initial step toward this goal, several errors were resolved by consulting the local supplier, IJP Technologies, and noting down the troubleshooting steps. During the ongoing project, a three-phase approach was initiated, including SOP preparation, employee training, and evaluation of training effectiveness. These interventions are expected to reduce delays by minimizing errors, reducing waste, and lowering production costs, contributing to smoother and more cost-effective operations at CBL Natural Foods (Pvt.) Ltd.

External Supervisor: *Ms. W.M.T.L. Siriwardhana, Assistant Production Manager, CBL Natural Foods (Pvt.) Ltd., Aweriwatta Road, Heenatiyana, Minuwangoda. Sri Lanka.*

Internal Supervisor: *Prof. B.L.W.K. Balasooriya, Professor, Department of Biotechnology, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka.*

MINIMIZING MICROBIAL CONTAMINATION IN THE LARGE-SCALE SPRAY DRYER

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Wayamba University of Sri Lanka, Makandura, Gonawila (NWP), Sri Lanka*

Abstract

HDDES Extracts (Pvt.) Ltd. is an exporter of spices, cosmetics, coconut milk powder, and essential oils. This study was conducted at HDDES Extracts (Pvt.) Ltd. to address high microbial counts in a large-scale spray dryer, which were negatively impacting final product quality. Initial swab tests from the dryer's chamber and product outlet showed unacceptably high levels of Enterobacteriaceae (EB), with counts often over 100 CFU (colony forming units) /swab or Too Numerous To Count (TNTC), which exceeds the acceptable standard level of <100 CFU. To solve this issue, three cleaning methods were tested over five weeks: a full manual clean with disassembly, a hot water rinse, and an automated Clean-in-Place (CIP) system. The manual method reduced counts to an acceptable range of 10-50 CFU/swab, but required significant labour and downtime, making it inefficient for daily use. The hot water rinse was largely ineffective, failing to properly remove contamination and leaving counts above 50 CFU/swab. In contrast, the automated CIP system proved highly effective, consistently lowering EB counts to an excellent level of less than 5 CFU/swab at all sample sites. Therefore, the CIP system was identified as the most effective and practical cleaning method. Its implementation is recommended to ensure consistent product quality and safety for export, improve operational efficiency, and guarantee compliance with international food safety standards.

External Supervisor: Mrs. S. Premalal, Senior Manager, Quality Assurance and Research and Development, HDDES Extracts (Pvt.) Ltd.

Internal Supervisor: Snr. Prof. N.S. Kottearachchi, Senior Professor, Department of Biotechnology, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka.

DEVELOPMENT OF A FUNGAL-BASED BIOPESTICIDE FOR EFFECTIVE PEST MANAGEMENT IN PROTECTED-HOUSE VEGETABLE CULTIVATION IN BADULLA DISTRICT

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Abstract

This study was conducted during industrial training at Sri Biotech Lanka (Pvt.) Ltd., a company producing eco-friendly biofertilizers and biopesticides. The study aimed to evaluate a fungal-based biopesticide for pest management in highland protected-house vegetable cultivation in Welimada and Bandarawela, Badulla District, Sri Lanka, where the cool and humid climate of these regions favours pest outbreaks during the dry season, including thrips (*Frankliniella occidentalis*), whiteflies (*Bemisia tabaci*), and mites (*Tetranychus urticae*), causing leaf curling, chlorosis, fruit scarring, and viral disease transmission. As conventional chemical pesticides have shown reduced efficacy due to repeated use and resistance development, a fungal-based biocontrol product, “BioNemix”, comprising *Verticillium chlamydosporium*, *Beauveria bassiana*, and *Metarhizium anisopliae* (1:1:1), was formulated. Trials were conducted in six protected-house sites; four in Welimada (bell pepper, cucumber, tomato) and two in Bandarawela (chilli, cucumber) area. Each site included around 80 treated plants and untreated controls. The first application of treatments has been completed, with preliminary farmer feedback indicating a noticeable reduction in pest incidence and associated symptoms, including leaf curling and chlorosis. Based on these positive responses, the second and third applications are scheduled at 10-day intervals to further evaluate treatment efficacy. This work serves as an initial step toward validating BioNemix as an eco-safe alternative to synthetic pesticides. Results are anticipated to show its effectiveness in reducing pests and enhancing plant health in highland protected cultivation.

External Supervisor: *Mr. Y.G.S.S Gunathunga, Senior Microbiologist, Sri Biotech Lanka (Pvt.) Ltd., G & G Group, Mawathagama, Meepe, Sri Lanka.*

Internal Supervisor: *Dr. D.R. Gimhani, Senior Lecturer, Department of Biotechnology, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka.*

ORGANIC COCONUT WATER POWDER AS A VALUE-ADDED EXPORT PRODUCT AT NDC EXPORTS (PVT) LTD

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Abstract

NDC Exports (Pvt.) Ltd. is a leading manufacturer and exporter of organic coconut-based products in Sri Lanka. Established in 2009, the company has continuously focused on the development of novel products and product diversification to enhance export demand. This study aimed to develop an organic coconut water powder as a novel value-added product for the export market. The methodology of the study included determining the production process and evaluating the product quality in comparison with natural coconut water. The optimized production process followed steps such as fat separation, chilling, batch mixing with food-grade additives (organic maltodextrin, dextrose, TSP, and ascorbic acid), homogenization, spray drying, cooling, sieving, and packaging. The shelf life of the new product was 24 months, whereas that of the liquid product was significantly lower. The results of microbial quality analysis revealed that coconut water powder had a significantly lower microbial load (Total Plate Count (TPC) 1.1×10^2 CFU/g) compared to that in natural coconut water (TPC 3.2×10^4 CFU/ml). *E. coli* and coliforms were not detected in the powdered form, while in the liquid product, it was 6-12 months. The study highlighted that the powder form offers several advantages, including extended shelf life, reduced microbial risk, easy handling, convenient storage, and lower transportation costs, making it more suitable for export. The organic coconut water powder is a valuable innovation with product safety and stability, offering high export market competitiveness for the coconut processing sector in Sri Lanka.

External Supervisor: *Mr. W.M.S.B. Wijekoon, Head of Quality Assurance, NDC Exports (Pvt.) Ltd.*

Internal Supervisor: *Prof. B.L.W.K. Balasooriya, Professor, Department of Biotechnology, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka.*

IDENTIFICATION OF THE BEST ELECTRICAL CONDUCTIVITY REDUCING SOLUTION FOR ENHANCING FERTILIZER USE EFFICIENCY IN ORCHID GROWING MEDIA

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Abstract

The orchid collection of the Floriculture Research and Development Unit, Department of National Botanic Gardens, Peradeniya, consists of more than 300 orchid varieties, including endemic and exotic varieties. Commercial Orchid cultivation is a profitable floricultural industry in Sri Lanka with high demand in both export and domestic markets. Successful orchid cultivation requires balanced fertilizer application according to the plant's growth stage and nutrient requirements. Continuous applications of chemical fertilizers in commercial orchid cultivation cause an increase in the Electrical Conductivity (EC) of the growing medium, reducing the nutrient uptake, leading to retarded plant growth and poor flower production. This study aimed to identify the best solution for lowering the EC in orchid growing media and enhancing fertilizer uptake efficiency and plant growth. Rainwater, 0.01 M EDTA, compost extract, and distilled water were tested as EC-reducing draining solutions. The potting media of the selected orchid plants were dipped in the draining solution for 20 hr, and the EC reduction was calculated. The highest EC reduction was obtained from rainwater and 0.01 M EDTA, respectively. An increase in chlorophyll content and new shoot initiation was observed after the treatment. This study highlights the relationship between EC and fertilizer absorption efficiency and the potential of EC-reducing solutions for increased plant growth and flower production in commercial orchid cultivation. Naturally available EC-reducing solutions provide a cost-effective alternative to enhance plant nutrient uptake efficiency and growth.

External Supervisor: *Ms. M.M.L.I.W. Bandara, Assistant Director, Floriculture Research and Development Unit, Department of National Botanic Gardens, Peradeniya.*

Internal Supervisor: *Snr. Prof. N.S. Kottearachchi, Senior Professor, Department of Biotechnology, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka.*

DIGITAL TRACEABILITY AND RISK ASSESSMENT FOR DEFORESTATION-FREE SUPPLY CHAINS IN THE RUBBER INDUSTRY

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Abstract

Dipped Products PLC (DPL), a leading Sri Lankan manufacturer of natural and synthetic rubber gloves, exports its products extensively to European markets. With the introduction of the European Union Deforestation Regulation (EUDR), the global rubber industry faces growing pressure to ensure sustainable and traceable sourcing practices. The regulation requires natural rubber to be deforestation-free and verifiable, presenting a significant compliance challenge for producers and exporters. For DPL, the core issue was the absence of transparent and reliable supply chain data to demonstrate compliance with the EUDR framework. To address this, DPL implemented *TerRax*, a digital traceability platform that consolidates farmer-level information, including cultivation details, GPS coordinates, and land use data, while performing deforestation risk assessments. Using this system, data from 3,556 farmers covering 4,715 hectares were digitized. GPS-based analysis of land use after 2020 enabled the identification of potential deforestation risks within the supply chain. Implementation extended beyond digital monitoring to on-site validation. Field supervisors inspected risk-flagged lands, collected photographs, mapped bordering areas, and recorded modifications such as tree cover loss, tree cutting, proximity to protected lands, or adjacent to natural environments. These findings were compiled into field verification reports to confirm or dismiss deforestation risks with comprehensive evidence. This study demonstrates how DPL aligns with the EUDR by integrating technology-driven traceability with field-level verification. The approach not only ensures regulatory compliance but also strengthens transparency, mitigates risks, and reinforces the company's long-term commitment to sustainable and responsible sourcing practices.

