มหาวิทยาลัยแม่โจ้ MAEJO UNIVERSITY
คณะวิทยาศาสตร์ FACULTY OF SCIENCE

ICSTI-MJU

THE 5th INTERNATIONAL CONFERENCE ON
SCIENCE TECHNOLOGY & INNOVATION-MAEJO UNIVERSITY

ICSTI-MJU 2025

March 28, 2025 | CHIANG MAI, THAILAND

BOOK OF ABSTRACTS

Book of Abstracts

The 5th International Conference on Science, Technology & Innovation – Maejo University (5th ICSTI-MJU 2025)

"Science, Technology, and Innovation for Sustainable Agriculture, Digital Agriculture, and Well-being Agriculture"

March 28, 2025
Maejo University, Chiang Mai, Thailand

Prepared by
Faculty of Science, Maejo University
Chiang Mai, Thailand

Welcome Message

Associate Professor Dr. Weerapon Thongma
President of Maejo University

Dear Chairperson, Keynote Speakers, Honoured Guests, and Participants,

On behalf of Maejo University, it is my great pleasure and honour to welcome you to The 5th International Conference on Science, Technology & Innovation (ICSTI 2025), hosted by the Faculty of Science, Maejo University, Chiang Mai, Thailand. This event is organized in collaboration with leading academic journals and publication partners, including Current Applied Science and Technology, Thai Journal of Nanoscience and Nanotechnology, Thai Journal of Trends in Sciences, Thailand Statistician Journal, and the ICSTI Proceedings.

Maejo University is committed to advancing knowledge and practical solutions in agri-technology innovation, sustainable agriculture, and well-being agriculture. We recognize the critical role that science, technology, and innovation play in addressing global challenges and improving the quality of life. Through this conference, we aim to foster interdisciplinary collaboration and promote high-impact research in biological and environmental sciences, mathematics, statistics, computer and data science, and related fields.

ICSTI-MJU 2025 serves as a platform for meaningful exchange among scholars, researchers, students, and industry professionals. I am confident that the discussions and presentations throughout this event will inspire new ideas, strengthen academic networks, and contribute to the advancement of knowledge in impactful ways.

I would like to express my sincere appreciation to the organizing committee, keynote speakers, session chairs, reviewers, presenters, participants, and supporting staff for their dedication and commitment to making this event a success.

Let this conference be a symbol of our shared pursuit of innovation, sustainability, and academic excellence.

Welcome to ICSTI 2025.
Thank you.

Welcome Message

Assistant Professor Dr. Tapana Cheunban
Dean, Faculty of Science, Maejo University

It is my great pleasure and honour to welcome all distinguished keynote speakers, researchers, scholars, and participants to The 5th International Conference on Science, Technology & Innovation – Maejo University (ICSTI-MJU 2025), organized by the Faculty of Science, Maejo University, Chiang Mai, Thailand.

This international academic event is held in a hybrid format-both onsite at Maejo University and online-providing a dynamic and inclusive platform for sharing knowledge across borders.

The primary objectives of ICSTI-MJU 2025 are:

- To provide a platform for Thai and international researchers to present their work and exchange knowledge.
- To foster collaboration and build sustainable research partnerships that can lead to impactful innovations and global competitiveness.

The conference features presentations across three key thematic tracks:

- Mathematics, Statistics, Computer & Data Science
- Innovations in Science & Technology
- Biological Science & Environment

I am proud to announce that this year's conference is supported by a number of esteemed academic journals, including:

- Thailand Statistician
- Current Applied Science and Technology
- Thai Journal of Nanoscience and Nanotechnology
- Thai Journal of Trends in Sciences

On behalf of the Faculty of Science, Maejo University, I extend my sincere gratitude to our co-organizing universities, academic partners, and all contributors for their valuable support in making this conference possible.

It is our great honour to serve as the host institution for this meaningful event. We hope that ICSTI-MJU 2025 will serve as a catalyst for innovative ideas, fruitful discussions, and long-lasting international collaboration.

Welcome to ICSTI-MJU 2025.
Thank you.