External Supervisor: *Mr. K. Devapriya, Group Manager, Quality Systems, Dipped Products PLC, 400, Deans Road, Colombo 10, Sri Lanka.*

Internal Supervisor: *Dr. P.S. Warakagoda, Head/ Senior Lecturer, Department of Biotechnology, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka.*

SUSTAINABLE APPROACHES FOR PADDY CULTIVATION USING CYANOBACTERIA-BASED BIOFERTILIZER

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Abstract

New biofertilizers developed by researchers are tested at the research stations under greenhouse conditions, followed by trials in research fields and in farmers' fields. The Sustainable Agricultural Research and Development Center, Makandura, also focuses on developing biofertilizers, which is a promising sustainable approach in agriculture. Cyanobacteria are photosynthetic prokaryotes that are capable of nitrogen fixation, making them valuable sources for nitrogen addition in paddy cultivation. This study aims to test the efficiency of a novel nitrogen-fixing cyanobacteria-based biofertilizer developed by the Department of Biotechnology, Wayamba University of Sri Lanka, for paddy cultivation in Sri Lanka. The biofertilizer formulated using several cyanobacteria species (*Chroococcus sp.*, *Synechococcus elongatus*, *Leptolyngbya*, *Anabaena sp.*) was obtained from the Department of Biotechnology of Wayamba University of Sri Lanka. A greenhouse pot experiment with five fertilizer treatments with four replicates; T1 – 100% cyanobacteria (CB), T2 – CB + 50% Department of Agriculture recommended chemical fertilizer (DOA), T3 – CB + 30% DOA, T4 – 100% DOA, and T5 – no fertilizer, was conducted. Pots were filled with paddy soils collected from a paddy field in the Badalgama area after steam sterilization and incubated with autoclaved water for one week. BW367, a 3.5-month rice variety common in the wet zone, was transplanted into pots and fertilized per DOA recommendations, where Cyanobacteria biofertilizer was applied in a 100 mL/pot concentration. At the baseline soil analysis, pH, EC, N, P, K, and organic carbon were measured. The soil analysis will continue along with growth and yield parameters at tillering, flowering, and harvesting stages of the crop. This study establishes the foundation for evaluating the efficacy of cyanobacteria-based biofertilizers as a sustainable approach for paddy cultivation.

External Supervisor: *Ms. W.L.S Priyangika, Assistant Director of Agriculture (Research), Sustainable Agricultural Research and Development Center, Makandura.*

Internal Supervisor: *Dr. P.S. Warakagoda, Head/ Senior Lecturer, Department of Biotechnology, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka.*

EVALUATION OF FILLING CONSISTENCY AND MACHINE CALIBRATION ISSUES IN “PERMIT” PRODUCTION LINE

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Abstract

Lankem Ceylon PLC is one of the leading providers of agricultural inputs, specializing in herbicides, fertilizers, and seeds. The company offers advanced formulations such as vitamins, amino acids, nutrient supplements, anti-stress agents, and growth enhancers, thereby supporting the development of the national agricultural sector. Halosulfuron is a systemic herbicide of Western origin belonging to the sulfonylurea chemical group. This herbicide is primarily applied to *Zea mays* L. (maize) cultivation and effectively controls a range of broadleaf and sedge weed species, including Kaladuru (*Cyperus rotundus*). This case study examines an operational challenge encountered in a filling machine at an agrochemical manufacturing facility. The investigation focused on inconsistent outflow rates across six filling nozzles, where one nozzle exhibited excessive flow, two demonstrated reduced output, and three maintained normal operation. This variation resulted in inaccurate packaging weights, reduced product quality, and increased material waste. A systematic analysis identified potential root causes, including nozzle degradation, partial blockages, pressure distribution imbalances, and calibration drift. Corrective measures implemented included an effective cleaning inspection process (CIP), replacement of deteriorated components with high-quality and corrosion-resistant nozzles, and system-wide recalibration to restore uniform pressure distribution. Preventive maintenance protocols and continuous monitoring systems were subsequently established to ensure sustained operational consistency. The findings emphasize the critical role of proactive equipment maintenance, precision calibration, and systematic quality monitoring in maintaining production efficiency and product integrity in fertilizer manufacturing operations.

External Supervisor: *Ms. C.P. Kahaduwa, Senior Chief Chemist and the System Manager, Lankem Agro Chemical Factory, Industrial Zone West, Makandura, Gonawila.*

Internal Supervisor: *Dr. M.J.M.S. Kurera, Lecturer, Department of Biotechnology, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka.*

DEVELOPMENT OF A BIO-BASED CONTROL STRATEGY FOR GUAVA WILT IN DAMBULLA USING *Trichoderma* Spp. AND *Verticillium chlamydosporium*

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Abstract

Guava (*Psidium guajava*) is a commercially important fruit crop in Sri Lanka that has recently been affected by a severe wilt problem in the Dambulla region. This study was conducted during industrial training at Sri Biotech Lanka (Pvt.) Ltd., a company specializing in eco-friendly bio-solutions for sustainable agriculture, including biopesticides. Affected guava plants exhibited leaf yellowing, vascular discoloration, and progressive wilting. To identify and confirm the causal organism of guava wilting, shoot tip samples were collected from both healthy and diseased plants, surface sterilized with 70% ethanol and 1% NaOCl, and thoroughly rinsed. Stem tips were cut longitudinally to expose the vascular tissues and cultured on antibiotic-treated PDA medium. After three days, only tissues from diseased plants produced fungal colonies with a reddish hue that resembled *Fusarium* morphology, emerging from the vascular region. Microscopic examination and pathogenicity testing are ongoing to confirm the causal organism. As chemical fungicides have shown limited effectiveness, a novel biological control formulation named “TricoFruit” consists of *Trichoderma harzianum*, *Trichoderma viride*, and *Verticillium chlamydosporium* in a 1:1:1 ratio, was developed targeting both fungal pathogens and potential nematode associations linked to the wilt complex. Field trials were established in the Dambulla area: T1 (3-year-old plants, Wewala), T2 (8-month-old plants, Wewala), and T3 (3-year-old plants, Ibbankatuwa), to evaluate the efficacy of bioformulation across different plant ages and sub-regions. Although results are still under observation, preliminary findings indicate that *Fusarium* is a probable pathogen and suggest “TricoFruit” as a promising and sustainable management strategy for guava wilt in Sri Lanka.

External Supervisor: *Mr. Y.G.S.S. Gunathunga, Senior Microbiologist, Sri Biotech Lanka (Pvt.) Ltd., G&G Group, Mawathagama, Meepe, Sri Lanka.*

Internal Supervisor: *Dr. D.R. Gimhani, Senior Lecturer, Department of Biotechnology, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka*

PRELIMINARY BIOGEOGRAPHIC STUDY OF ORCHID SPECIES IN SRI LANKA

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Abstract

The Department of Botany of the Faculty of Science, University of Peradeniya, is one of the most reputed academic establishments for plant sciences in Sri Lanka, conducting multidisciplinary research ranging from molecular biology to ecosystem ecology while contributing to society through ecological restoration and community awareness initiatives. Building on this foundation, this study conducts a preliminary biogeographic study of orchid species in Sri Lanka to explore their evolutionary relationships and divergence time estimation. Orchids represent a diverse flowering plant family, exhibiting special evolutionary adaptations and ecological significance. However, their origin, spread across the globe, and speciation remain uncertain due to the lack of an up-to-date biogeographic study in Sri Lanka. Understanding their biogeographic distribution is essential for biodiversity conservation and evolutionary studies. Therefore, this study aimed to assess the biogeography of 113 orchid species, including 17 endemic and 5 native species of Sri Lanka, along with two outgroup taxa. DNA sequences of *matK* and *ITS* genes were retrieved from the NCBI GenBank database. Each gene dataset was aligned using the MAFFT web server and concatenated using BioEdit software. Preliminary phylogeny, molecular dating, and inferring ancestral states were constructed using BEAST.X.v10.5 and MrBayes-3.2.7 software to investigate evolutionary relationships and lineage divergence. This study highlights the understanding of key distribution patterns and new orchid taxa to be included, representing biogeographic regions for the next analysis for enhanced understanding of Sri Lankan endemic orchid biogeography and conservation planning.