Preface

We are delighted to present the Book of Abstracts for the 5th International Conference on Science, Technology & Innovation – Maejo University (5th ICSTI-MJU 2025), held on March 28, 2025, at the Faculty of Science, Maejo University, Chiang Mai, Thailand, in a hybrid format (on-site and online).

The conference serves as a global platform for students, academics, researchers, and professionals to share recent advancements in science, technology, and innovation particularly in their applications to sustainable agriculture**,** digital agriculture**,** and well-being agriculture**.** This year's conference features three main thematic tracks:

1. Mathematics, Statistics, Computer & Data Science
2. Innovations in Science & Technology
3. Biological Science & Environment

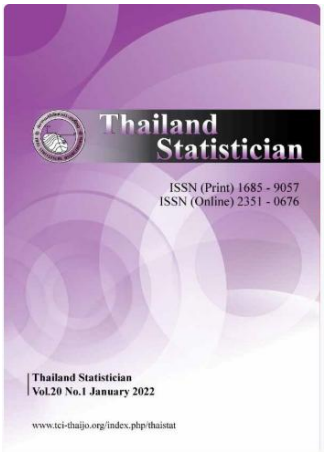
The abstracts included in this volume represent a diverse range of innovative research and interdisciplinary approaches contributed by scholars from various institutions worldwide. Each submission has undergone a review process by our academic committee to ensure quality and relevance.

We would like to express our sincere gratitude to all keynote speakers, presenters, reviewers, and participants for their valuable contributions to the success of this conference. Special thanks are also extended to the organizing team and supporters who made this event possible.

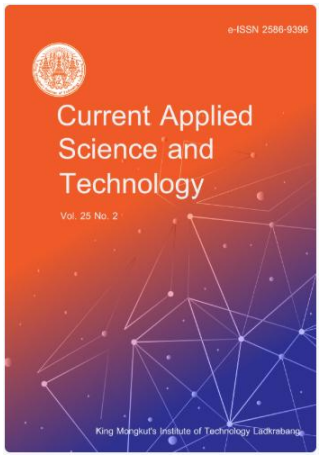
We hope that the ideas exchanged through this conference will foster future collaborations and contribute to scientific advancement and sustainable solutions for global challenges.

ICSTI-MJU 2025 Organizing Committee
Faculty of Science, Maejo University
Chiang Mai, Thailand

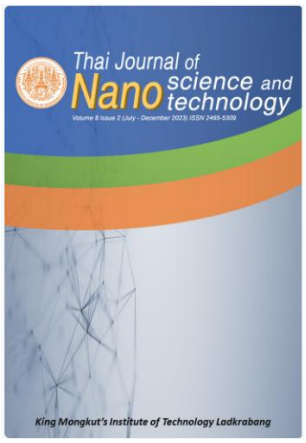
Journal Selection for Publication



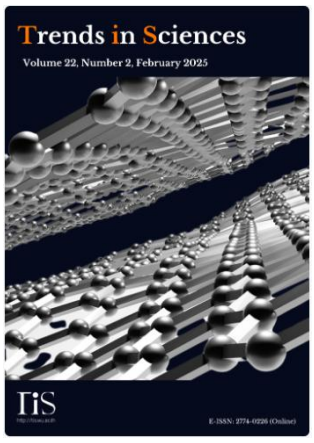
Thailand Statistician Journal



Current Applied Science and Technology



Thai Journal of Nanoscience and Nanotechnology



Thai Journal of Trends in Sciences

Conference Program Overview

The 5th International Conference on Science Technology & Innovation
(5th ICSTI) - Maejo University 2025
"Science, Technology, and Innovation for Sustainable Agriculture,
Digital Agriculture, and Well-being Agriculture"

March 28, 2025
Chula Phorn Building, Faculty of Science, Maejo University, Chiang Mai, Thailand