External Supervisor: *Snr. Prof. D.M.D. Yakandawala, Senior Professor, Department of Botany, Faculty of Science, University of Peradeniya.*

Internal Supervisor: *Dr. M.J.M.S. Kurera, Lecturer, Department of Biotechnology, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka.*

IMPACT OF WASTEWATER TREATMENT PLANT CAPACITY EXPANSION ON WASTEWATER QUALITY AT NATURE'S BEAUTY CREATIONS LTD

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Abstract

Nature's Beauty Creations Ltd. is a leading herbal-based cosmetics manufacturer in Sri Lanka, where wastewater treatment plays a vital role in ensuring environmental sustainability and compliance with discharge standards. With the recent increase in production capacity at the main factory complex, the volume of wastewater generated also increased proportionately, making it necessary to increase the capacity of the existing wastewater treatment plant. This study was conducted to evaluate the efficiency of the treatment plant after its expansion based on three key water quality parameters: Chemical Oxygen Demand (COD), Biological Oxygen Demand (BOD), and Total Suspended Solids (TSS). Wastewater samples were collected at the final water discharging point of the wastewater treatment plant and analyzed using standard procedures recommended by the American Public Health Association (APHA). The results were compared with the tolerance limits specified in the Extraordinary Gazette No. 2264/74 for the discharge of effluent into inland surface waters in Sri Lanka. Before the expansion, the COD, BOD, and TSS values were 180 mg/L, 26 mg/L, and 38 mg/L, respectively. After the expansion, the corresponding values were 26 mg/L, 5 mg/L, and 18 mg/L. Before and after the wastewater treatment plant capacity expansion, all observed values remained below the regulatory limits (COD-250 mg/L, BOD-30 mg/L, and TSS-50 mg/L). However, pre-expansion values were closer to these tolerance limits, while post-expansion results showed significant improvement. Based on the available results, the capacity expansion of the existing wastewater treatment plant has effectively increased its efficiency, ensuring compliance with the regulatory requirements and environmental sustainability.

External Supervisor: *Mr. R.L. Karannagoda, Head of Quality Assurance, Nature's Beauty Creations Ltd., Millawa, Horana.*

Internal Supervisor: *Dr. P.S. Warakagoda, Head/Senior Lecturer, Department of Biotechnology, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka.*

SAMPLE DISTRIBUTION AND WORKING STANDARD MANAGEMENT

W.G.P.M. KARUNARATHNE

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Abstract

Kelun Life Sciences (Pvt.) Ltd., located in the BOI Zone, Pallekele, Kandy, is Sri Lanka's first and only saline manufacturing plant and a branch of Sichuan Kelun Pharmaceutical Co., Ltd, China. This company specializes in the production of sterile intravenous (IV) fluids and liquid injectables for both local and export markets. The IV fluids are specially formulated solutions administered intravenously to prevent or treat dehydration. Kelun LifeSciences helps reduce medicine shortages and supports import reduction by providing freshly manufactured, high-quality products to the Ministry of Health, Sri Lanka. The Quality Control Department plays a vital role in ensuring that every stage of production complies with Good Manufacturing Practices (GMP) through systematic analytical testing and verification before product release. In pharmaceutical analysis, reference standards, which are highly purified and well-characterized compounds, are essential for obtaining accurate and reliable analytical results. However, when certified reference materials are unavailable from commercial sources, a working standard must be prepared and validated from high-purity raw material. In this study, a working standard of tranexamic acid was developed using a sample from a selected batch with high purity. The material underwent standard physicochemical testing with X replicates, such as identification assay, and loss on drying, compared with a certified standard. After successful validation, the working standard was standardized, labeled, and stored under specified conditions. The established tranexamic acid working standard met pharmacopeia requirements, ensuring analytical accuracy, laboratory continuity, and cost-effective pharmaceutical quality assurance when reference standards are limited or unavailable.

External Supervisor: *Ms. L.R.S.K. Wijerathne, Junior Executive Chemist, Quality Control Department, Kelun Lifesciences (Pvt.) Ltd., Pallekele, Kandy, Sri Lanka.*

Internal Supervisor: *Dr. P.S. Warakagoda, Head/Senior Lecturer, Department of Biotechnology, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka.*

FEASIBILITY STUDY ON INITIATING A BIOTECHNOLOGY LABORATORY BY FABLANKA FOUNDATION, MAKANDURA

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Abstract

The FabLanka foundation, established in April 2016, aims to expand a network of FabLabs across Sri Lanka to advance digital fabrication and innovation. Situated at the Public Library Complex, Kurunegala Road, Makandura, Gonawila, the foundation provides facilities for education, training, and product development. This study evaluated the feasibility of establishing a biotechnology laboratory under the foundation to serve as a regional hub for research, analytical training, and academic-industrial collaboration. A SWOT analysis conducted between August and September 2025 revealed key internal and external factors influencing the project's viability. Strengths include the acquisition of several equipment, such as Agilent 8453 G1103A UV–Vis and NanoDrop 2000c spectrophotometers, Invitrogen Zoom IPG Runner, X Cell Surelock Minicell systems, Charles River Endosafe portable test system, and Thermo Scientific Orion pH meters donated by international partners, alongside adequate funding and dedicated management. Weaknesses comprise the shortage of skilled personnel, insufficient laboratory infrastructure, and a lack of expert supervision, contributing to delays in equipment commissioning. Threats include regulatory challenges, biosafety concerns, and competition from established biotechnology laboratories in Sri Lanka. Overall, the study highlights the potential of Fab Lanka Foundation for initiating a biotechnology laboratory following the guidelines given by the respective government authorities. Once established, the facility will have a significant opportunity to strengthen the biotechnology research capacity and foster innovation for sustainable development in Sri Lanka.

External Supervisor: *Mr. C.D. Hettiarachchi, Director, FabLanka Foundation, No.28, Makandura, Gonawila, 60170, Sri Lanka.*

Internal Supervisor: *Prof. B.L.W.K. Balasooriya, Professor, Department of Biotechnology, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka.*

EFFECT OF CINNAMON WOOD CHARCOAL ON SOIL MICROBIAL ABUNDANCE AND PHYSICO-CHEMICAL PROPERTIES OF SOIL IN SELECTED CINNAMON FIELDS

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Abstract

Cinnamon wood charcoal (CWC) is a highly porous biochar that enhances the soil microbial habitat and physicochemical properties of soil. This study aimed to analyze the effects of CWC on soil microbial population, pH, and electrical conductivity (EC) in cinnamon cultivated soil. The experiment was conducted at the National Cinnamon Research and Training Center, Palolpitiya, using a Randomized Complete Block Design with four treatments: applying 0.2 kgm⁻² of untreated charcoal (T1), applying 0.2 kgm⁻² of charcoal treated with concentrated microbial solution (CMS) (T2), applying 2 kgm⁻² of untreated charcoal (T3) and no application of charcoal (control) (T4) to the cinnamon cultivated fields. Soil pH and EC were measured using standard laboratory procedures; microbial populations were determined through serial dilutions (10⁻¹, 10⁻², 10⁻³) followed by plate counts on nutrient agar. Data were analyzed using ANOVA with Tukey's test for mean comparison. Results showed that soil pH and EC significantly increased ($p < 0.05$) in T1 and T2 compared to the control, while T3 had significantly lower pH and EC, indicating that higher charcoal levels reduced soil pH and EC. Regarding microbial population, T2 recorded the highest mean value, followed by T1. No significant difference ($p < 0.05$) between T3 and T4. Overall, the application of CWC at a 0.2 kgm⁻² concentration improved soil pH and EC, whether it was treated with CMS or not. T2 showed the highest microbial activity, indicating it is the most effective treatment for cinnamon cultivations. Further validations are needed to gain a better understanding of the effect of CWC on cinnamon cultivations.

External Supervisor: Ms. H.M.T.T. Madhurangi, Deputy Director (Research), National Cinnamon Research and Training Center, Palolpitiya, Thihagoda, Matara.

Internal Supervisor: Dr. P.S. Warakagoda, Head/Senior Lecturer, Department of Biotechnology, Faculty of Agriculture & Plantation Management, Wayamba University of Sri Lanka.

DEVELOPMENT OF SOPs FOR FOOD MICROBIOLOGICAL AND CHEMICAL TESTING IN AN AIRLINE CATERING INDUSTRY

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Abstract

Sri Lankan Catering is renowned in the airline catering industry for ensuring the quality of food with unique flavors as well as safety. The Hygiene and Quality Assurance Department of the company plays a vital role in maintaining food hygiene throughout the entire supplier chain, from receiving raw materials to the delivery of finished products. Microbiological analysis of raw and finished goods, together with chemical testing of water used for processing, drinking, and ice, is routinely conducted in an internal laboratory to ensure that all products meet food safety requirements. These practices comply with five global certifications, including ISO 9001, ISO 22000, ISO 14001, ISO 45001, and HACCP. This case study focuses on developing a comprehensive laboratory manual that standardizes testing procedures for both food and water samples. The main microbiological analyses are Total Plate Count (TPC), Total Coliform Count, and detection of *Staphylococcus spp.*, *Salmonella spp.*, *Bacillus spp.*, *Escherichia coli*, SWAB, and catalase testing, whereas key chemical parameters determined are pH, total hardness, free chlorine (Cl₂), sulphate (SO₄²⁻), and chloride (Cl⁻) ions. The manual compiles detailed standard operating procedures for each analysis to improve the accuracy, consistency, and reliability of laboratory results. It also supports compliance with international standards, enhances laboratory efficiency, and serves as a training guide for staff and interns. The developed manual ultimately contributes to strengthening food safety and quality assurance practices within Sri Lankan Catering, ensuring that high hygiene standards are maintained across all operations.

External Supervisor: *Mr. D.J. Samarakon, Manager, Hygiene and Quality Assurance Department, Sri Lankan Catering Limited, Colombo Bandaranaike International Airport, Veyangoda Road, Katunayake.*

Internal Supervisor: *Prof. B.L.W.K. Balasooriya, Professor, Department of Biotechnology, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka.*

ANALYSIS OF SYNTHETIC PESTICIDE MARKET AND TRENDS IN SRI LANKA FROM 2022 TO 2024

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Abstract

SunAgro LifeScience Ltd, a fully owned subsidiary of Lankem Ceylon PLC, is a leading agrochemical company in Sri Lanka, committed to enhancing agricultural productivity through innovation. Analyzing fluctuations in the pesticide market is important for agricultural policy formulation and industrial strategic planning. This study examined the compositional changes in pesticide categories (insecticides, fungicides, and herbicides with glyphosate) over the past three years to identify industrial trends and shifts in Sri Lanka. The data were collected from the import statistics of Sri Lanka Customs and analyzed using MS Excel 2019. The pesticides market in Sri Lanka demonstrated significant variation across the 2022-2024 period, with total market values of LKR 8.64 billion (2022), LKR 17.21 billion (2023), and LKR 23.48 billion (2024), respectively. As part of a policy shift towards organic agriculture, the government banned the import of synthetic agrochemicals, which was the main cause of the decline in 2022. Comparing the year 2023 with the year 2024, it showed some import reduction due to dollar shortage and economic crisis. Glyphosate also saw remarkable growth, increasing its contribution from 4% in 2022 to 21% in 2024, reflecting a resurgence in herbicide use for weed control. Fungicides maintained a relatively stable market share, accounting for around 12–18% across the three years. The findings indicate a fundamental restructuring of the pesticide market, with herbicides emerging as the dominant category. This shift may reflect changing agricultural practices, crop patterns, pest management strategies, trends for agricultural sustainability, chemical manufacturing priorities, and import policy considerations.

External Supervisor: *Ms. D.A.U.H. Perera, Assistant Manager-Research and Development, SunAgro LifeScience (Pvt.) Ltd., No. 98, Sri Sangaraja Mawatha, Colombo 10, Sri Lanka.*

Internal Supervisor: *Prof. B.L.W.K. Balasooriya, Professor, Department of Biotechnology, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka.*

COMPARATIVE STUDY ON GERMINATION PERFORMANCE OF SELECTED NADU RICE VARIETIES UNDER LABORATORY CONDITIONS

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Abstract

Chemical Industries Colombo (CIC) Holdings PLC is one of Sri Lanka's leading conglomerates, engaging in Agriculture. CIC has contributed to the growth of Sri Lanka's agriculture in various aspects for more than six decades. CIC Pelwehera farm consists of a seed testing laboratory that conducts viability, germination, purity, and moisture tests to ensure the quality of paddy seeds. Seed germination is a critical factor of crop productivity as it determines the successful establishment of crops. A case study was conducted to compare the germination performance of five Nadu rice (*Oryza sativa* L.) varieties, i.e., BG 352, BG 359, BG 374, BG 366, and BG 300, under laboratory conditions. The experiment followed a Completely Randomized Design with four replicates, and each replicate consisted of 100 seeds. All varieties showed high seed viability of approximately 95% by the Tetrazolium test, 99% purity, and 13% moisture content. After seven days, BG 374 recorded the highest mean germination (88.5%), followed by BG 359 (77.25%) and BG 352 (76.5%). BG 366 (63.5%) and BG 300 (63.25%) showed the lowest germination percentages, indicating reduced seedling vigour despite high viability, purity, and moisture level. These results indicate that BG 374 exhibits superior germination potential among the tested varieties of Nadu rice. This study highlights the importance of evaluating germination rates to ensure effective varietal selection for rapid establishment towards high seed production.

External Supervisor: *Mr. K. Subasinghe, Executive (Production), Training Coordinator, CIC Agribusiness (Pvt.) Ltd., Pelwehera, Dambulla.*

Internal Supervisor: *Dr. P.S. Warakagoda, Head/Senior Lecturer, Department of Biotechnology, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka.*

OPTIMIZATION OF CAPSAICIN EXTRACTION OF CHILI AND ISOLATION OF CAPSAICIN BY CRUDE EXTRACT

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Abstract

Industrial Technology Institute (ITI) is the pioneer of a scientific research and development organization in Sri Lanka that enables the public to access the benefits of technology. Ongoing project of the organization considers the extraction and isolation of bioactive compounds such as capsaicin from chili (*Capsicum* spp.) as an essential step in product development with enhanced bioactivity. To address this requirement, this study aimed to optimize the extraction process and establish an isolation method for capsaicin from locally grown chili varieties. The work was carried out by focusing on improving extraction efficiency by evaluating different extraction techniques and solvent concentrations. Initially, capsaicin was extracted using a simple soaking method in ethanol. To determine the most effective solvent system, four ethanol concentrations (96%, 85%, 80%, and 70% (v/v%)) were screened via high-performance liquid chromatography (HPLC) analysis, which revealed that 70% ethanol provided the highest peak area for capsaicin, establishing it as the optimal solvent concentration. Using this optimized solvent, Soxhlet and vortex-assisted centrifugal methods were carried out to further study their efficiency in capsaicin recovery. Crude extracts obtained through these optimized methods were subjected to isolation studies employing thin-layer chromatography (TLC), preparative chromatography, and column chromatography techniques by optimizing the mobile phase combinations and concentrations for better separation. Column chromatography was used to isolate pure capsaicin among other isolation methods, enabling its separation for further biological and chemical studies. This project highlights the systematic optimization of capsaicin extraction and isolation, enhancing its bioactivity, which helps develop reliable isolation techniques that can be applied in future pharmacological and industrial applications.

External Supervisor: *Dr. H.D. Weerathunga, Senior Research Scientist, Herbal Technology Section, Industrial Technology Institute, Malabe.*

Internal Supervisor: *Dr. M.J.M.S. Kurera, Lecturer, Department of Biotechnology, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka.*

FOLLOW-UP EVALUATION OF INSECT DEFECT REDUCTION IN GLOVE PRODUCTION THROUGH INTEGRATED PEST MANAGEMENT (IPM)

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Abstract

Lalan Rubbers (Pvt.) Ltd., Seethawaka, is one of the leading glove manufacturing companies in Sri Lanka, producing a large number of glove batches each month across seven production lines. Insect-related defects have been identified as a critical factor affecting product quality and batch acceptance, particularly in dipping, curing, and online packing areas. In 2024, the company implemented an Integrated Pest Management (IPM) project that combined physical, environmental, and monitoring strategies to minimize insect contamination and improve glove quality. Although initial improvements were observed, subsequent rejection trends indicated the need for a detailed follow-up evaluation. The present study analysed insect-related batch rejections over six months across all production lines, supported by trap inspections and environmental observations to assess the current effectiveness of the IPM system. The analysis revealed that Lines 6 and 7 consistently recorded the highest defect rates, while Line 5 showed minimal but increasing rejection trends. The findings further indicated limited trap coverage in certain areas and several non-functional traps that reduced overall control efficiency. Observations also identified contributing factors such as lighting attraction, inadequate sealing, waste handling, and inconsistent maintenance practices. Based on these outcomes, corrective and preventive measures were proposed, including trap replacement and redistribution, improved inspection frequency, and enhanced worker awareness through training and monitoring programs. This follow-up evaluation emphasizes the importance of sustaining effective pest management systems and continuous data-driven monitoring to ensure consistent glove quality in manufacturing operations.

External Supervisor: *Mrs. H.R.S.D. Weerasinghe, Junior Executive Quality, Department of Quality Assurance, Lalan Rubbers (Pvt.) Ltd., Seethawaka.*

Internal Supervisor: *Dr. P.S. Warakagoda, Head/ Senior Lecturer, Department of Biotechnology, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka.*

A CASE STUDY ON THE STRATEGIC USE OF FOOD SAFETY WEEK TO FOSTER A PROACTIVE FOOD SAFETY CULTURE AT PRODUCE OF PARADISE (PVT) LTD

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Abstract

Produce of Paradise Pvt. Ltd., a coconut milk exporter which is based in Minuwangoda, Sri Lanka, initiated a strategic cultural transition to uplift its food safety standards to the Proactive stage by 2026. This goal was set after a comprehensive initial evaluation, utilizing a food safety culture questionnaire administered across all organizational levels, revealing that the company's current food safety culture operates at the active stage. This case study details the development and execution of the foundational first step in this organizational transition: a six-day Food Safety Week, held from 22nd to 27th September 2025. The event was conducted under the unifying theme of "Safe Hands, Safe Food, Safe Future", with the primary objective of establishing a basic knowledge foundation and encouraging practical engagement across all organizational levels. My role encompassed end-to-end execution, including planning, budgeting, designing marketing materials and banners, and directly conducting training and interactive games. The week was rigorously structured around six distinct daily themes to cover core competencies. Activities included Day 1: "Building Foundation of Food Safety" (Introduction); Day 2: "Safe Practices, Safe Products" (GMP site visit and malpractice spot test); Day 3: "See it before it Strikes" (Hazard identification and the 'Hazard Hunters' game); Day 4: "Food Safety Starts with Me" (Personal responsibility via an art competition); Day 5: "Together for a Safer Workplace" (Environmental clean-up); and Day 6: "Celebrating Champions" (Appreciation and motivation). Post-event feedback confirmed that employees successfully gained the intended basic knowledge, thereby laying the critical initial foundation necessary for achieving the strategic 2026 cultural goal.