Time	Schedules		
08.00-08.30	**Registration (Room 3100)**		
08.30-09.00	**Opening Ceremony (Room 3100)**		
09.00-09.45	**Keynote Speaker: Professor Dr. Siwaporn Meejoo Smith (Room 3100)** Department of Chemistry, Faculty of Science, Mahidol University, THAILAND		
09.45-10.30	**Keynote Speaker: Associate Professor Dr. Warintorn Chavasiri (Room 3100)** Department of Chemistry, Faculty of Science, Chulalongkorn University, THAILAND		
10.30-10.45	**Morning Break**		
10.45-12.05	**Poster Presentation Session at Room 3201**		
	Parallel Oral Presentation Sessions		
	Session 1: Room 3103 **Mathematics, Statistics, Computer & Data Science** **Note : 10.45-12.35**	**Session 2: Room 3100** **Innovations in Science & Technology**	**Session 3: Room 3104** **Biological Science & Environment**
12.05-13.00	**Lunch : Room 3210**		
13.00-13.45	**Keynote Speaker: Professor Dr. Akira Baba (Online)** Faculty of Engineering and Graduate School of Science and Technology, Niigata University, JAPAN		
13.45-14.30	**Keynote Speaker: Associate Professor Dr. Yi-Hsin Chien (Online)** Department of Materials Science and Engineering, Feng Chia University, TAIWAN		
14.30-14.45	**Afternoon Break**		
14.45-16.45	**Poster Presentation Session at Room 3201**		
	Parallel Oral Presentation Sessions		
	Session 1: Room 3103 **Mathematics, Statistics, Computer & Data Science**	**Session 2: Room 3100** **Innovations in Science & Technology**	**Session 3: Room 3104** **Biological Science & Environment**
16.45	**Closing Session**		
Announcement of awards on website			

Parallel Oral Presentation Sessions Schedule

The 5th International Conference on Science Technology & Innovation (5th ICSTI) - Maejo University 2025
March 28, 2025

"Science, Technology, and Innovation for Sustainable Agriculture, Digital Agriculture, and Well-being Agriculture"

Session 1: Room 3103
Mathematics, Statistics, Computer & Data Science

Time	Paper ID	Paper Title	Presenter's Name
10.45-11.05	ABRS168017	Overexpression of hsa_circ_0006060 in human papillomavirus 16-positive cervical cancer and its role in cervical carcinogenesis	Juthamas Subin
11.05-11.25	ABRS168003	Regression Imputation Method with Composite Regression Coefficients	Phruettichai Nueasri
11.25-11.45	ABRL168028	Constructing a Knowledge Graph of Programming Language Evolution from Wikipedia Infoboxes	Preeyaphorn Intamong
11.45-12.05	ABRL168014	Optimizing Wi-Fi Access Point Allocation: A Case Study for Classroom Buildings at Thammasat University	Supawich Sophonkeereerat
12.05-12.35	ABRL168018	AI-Driven Behavioral Detection System for Exam Integrity	Atchara Namburi
14.45-15.05	ABRS168024	Nonparametric Bootstrap Confidence Interval for Population Size in Capture-Recapture under a Linear Regression Models	Taweesak Channgam
15.05-15.25	ABRL168025	Factor Identification for Longan Price Prediction: A Case Study of Northern Thailand	Naruechanat Kaikaew
15.25-15.45	ABRL168019	An AI-Powered Assistive System for Safe Navigation of the Visually Impaired	Patipat Sitpasert
15.45-16.05	ABRL168022	Enhancing Blood Cell Classification and Fundamental Screening with Advanced 2D Imaging, Explainable Statistical Methods with Deep Learning Techniques	Chalermrat Nontapa
16.05-16.25	ABRL168020	An IoT-Enabled Smart Trash Can with Real-Time Monitoring and Automated Alerts	Atchara Namburi
16.25-16.45	ABRL168021	Deep Learning-Based Detection of Drowsy and Unsafe Driving for Accident Prevention	Patipat Sitpasert

Parallel Oral Presentation Sessions Schedule

The 5th International Conference on Science Technology & Innovation (5th ICSTI) - Maejo University 2025
March 28, 2025
"Science, Technology, and Innovation for Sustainable Agriculture, Digital Agriculture, and Well-being Agriculture"