External Supervisor: *Ms. J.A.A.S. Jayaweera, Quality Assurance Manager, Produce of Paradise (Pvt.) Ltd., Kalahugoda, Minuwangoda, Sri Lanka.*

Internal Supervisor: *Snr. Prof. N.S. Kottearachchi, Senior Professor, Department of Biotechnology, Faculty of Agriculture & Plantation Management, Wayamba University of Sri Lanka*

ENHANCING PRODUCT QUALITY BY ADDRESSING DESTONER PERFORMANCE ISSUES IN SPICE EXPORTS

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Abstract

Spices such as cloves, pepper, and other raw materials acquired for exportation tend to be embedded with foreign material such as stones, dust, and foreign particles that must be separated to ensure product quality and safety. Destoner machines are typically applied in this context, functioning on the principle of density separation with the help of an inclined vibrating deck and controlled airflow. Ideally, stones being heavier than the spice material should be completely separated, and a clean product should remain for further processing. However, it was observed that the output of the destoner still contained some stones, which created quality problems and the possibility of rejection in export shipments. Investigation into this issue revealed a series of causes from an operations point of view. In some cases, the deck angle was excessively high, which adversely affected the proper stratification of material and allowed stones to travel along with the product. In other cases, the air was too weak due to low fan speed or air chamber leaks, particularly when closing the backside door loosely. These inefficiencies significantly affected the ability of the machine to separate. To solve this kind of trouble, regular maintenance and correct machine adjustments are recommended, including cleaning the fan and ducts, ensuring doors and seals are properly closed to prevent air leakage, and adjusting deck inclination and airflow according to raw material conditions, along with trained operators who ensure correct setup, monitoring, and maintenance. Implementing these measures will enhance stone removal efficiency, reduce product contamination, and improve the overall quality of spice exports.

External Supervisor: *Mrs. A.U. Ramanayake, Manager- Quality Assurance and R&D, Cinnatopia (Pvt.) Ltd., Polgasowita.*

Internal Supervisor: *Dr. P.S. Warakagoda, Head/Senior Lecturer, Department of Biotechnology, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka.*

IDENTIFICATION OF AN ENVIRONMENTALLY FRIENDLY SUSTAINABLE CONTROL METHOD FOR CONTROLLING RICE LEAF BROWN SPOT DISEASE

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Abstract

The Rice Leaf Brown Spot disease caused by *Bipolaris oryzae* is one of the major rice diseases in Sri Lanka. So, the Rice Research Station in Labuduwa, Sri Lanka, is researching methods to overcome this problem. This study was conducted to identify an environmentally friendly, non-chemical method to control the brown spot disease in rice. This was started in the 2025 Yala season as two parts: field experiment and lab experiment. Field experiment was conducted with nine treatments such as soil drench (T1), seed treatment (T2), soil drench + seed treatment (T3), chemical control (T4), hot water seed treatment (T5), managing fertilizer (T6), DOA recommendation (T7), soil drench + seed treatment + hot water treatment (T8), control along with three replicates (T9). These treatments were applied in a Randomized Complete Block Design (RCBD), cultivating the recommended variety, Ld 368, which is resistant to brown spot disease for these experiments. The lab experiment was conducted by extracting *Trichoderma*, which is a well-researched biological control agent known for its effectiveness against numerous plant pathogens. In here, a locally isolated *Trichoderma virens* was evaluated against *Bipolaris oryzae* under *in vitro* conditions. The interaction between *T. virens* on *B. oryzae* was examined through the dual culture technique to determine the antagonism. Further feasibility studies are recommended to evident that the *T. virens* can successfully inhibit the growth of pathogens that cause the rice brown spot disease and other environmentally friendly methods that could be used to control the brown spot disease.

External Supervisor: Ms. H.K.A. Karunathilaka, Assistant Director Research, Rice Research Station, Labuduwa, Akmeemana, Galle.

Internal Supervisor: Dr. M.J.M.S. Kurera, Lecturer, Department of Biotechnology, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka.

INNOVATING PASSION FRUIT QUALITY AND SHELF LIFE FOR EXPORT MARKETS

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Abstract

Nidro Supply Private Limited, established in 1974, first supplied fresh fruits and vegetables to resort operators in the Maldives, and now it has grown up to a leading exporter of Sri Lankan produce. Passion fruit (*Passiflora edulis*) is a tropical and subtropical fruit that is very popular in the export market. It has a sweet-sour taste and high demand, but its short shelf life of only about 3-4 days has been a major problem in the export market. Therefore, this study was focused on finding new methods to extend the shelf life up to 1–2 weeks. Fruits were divided into two groups based on colour: green and yellow, to ensure uniform ripening, consistent quality, and maturity. This sorting helps to prevent overripe or underripe fruits from affecting others during storage. After sorting, the fruits were packed in polyethylene (PE) bags. These bags helped to control oxygen (O₂), carbon dioxide (CO₂), and humidity levels inside the package. Reduced oxygen slowed down respiration and ripening, while slightly higher CO₂ levels inhibited microbial growth. Small holes were made in the bags to balance gas exchange and prevent spoilage. The packed fruits were stored at an ideal temperature of 7–10 °C. This low temperature further slowed microbial activity and preserved freshness. Extending the shelf life of passion fruit is very important because it reduces post-harvest losses, supports long-distance transport, increases market availability, and prevents economic losses. Through proper sorting, packaging, and temperature management, exporters can maintain fruit quality for a longer period and achieve higher profits.

External Supervisor: *Mr. M.D. Devijan, Head of Operations/QA, Nidro Supply Private Limited, Biyagama.*

Internal Supervisor: *Snr. Prof. N.S. Kottearachchi, Senior Professor, Department of Biotechnology, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka.*

OPTIMIZATION OF BEER TRANSFER CONDITIONS TO REDUCE DISSOLVED OXYGEN LEVELS IN CRAFT BREWING

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Abstract

The Lion Brewery (Ceylon) PLC is a specialized facility dedicated to the production of premium-quality beers through advanced brewing processes. Beer transfer is a critical operation in the production process as trace levels of oxygen lead to oxidation, affecting flavor, stability, and shelf life. At a mini brewery of the facility that produces craft beer, oxygen pick-up was observed during manual transfer of the fermented beer from fermentation tanks to Bright Beer Tanks (BBTs). This study aimed to identify the main points of oxygen ingress and determine the measures to reduce such ingress during the transfer operation. First, a process flow diagram of the existing transfer system was executed, and the main points of oxygen ingress at the mini brewery were identified. During the ongoing study, CO₂ purging will be used as an alternative solution to remove oxygen from the transfer line and BBT headspace before transferring the beer. Furthermore, regulating transfer pressure and flow velocity will also be used as indirect methods to reduce turbulence and splashing, thereby reducing oxygen levels. Dissolved oxygen levels of beer before and after the transfer operation will be determined using standard methods. The effectiveness of each method for reducing oxygen ingress significantly will be determined by statistical data analysis. The study anticipates a practical and inexpensive solution to oxygen ingress management in the brewing process.

External Supervisor: *Mr. S. Amarasekere, Vice President- Consumer and Market Insights, Marketing General, Lion Brewery (Ceylon) PLC, Biyagama.*

Internal Supervisor: *Prof. B.L.W.K. Balasooriya, Professor, Department of Biotechnology, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka.*

ASSESSMENT OF PROTEIN AND FIBRE VARIATION DURING CATTLE FEED PROCESSING

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Abstract

Feed formulation in animal feed production is important as it maintains animal health and feeding efficiency. A potential issue was identified in an animal feed production company, where the final cattle feed showed lower protein and fibre contents than expected, despite the use of high-quality ingredients. As protein and fibre are the major nutrients that directly influence the quality of cattle feed, this study aimed to assess protein and fibre variation during feed processing to identify whether the process leads to any nutrient loss and to identify possible causes. Three batches of feed, which were processed under the same formula of ingredients, were tested for moisture, protein, and fibre contents using standard laboratory procedures. Nutrient values were calculated theoretically on a dry matter basis to avoid the impact of moisture. Results showed a relative loss of 10.68% in protein and 10.21% in fibre during processing. Several factors may contribute to these losses, including moisture variation, improper storage, nutrient degradation due to high temperatures, mechanical losses during the process, and incomplete mixing or segregation of feed components. Hence, to minimize nutrient degradation, enhancement of moisture and temperature control of processing, enhancing storage conditions, cleaning the machines properly after a batch, regular calibration of mixing and pelleting equipment, monitoring of mixing uniformity, and reducing dust and fines loss by implementing closed conveyance systems are recommended. This study highlights the importance of optimization of the process and quality assurance in industrial feed production to minimize nutrient losses and maintain consistent feed quality and performance.

External Supervisor: *Ms. A.N.P.E. Dayananda, Assistant Quality Controller, Super Feed (Pvt.) Ltd., Off Aluthnuwara Road, Edanduwawa, Mawanella.*

Internal Supervisor: *Dr. D.R. Gimhani, Senior Lecturer, Department of Biotechnology, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka.*

EFFECT OF FILTER MEDIA ON FILTRATION EFFICIENCY OF DRINKING WATER AT THE MEEWATHURA WATER TREATMENT PLANT

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Abstract

The National Water Supply and Drainage Board (NWSDB), established under Law No. 2 of 1974, is the principal government agency responsible for providing safe drinking water and sanitation services and managing the water supply and drainage systems in Sri Lanka. NWSDB operates laboratories at the central, regional, and plant levels, and the regional laboratories undertake monitoring of drinking water, wastewater, and groundwater quality, offering specialized services such as chemical profiling, microbial analysis, jar tests, and sieve tests. Meewathura Water Treatment Plant (WTP), under the Central South Region, produces 35,000 m³/day of drinking water according to SLS 614:2013 standards, using a full treatment process, where granular filtration is used to trap solid impurities. This study examined the filtration efficiency of six filters with varying filter media sizes (F1=1.1mm, F2=0.95mm, F3=1.04mm, F4=1.06mm, F5=1.06mm, F6=1.04mm) in Meewathura WTP by analyzing turbidity over three months (June-August 2025). Results showed that effective filter media size falls between 0.95–1.10 mm, exceeding the standard 0.5–0.95 mm range, with uniformity coefficients between 1.40–1.55. In all filters, filtration efficiency was high in June (≈90%) and declined over time. F1 showed the most significant reduction (53.88%), while F6 maintained a relatively stable performance. This indicates that higher media size leads to reduced performance in filtration and underscores the importance of maintaining proper media size for efficient filtration. In addition, other factors such as grading, timely media replacement, optimized backwashing, maintaining a steady flow rate, and regular monitoring may contribute to maintaining long-term filtration efficiency in water treatment processes.

***External Supervisor:** Ms. D. Ilangagedara, Senior Chemist, Regional Laboratory, National Water Supply and Drainage Board, Sarasawiyana, Peradeniya.*

***Internal Supervisor:** Prof. B.L.W.K. Balasooriya, Professor, Department of Biotechnology, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka.*

A CASE STUDY ON THE USE OF NATURAL ALOE VERA COATING FOR EXTENDING THE SHELF LIFE OF MANGO

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Abstract

The Office of the Deputy Director of Agriculture under the Department of Agriculture, Northern Provincial Council, plays a vital role in promoting sustainable agricultural practices in Jaffna. Mango (*Mangifera indica* L.) is one of the most commercially important fruits in Jaffna. However, rapid ripening and spoilage of the fruits cause considerable post-harvest losses during harvesting, storage, and marketing. Natural edible coatings are becoming progressively common as an environmentally friendly approach to maintaining fruit quality and increasing shelf life. The purpose of this study was to assess the effectiveness of an aloe vera gel coating on the quality and shelf life of ripe mango. Fresh, mature Willard mangoes were selected, cleaned, and studied in two groups: Aloe vera-coated and uncoated (control), 17 replicates per treatment. Fresh aloe vera leaves were used to extract the gel and applied thinly to the mango's surface. For 10 to 12 days, the fruits were kept at room temperature (28 to 30 °C), and at regular intervals, the color, firmness, weight loss, and percentage of spoilage were recorded. Initial findings suggested that aloe vera gel coating minimized physiological weight loss (Approximately 9.25%) and preserved fruit firmness. The coating slowed down ripening and changes in skin color. These results show that aloe vera gel could be a natural, safe, and cost-effective method to keep mangoes fresh for a longer duration. This method has high potential to reduce losses after harvest during transportation and storage towards promoting better marketing in both local and export markets.

External Supervisor: *Mrs. A. Srirangan, Deputy Director of Agriculture, Office of the Deputy Director of Agriculture, Palali Road, Thirunelvely, Jaffna.*

Internal Supervisor: *Snr. Prof. N.S. Kottearachchi, Senior Professor, Department of Biotechnology, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka.*

CAUSES AND MITIGATION OF EXCESSIVE SOURNESS IN SET YOGHURT AT ISLAND DAIRIES (PVT) LTD

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Abstract

Island Dairies (Pvt.) Ltd. has steadily expanded and become a leading producer of high-quality dairy products in Sri Lanka. Among its product range, yoghurt is one of the popular fermented dairy products, valued for its nutritional benefits. This case study aimed to address a sensory issue of the yoghurt product due to excessive sourness. According to a detailed assessment of the production process, the major reason was identified as the continuous accumulation of starter cultures in production vats, as Clean-in-Place (CIP) was not carried out on a batch-wise basis. Due to this condition, residual microorganisms from previous batches accumulated and carried over into subsequent batches, leading to over-acidification. In addition, high incubation temperature (46-48 °C) instead of the optimal temperature range (42-45 °C), extended incubation period beyond the standard four hours, and failure to maintain the correct brix value (20-22) contributed to diminishing the product quality. Batch-wise cleaning of vats by using hot water (10 minutes), routine monitoring of incubator temperature twice per day to ensure accuracy, timely release of yoghurt batch after recommended incubation period, and strict verification of Brix values before finalization of yoghurt mixture were employed as mitigating practices to address those consequences. These measures could minimize the excessive sourness by increasing pH from 4.28 to 4.5 and Brix value from 18.5 to 21.2 in yoghurts by enhancing both product consistency and consumer satisfaction. This study highlights that strict hygiene and precise process control can maintain the quality of the fermented dairy products.

External Supervisor: *Mr. A. Mayurapaksha, Production Manager, Island Dairies (Pvt.) Ltd. Kegalle.*

Internal Supervisor: *Dr. M.J.M.S. Kurera, Lecturer, Department of Biotechnology, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka.*

MANAGEMENT PRACTICES DETERMINING THE SEED PERFORMANCE IN A COMMERCIAL SEED PRODUCTION FACILITY

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Abstract

Seed production plays a pivotal role in sustaining agricultural productivity by ensuring the availability of high-quality planting materials. Browns Agri Solutions (Pvt.) Ltd., a leading agricultural enterprise in Sri Lanka, engages in the production, processing, and marketing of certified seeds for various crop species such as brinjal and watermelon. This study focused on different stages of the seed production process, including parental line selection, field inspection, controlled pollination, harvesting, drying, cleaning, grading, and packaging. The primary objective was to identify the best management practices that determine the seed performance, such as germination percentage, moisture content, purity, and vigor index. Data on seed production and performance of brinjal and watermelon crop varieties were collected from the records available from August to September 2025. The findings revealed that maintaining optimal environmental conditions, proper field management, and careful post-harvest handling significantly lead to higher seed viability and vigor. Moreover, the integration of biotechnology tools such as molecular marker-assisted selection and tissue culture techniques and advanced machinery has improved seed purity and efficiency of seed production, respectively. Overall, the study emphasizes the importance of adopting a standardized operational procedure for the production of high-quality seeds with genetic purity for enhancing commercial seed production and supporting sustainable agricultural development in Sri Lanka.

External Supervisor: *Mr. C. Thananseyan, Executive- Product Development, Browns Agri Solutions (Pvt.) Ltd., Colombo 10.*

Internal Supervisor: *Prof. B.L.W.K. Balasooriya, Professor, Department of Biotechnology, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka.*

A CASE STUDY ON OVERCOMING AGRONOMIC AND LOGISTICAL CHALLENGES IN THE PUMPKIN INBREEDING PROGRAM AT CIC HOLDINGS PLC

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Abstract

Sri Lanka imports 7250 metric tons of pumpkin seeds annually, accounting for a substantial 94% of the total pumpkin seed market. Understanding this seed demand, CIC has initiated the pumpkin inbreeding program at its Seed Farm, Pelwehera, which is critical for developing superior inbred line products to create pumpkin hybrid varieties well adapted to local conditions. The success of the program depends on maintaining genetic diversity and purity through controlled pollination and seed extraction to produce inbred lines, which will later be crossed for hybrid pumpkin production. The breeding program is threatened by several challenges. This case study identified four primary constraints: significant yield loss due to peacock attacks on berries, ineffective identification of pollination-ready buds, difficulties in timely pollination, and the absence of a numerical tagging system for tracking self-pollinated flowers, which weakened the program evaluation. To address these issues, a set of integrated solutions was proposed. Peacock attacks could be mitigated by replacing existing blue and green nets with white nets and implementing white thread fences to repel birds' attraction. The same white nets will enhance bud visibility against the green foliage, solving the identification issue of pollination-ready buds. To improve the pollination working environment, increasing the net height with supportive structures was recommended. Finally, introducing a systematic numerical tagging protocol for pollinated flowers will enable precise tracking and monitoring of breeding progress. Therefore, implementation of these approaches could enhance seed yield, ensure reliable genetic data, safeguard investments, and ultimately increase the overall efficiency and success of the pumpkin inbreeding program.