Session 2: Room 3100
Innovations in Science & Technology

Time	Paper ID	Paper Title	Presenter's Name
10.45-11.05	ABRS168004	Analysis of single-photon interference pattern in three-slits experiment using the pilot-wave function	Attaporn Phakum
11.05-11.25	ABRS168005	Efficacy of Cathelicidin Against Hypervirulent and Virulent Clinical Isolates of Acinetobacter baumannii: A Promising Approach for Infection Management	Thanyaporn Wisedsuk
11.25-11.45	ABRL168006	Development of an Electrochemical Biosensor for Analyzing Glucose Solutions, with Potential Future Applications in HbA1c Detection	Bussabongkod Nenrot
11.45-12.05	ABRL168015	DESIGN AND SIMULATION OF A SINGLE-PHASE GRID-TO-VEHICLE (G2V) SYSTEM WITH PSO-OPTIMIZED PI CONTROL	Sompol Sudwangyang
14.45-15.05	ABRS168008	THE ELECTROCHEMICAL BIOSENSOR FOR DETECTION OF GLUCOSE USING PLATINUM NANOPARTICLE AND GLUCOSE OXIDASE IMPLANTED CARBON PASTE ELECTRODE	Suphaporn Chenkhuruthum
15.05-15.25	ABRS168010	COMPUTATIONAL INVESTIGATION OF PLASMA ACTUATOR EFFECTS ON AIRFLOW DYNAMICS AROUND A CIRCULAR CYLINDER STRUCTURE	Naruesorn Thakarn
15.25-15.45	ABRL168012	Optimization of Nonthermal Plasma Technology for Insecticide Degradation: An Experimental Design	Phanumas Sojithamporn
15.45-16.05	ABRL168026	Effects of blending ratio on the properties of epoxidized natural rubber/chloroprene rubber blend	Benjatham Sukkaneewat

Parallel Oral Presentation Sessions Schedule

The 5th International Conference on Science Technology & Innovation (5th ICSTI) - Maejo University 2025
March 28, 2025
"Science, Technology, and Innovation for Sustainable Agriculture, Digital Agriculture, and Well-being Agriculture"

Session 3: Room 3104
Biological Science & Environment

Time	Paper ID	Paper Title	Presenter's Name
10.45-11.05	ABRS168007	THE ROLE OF CHITOSAN AGAINST Acinetobacter baumannii: EVALUATING ANTIMICROBIAL ACTIVITY IN RELATION TO BACTERIAL IMMUNE RESISTANCE	Dwi Khalimah
11.05-11.25	ABRS168011	THE CHARACTERIZATION AND LYTIC ACTIVITY OF PHAGES AGAINST ANTIBIOTIC MULTIDRUG RESISTANT KLEBSIELLA PNEUMONIAE	Narathon Laemthonglang
11.25-11.45	ABRS168002	Dynamic Changes in Exometabolites of Biocrusts: Exometabolite Release During Short and Prolonged Wetting	Teeratat Kaewjon
11.45-12.05	ABRL168001	POTENTIAL ANTI-AMOEBIC EFFECTS OF Clitoria ternatea L. FLOWER EXTRACT AGAINST Acanthamoeba culbertsoni TROPHOZOITE AND CYST FORMS	Muhammad Ashraf Hadi Rosman
14.45-15.05	ABRS168009	Investigating the Clinical Implications of Complement Resistance in Acinetobacter Complex: Correlation with Patient Mortality and Plasma Susceptibility	Atitiya Prakika
15.05-15.25	ABRS168016	HAZARD ANALYSIS AND CRITICAL CONTROL POINTS (HACCPs) FOR SUSTAINABLE VALUC CHAIN OF BHUTAN ORGANIC BLACK TEA	Pelden Wangchuck
15.25-15.45	ABRL168013	Land Cover Effects on Microclimate and PM Reduction Efficiency of Pocket Parks: A Case Study in Nakhon Pathom, Thailand	Varitsara Manonai
15.45-16.05	ABRL168023	Generation of radon progeny attached aerosol for effective dose estimation in human lungs	Rungroj Sakulnaeramit
16.05-16.25	ABRL168027	EFFECT OF CITRIC ACID AND ASCORBIC ACID ON THE THERMAL RESISTANCE OF Salmonella Typhimurium IN HONEYDEW PUREE	Nurul Afiqah

List Presentation Abstracts

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Parallel Oral Presentation Sessions Schedule

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Mathematics, Statistics, Computer & Data Science

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15.45-16.05	ABRL168026	Effects of blending ratio on the properties of epoxidized natural rubber/chloroprene rubber blend *Benjatham Sukkaneewat*	26

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Session 3: Room 3104
Biological Science & Environment

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Poster Presentation Sessions

Session 2: Room 3201
Innovations in Science & Technology

Time : Post-morning break: 10:45 - 12:05
Post-afternoon break: 14.45 - 16:30

Poster Presentation Sessions

Session 3: Room 3201
Biological Science & Environment

Time : Post-morning break: 10:45 - 12:05
Post-afternoon break: 14.45 - 16:30

Keynote Speaker

Professor Dr. Akira Baba

Faculty of Engineering and Graduate School of Science and Technology, Niigata University, Japan

Professor Dr. Siwaporn Meejoo Smith

Department of Chemistry, Faculty of Science, Mahidol University, Thailand

Associate Professor Dr. Yi-Hsin Chien

Department of Materials Science and Engineering, Feng Chia University, Taiwan

Associate Professor Dr. Warintorn Chavasiri

Department of Chemistry, Faculty of Science, Chulalongkorn University, Thailand

From Trash to Treasure: Sustainable Material Development through Waste Utilization

Siwaporn Meejoo Smith*, Jutamanee Boonnoon, Suwilai Chaveanghong, Warisara Woranuch, Jaturavit Nimnuan
Center of Sustainable Energy and Green Materials and Department of Chemistry, Faculty of Science, Mahidol University, 999 Salaya, Phuttamonthon, Nakorn Pathom, 73170 Thailand.

**Corresponding Author Email: siwaporn.smi@mahidol.ac.th*

Abstract

The escalating global waste crisis demands innovative solutions. This research explores waste valorization through materials chemistry, transforming low-value agricultural and industrial byproducts into functional materials for environmental applications. Through controlled thermal treatments, chemical activation, and surface functionalization, we develop waste-derived materials with tailored physicochemical properties suitable for implementation as sorbents, catalysts, or adhesives. Our work demonstrates three successful waste valorization systems: (1) Chemically modified flour residues converted into enhanced strength bioadhesives; (2) Calcium-rich eggshell or bone waste transformed into heterogeneous catalysts for wastewater remediation or biodiesel production, respectively; and (3) Pineapple leaf fiber-derived sorbent or catalyst for the removal of persistent organic pollutants from wastewater. This research establishes a framework for Circular Economy implementation in materials chemistry, providing sustainable alternatives to conventional material synthesis while converting waste to value added and more useful products. The scalable processes developed here have significant implications for industrial adoption and policy development in waste management and green chemistry.

Keyword: Waste utilization, Material development, Sorbent, Catalyst, Adhesive

Development of Surface Plasmon Enhanced Opto-electronic devices

Akira Baba*, Sachiko Jonai, Kazunari Shinbo
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Corresponding Author Email: ababa@eng.niigata-u.ac.jp

Abstract

Surface plasmon resonance (SPR) phenomena have attracted considerable attention since many years because of the extremely strong enhancement and confinement of electric fields near metal surfaces. Recently, we have studied grating-coupled surface plasmon-based multiple plasmonic structures for electric-field enhanced organic device applications such as biosensors and photo-electric conversion devices [1, 2]. In this presentation, we will introduce our recent progress on surface plasmon enhanced photo-electric conversion systems. The cooperative multiple plasmonic effect exhibits advantages, including broader light absorption enhancement, enhanced exciton generation rate and dissociation efficiency, and increased charge carrier density and lifetime.