External Supervisor: *Mr. K.G.N. Subasinghe, Executive (Industrial Training Coordinator), CIC Seed Farm, Pelwehera, Dambulla.*

Internal Supervisor: *Snr. Prof. N.S. Kottearachchi, Senior Professor, Department of Biotechnology, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka.*

DEVELOPMENT AND QUALITY EVALUATION OF AMBARELLA (*Spondias cytherea*) EXTRACT INCORPORATED DRINKING YOGHURT

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Abstract

Ambarella (*Spondias cytherea*) is a tropical fruit well known in Sri Lanka for its nutritional benefits. Incorporating ambarella extract into drinking yoghurt can create a functional beverage that meets consumer demand for natural, health-promoting foods while adding value to a locally available fruit in Sri Lanka. The present study aimed to develop a drinking yoghurt incorporated with ambarella extract and evaluate its physico-chemical, microbial, and sensory characteristics at the Milco (Pvt.) Limited. An experiment was conducted using drinking yoghurt prepared with different concentrations of ambarella extract (15%, 20%, 25%) and a control with three replicates. A sensory evaluation was conducted using 20 untrained panellists, and results indicated that 25% ambarella extract incorporation was the most acceptable treatment in terms of taste, aroma, colour, texture, mouthfeel, and overall acceptability. Physicochemical analyses included pH, total solids (TS), moisture (%), titratable acidity (TA), Brix (%), and fat content. The results revealed a significant decrease in pH and significant increases in titratable acidity and Brix values compared to the control, while fat content remained stable and TS and moisture showed no significant differences ($p > 0.05$). Microbiological analysis confirmed the absence of coliforms in all treatments, while yeast and mould counts were reported as less than 10 CFU/mL, indicating overall product safety. Conclusively, ambarella extract (25%) can be successfully incorporated into drinking yoghurt to enhance its nutritional and sensory qualities.

External Supervisor: *Mrs. M.P. Edirisinghe, Manager, Quality Assurance Research & Development, Milco (Pvt.) Limited, Narahenpita, Colombo 05.*

Internal Supervisor: *Dr. D.R. Gimhani, Senior Lecturer, Department of Biotechnology, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka.*

DEVELOPMENT OF UREA COCRYSTALS AS A SUSTAINED-RELEASE NITROGEN SOURCE TO BE USED IN AGRICULTURE

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Abstract

The Faculty of Engineering at the University of Peradeniya is the oldest and most esteemed institution for engineering in Sri Lanka. Department of Chemical Engineering dives beyond research and leads pioneering revolutions. Their focus on controlled delivery of agrochemicals addresses key challenges faced by modern agriculture, such as the waste of essential nutrients from agrochemicals and fertilizers. The main challenge is nitrogen, as conventional fertilizers lose about 50%-70% of this essential nutrient through soil urease activity, leaching, nitrification, and volatilization. This inefficiency reduces profits and harms ecosystems. Slow-release nutrient encapsulated fertilizers and coated nano fertilizers are currently used to address these nutrient delivery issues. However, their synthesis methods are complex and expensive. In response, crystal engineering has emerged as a cost-effective and sustainable strategy for fertilizer design, particularly through urea cocrystals. These materials are made by combining urea with conformers through noncovalent interactions in an environmentally safe manner. Liquid-assisted grinding (LAG) was employed to grind the urea and conformer using a Retsch mill. Further feasibility studies will be characterized by using the techniques of Powder X-ray Diffraction (PXRD), Fourier Transform Infrared Spectroscopy (FTIR), Thermogravimetric Analysis (TGA), Differential Scanning Calorimetry (DSC), and Scanning Electron Microscopy (SEM), and will analyze their effectiveness. Moreover, solubility, stability, and releasing behaviour will be studied, followed by plant-based pot trials to compare the efficacy of urea cocrystals with commercial urea. Developing urea cocrystals is one of the best approaches to ensure sustained nutrient release and create an eco-friendly fertilizer platform with significant potential for large-scale agricultural applications.

External Supervisor: *Prof. N.M. Adassooriya, Professor, Department of Chemical and Process Engineering, Faculty of Engineering, University of Peradeniya*

Internal Supervisor: *Dr. M.J.M.S. Kurera, Lecturer, Department of Biotechnology, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka*

ENHANCING ECO-TOURISM THROUGH SCIENTIFIC IDENTIFICATION AND DIGITAL DOCUMENTATION OF MEDICINAL PLANTS

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Abstract

Nandana Tea Factory, a diversified tea industry in Akuressa, Sri Lanka, maintains a diverse herbal garden consisting of over 100 medicinal plant species. The primary objective of this garden is to introduce both local and foreign visitors to Sri Lankan herbal plants. However, the absence of proper plant identification and an effective communication system has hindered the educational potential of the garden. To address this gap, an extensive review of literature, including online resources from the Department of Ayurveda, was conducted. Collaboration with an Ayurvedic physician facilitated the accurate identification of herbal plants based on morphological characteristics, along with the documentation of corresponding chemical compounds and therapeutic uses. Following plant identification, a systematic and user-friendly solution was developed to enhance knowledge dissemination. Laminated name boards were designed for each plant, displaying the scientific name, common name, major bioactive compounds, and medicinal applications. Additionally, each board incorporated a QR code linked to Nandana Tea Factory's official webpage, enabling visitors to access detailed digital information. All identified plants were categorized alphabetically to facilitate quick reference and improve educational experience. This initiative significantly strengthened the factory's ecotourism value by creating an interactive and scientifically informative herbal garden. Using correct plant names along with modern digital tools creates a lasting way to share knowledge about herbs, raise awareness about conservation, and encourage learning between cultures in agro-tourism areas.

External Supervisor: *Mr. G.M. Wanigasekara, Director, Nandana Tea Factory (Pvt.) Ltd., Akuressa, Sri Lanka.*

Internal Supervisor: *Snr. Prof. N.S. Kottearachchi, Senior Professor, Department of Biotechnology, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka.*

EVALUATION OF THREE DIFFERENT GLUCOSE SYRUPS FOR WATER ICE PRODUCTION

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Abstract

Cargills Dairies (Pvt.) Ltd. is a leading producer of dairy and frozen dessert products in Sri Lanka, including a wide range of water ice products. Water ice is a popular frozen dessert prepared using Cargills Dairies' standard formulations, where glucose syrup acts as a key ingredient influencing sweetness, improving texture by lowering the freezing point, preventing large crystal formation, and increasing smoothness and stability. This study was conducted to evaluate the effect of three different types of glucose syrups (A, B, and C) on the quality parameters of water ice produced according to the company's recipes. Samples of water ice produced using different glucose (A, B, and C) were analysed for total solids (TS), pH, Brix value, and viscosity with three replicates, and statistical analysis was performed using one-way ANOVA. Results revealed significant differences ($p < 0.05$) among samples for all parameters except melting rate. The ANOVA indicated a significant effect of the type of glucose syrup on pH, total solids, viscosity, and Brix. However, sample C exhibited a relatively higher melting rate compared to samples A and B, showing that samples A and B had better melting stability. Sensory evaluation further revealed that samples A and B achieved the highest overall acceptability, indicating superior texture, flavour, and mouthfeel. In contrast, sample C exhibited a higher melting rate and lower sensory preference. Therefore, samples A and B were identified as the most suitable glucose syrup formulations for producing high-quality water ice using Cargills Dairies' recipe.

External Supervisor: *Ms. S. Wickramage, Assistant Manager of Quality Assurance, Cargills Dairies (Pvt.) Ltd., Illukhena Rd, Gaspe, Banduragoda.*

Internal Supervisor: *Dr. D.R. Gimhani, Senior Lecturer, Department of Biotechnology, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka.*

EVALUATION OF BLOOD CHOLINESTERASE ACTIVITY AS A BIOMARKER OF OCCUPATIONAL EXPOSURE TO AGROCHEMICAL TOXICANTS

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Abstract

Lankem Ceylon PLC, established in 1964, is a foremost company in the agricultural sector in Sri Lanka, offering comprehensive agrochemical, fertilizer, seed, and crop management solutions while ensuring occupational health, supported by ISO-certified systems. Continuous exposure to pesticides, herbicides, and other toxicants can cause serious health effects due to the inhibition of the blood cholinesterase enzyme, an important component in the functioning of the nervous system. The blood cholinesterase enzyme catalyses the breakdown of acetylcholine into acetic acid and choline. However, toxic compounds present in organophosphate and carbamate pesticides inhibit this enzyme, reducing acetic acid formation and thereby lowering blood acidity. Therefore, checking for toxic contamination is important for preventing health hazards. This study aimed to assess the blood cholinesterase activity of workers at the Lankem factory, Makandura, to identify toxic contaminations. The test employed the Lovibond Comparator method with bromothymol blue as the pH indicator. In this method, a small amount of blood sample was mixed with the bromothymol blue, and the solution was incubated to develop a color change, which corresponds to the level of cholinesterase activity. The resulting color intensity was compared visually using the Lovibond Comparator disc to estimate enzyme activity levels based on standard color references. This test is beneficial for identifying health hazards and is essential to be introduced into agrochemical industries for routine monitoring. Future recommendations include developing a digital photometer-based version of this test, which can provide more accurate, real-time numerical readings of cholinesterase activity.

External Supervisor: *Ms. C.P. Kahaduwa, Senior Chief Chemist and the System Manager, Lankem Agro Chemical Factory, Industrial Zone West, Makandura, Gonawila.*

Internal Supervisor: *Dr. M.J.M.S. Kurera, Lecturer, Department of Biotechnology, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka.*

IDENTIFICATION OF A SUITABLE CULTURE MEDIUM FOR THE OPTIMUM GROWTH OF *Fusarium solani*

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Abstract

The preparation of pure cultures of *Fusarium solani*, a fungus known to cause disease in a wide range of plant species, can be a limiting factor in both research and industrial applications. This study aimed to identify the most suitable culture medium for the optimal mycelium growth of *F. solani*. A pure culture of *F. solani* was obtained and maintained on Potato Dextrose Agar (PDA). The isolated fungi were cultured on five different solid media: Lima Bean Agar, Corn Meal Agar, Sabouraud Dextrose Agar, PDA supplemented with 5% Glucose, and PDA supplemented with 10% Glucose, with standard PDA serving as the control. Each treatment was replicated five times. All inoculated plates were incubated under controlled conditions at a constant temperature of 28°C, and radial mycelial growth (cm) was measured after seven days of incubation. A One-way ANOVA and Tukey's HSD test were performed to determine significant differences in growth media for *F. solani*. The results revealed that the culture medium had a significant effect on the mycelial growth of *F. solani* ($p < 0.0001$). Tukey's HSD test showed that PDA supplemented with 5% glucose supported the highest growth ($p < 0.05$), followed by Lima Bean Agar. The superior performance of PDA+5% Glucose is likely due to its optimal balance of nutrient composition, providing both a complex base from potato infusion and readily available carbon in the form of glucose. This study conclusively identifies PDA+5% Glucose as the most effective medium for the rapid in vitro cultivation of *F. solani*, which would be useful in future pathological research studies.

External Supervisor: *Dr. P.H.P.R. De Silva, Head, Crop Protection Division, Coconut Research Institute, Lunuwila, Sri Lanka.*

Internal Supervisor: *Dr. D.R. Gimhani, Senior Lecturer, Department of Biotechnology, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka.*

AN ANALYSIS OF BUYER-PARTICIPATION IN PURCHASING OUTLOTS OF JOHN KEELLS PLC AND THEIR ENGAGEMENT IN LIVE TEA AUCTION ACTIVITIES

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Abstract

The Colombo Tea Auction in Sri Lanka is a formal process where tea from plantations is sold to buyers through licensed brokers. Tea broking acts as an intermediary service connecting producers and buyers. There are eight tea broking companies in Sri Lanka, with John Keells PLC being a major player. One of John Keells PLC's major challenges has been unsold tea lots that remain after the auction process. Those unsold lots are referred to as “Outlots”. Therefore, the company has been more focused on identifying potential buyers to purchase those outlots. This study focused on the outlot purchasing behavior of buyers of Ex-Estate tea in the years 2023 and 2024. For the analysis, general reports of 102 auctions from the "OKLO Smart Auction platform" over the period were obtained. In addition, reports of Forbes & Walker Tea Brokers (Pvt.) Ltd., another major tea broking company, were examined to determine compatible buyers. Consequently, 37 major buyers, who purchased outlots annually, were located. Among them, Heritage Teas Private Ltd consistently had the highest percentage of purchased outlots, indicating 13.97% in 2023 and 16.78% in 2024. Other prominent buyers such as Uniworld Teas, Akbar Brothers, Dilmah Ceylon Tea Company, Sunshine Consumer Lanka Limited, Tea Tang, and Uniworld Teas also had maintained sizeable shares. As per the results, outlots are significantly purchased by active bidders compared to passive bidders in the auction process. Hence, these measures will foster better communication between recognized buyers and sellers to ensure balanced supply-demand matching and support the sustainable growth of John Keells PLC in the tea industry.

External Supervisor: *Mr. D. De Alwis, Manager- Tea, John Keells PLC, Colombo 02.*

Internal Supervisor: *Snr. Prof. N.S. Kottearachchi, Senior Professor, Department of Biotechnology, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka.*

IDENTIFYING THE IMPACT OF QUALITY ASSURANCE AUDITS ON ISO COMPLIANCE AND PRODUCT SAFETY IN PERSONAL PROTECTIVE EQUIPMENT MANUFACTURING

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Abstract

The leading glove manufacturing company is globally recognized for providing personal protective equipment (PPE) for healthcare and industrial workplaces. The Quality Assurance (QA) Department ensures all products comply with regulatory guidelines and required standards, including ISO 9001 and ISO 13485, to maintain product safety and reliability. QA audits (F1 26 Audit-ongoing) are conducted to verify that all processes, from chemical compounding to final packaging, are conducted adhering to established Standard Operating Procedures (SOPs), ensuring consistent product quality. To plan an effective audit, key process areas were identified, a competent audit team was formed, an audit checklist was developed based on SOPs, and audits were scheduled with minimal disruption while notifying relevant departments. The QA audit has been scheduled from July of the current year to June of the following year, with a team of three auditors responsible for preparing and executing the audit checklist. The audit covers key operational areas, including dipping lines, packaging lines, washing and drying sections, compounding, GMP compliance, the QC laboratory, screen printing, the liner warehouse, and risk management. Any Non-Conformance Report (NCR) raised during the audit must be properly recorded, evaluated for effectiveness, and reported to the authorized person for immediate corrective actions. If a high number of NCRs are identified in a particular area, a follow-up audit is scheduled for that section to address the root causes and prevent recurrence of the issue. This study highlights the impact of systematic QA audits on ISO compliance and product safety in PPE manufacturing, emphasizing continuous process improvement and risk mitigation.

***External Supervisor:** Mrs. D. Nirmani, Quality Assurance Officer, Quality Assurance Department, Ansell Lanka (Pvt.) Ltd., Export Processing Zone, Biyagama*

***Internal Supervisor:** Dr. D.R. Gimhani, Senior Lecturer, Department of Biotechnology, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka*

ESTABLISHMENT OF A LONG-TERM PRESERVED MICROBIAL CULTURE COLLECTION IN THE LABORATORY

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Abstract

The National Institute of Fundamental Studies (NIFS) is the only government institute in Sri Lanka dedicated to fundamental research. The Microbial Biotechnology Research Program (MBRP) of NIFS conducts multidisciplinary research projects that involve multiple microbial species. MBRP maintains a collection of pure cultures within the laboratory. However, the program identified the need for an additional long-term preserved culture collection to ensure its availability whenever required. Therefore, a series of subculturing steps was conducted for the available fungal species using Potato Dextrose Agar (PDA) medium, along with an antibiotic, Chloramphenicol. Four successive subculturing steps were undertaken to ensure the purity of the cultures. Bacterial and Algae cultures were also revitalized in Nutrient Broth and Blue Green-11 media, respectively. The cultures were then preserved using glycerol stocking and dry filter paper preservation. In the glycerol stock method, bacteria, fungi, and microalgae cultures were preserved with final glycerol concentrations of 60% (v/v), 30% (v/v), and 10% (v/v), respectively. In the dry filter paper method, sterile filter paper strips were partially immersed in the respective microbial cultures and were stored in sterile Eppendorf tubes. During this study, pure cultures of seven bacterial species, four fungal species, and one microalgae species were preserved, which were then stored at -20 °C. Refreshing the preserved culture collection every three months is essential to maintain viability for future research applications. Hence, introducing these methods can be recommended for effective handling and maintaining any microbial-related cultures for a long-term aspect.

External Supervisor: *Dr. M. Premarathna, Research Fellow, Microbial Biotechnology Unit, National Institute of Fundamental Studies, Kandy 20000, Sri Lanka*

Internal Supervisor: *Dr. M.J.M.S. Kurera, Lecturer, Department of Biotechnology, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka.*

A CASE STUDY ON CHLOROPHYLL CATABOLISM AND TRANSPIRATIONAL WATER LOSS IN HERMETICALLY SEALED RETAIL PACKAGING OF *Capsicum annuum*

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Abstract

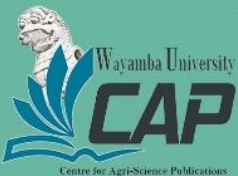
Domino's Sri Lanka, a subsidiary of the U.S.-based global food industry leader, is a key player in the island's Quick Service Restaurant sector. This case study investigated the premature quality degradation of cut *Capsicum annuum* within its supply chain, specifically in hermetically sealed retail packaging, with a focus on chlorophyll catabolism and water loss transpiration. Analysis traced rapid colour deterioration and water accumulation, indicating critical post-harvest handling failures. The sourcing of capsicums from an arid zone, preconditioned to low humidity, increased their susceptibility to physical damage and water stress. The primary root causes were identified as the storage of raw vegetables at uncontrolled ambient temperatures and a critical post-cutting delay where produce was held at 16 °C. This ambient storage period catalyzed enzymatic action and microbial growth. Physical damage from cutting induced cell lysis, releasing Polyphenol oxidase (PPO). In the presence of ambient oxygen, PPO oxidized endogenous phenolic compounds, accelerating chlorophyll breakdown and a strong browning reaction. The subsequent hermetic packaging exacerbated the issue by creating a saturated microclimate, leading to condensation that further promoted spoilage. Corrective actions mandated the immediate implementation of a cold chain, requiring all raw and cut capsicums to be chilled at 1-4 °C to retard enzymatic and microbial activity. To counter the inherent vulnerability of dry-zone capsicums, a pre-processing rehydration protocol, such as controlled hydro cooling, was recommended. This intervention aims to reduce water stress, improve turgor pressure, chlorophyll inhibition, and ultimately enhance the vegetable's resistance to physical damage and subsequent quality degradation.

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