Figure 1 shows an example of our plasmonic device, i.e. surface plasmon enhanced photoelectrochemical sensor, which was constructed by electro-depositing nanocomposite film of poly(3,4−ethylene dioxythiophene):poly (styrene sulfonate) (PEDOT:PSS) and gold nanoparticles (AuNPs) onto ITO coated glass substrate (ITO/PEDOT:PSS/AuNPs) and this platform was used as a working electrode for the quantification of glucose. UV-vis spectra of nanocomposite film obviously revealed an absorption enhancement in the visible region, indicating the surface plasmon resonance absorption of AuNPs at approximately 550 nm (Figure 1A). Current responses of the ITO/PEDOT:PSS/AuNPs were proportional to the concentration of glucose. Also, the photocurrents were significantly enhanced under irradiation of the solar light, exhibiting satisfactory results with a wide linear range from 2.4 to 22.0 mM and a sensitivity of 0.047 μA mM-1, and a low detection limit of 1.23 mM (Figure 1B). The photocurrent enhancements represent the potential of the localized surface plasmon resonance excitation of AuNPs, which generates hot photocarriers, approach to improve the efficiency of glucose detection.

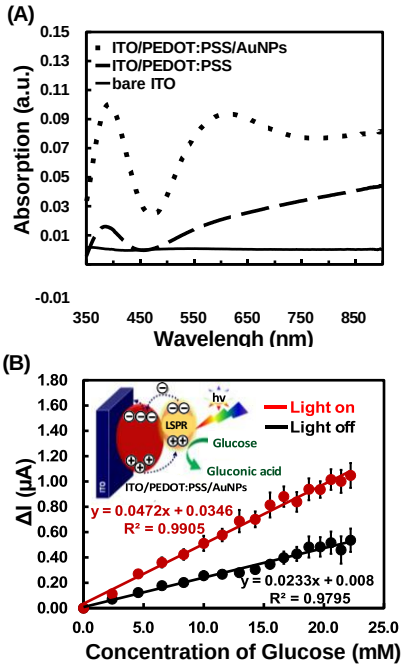

Fig.1(A) UV-vis spectra of nanocomposites films and (B) the corresponding calibration plot of the photocurrent responses vs. the concentration of glucose and schematic diagram (inset).

Keyword: Surface plasmon, Photoelectrochemical sensor, Organic Solar cells

References

1. T. Thepudom, C. Lertvachirapaiboon, K. Shinbo, K. Kato, F. Kaneko, T. Kerdcharoen and A. Baba, MRS Commun. 8, 107 (2018).
2. A. Phengdaam, S. Phetsang, S. Jonai, K. Shinbo, K. Kato, A. Baba, Nanoscale Adv., 2024, 6, 3494-3512 (2024)

Searching for bioactive compounds from Thai natural resources

Warinthorn Chavasiri*

Center of Excellence in Natural Products Chemistry, Department of Chemistry,
Faculty of Science, Chulalongkorn University, Bangkok 10330, Thailand

**Email: warinthorn.c@chula.ac.th*

Abstract

Due to its geographically tropical location, Thailand exhibits a high abundance of flora and fauna, representing a substantial reservoir of bioactive compounds. This presentation will introduce chemical ecology as a methodological framework for identifying potent compounds relevant to agricultural applications. Specific examples will be drawn from the exploration of plant-plant, plant-insect, plant-microorganism, and plant-animal interactions, in addition to the chemical investigation of fungal secondary metabolites.

Keyword: bioactive compounds, chemical ecology, natural resource

Agricultural Nanotechnology: Exploring Nanohybrid Composites for Sustainable Sensing, Biopesticides, and Biofertilizers

Yi-Hsin Chiena*

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Abstract

Agricultural nanotechnology is an emerging field that leverages biodegradable nanocomposites to enhance crop production, food quality, and sustainability. Key innovations include controlled-release agrochemicals, advanced remote sensing, and nano-formulated fertilizers and pesticides, offering eco-friendly solutions for microbial control while minimizing environmental impact. Recently, our research team has focused on investigating various plasmonic nanocomposites, specifically silver (Ag) and gold (Au) nanoparticles, to develop optical sensing techniques targeting molecular-level contaminants, including pesticides and pollutants. Additionally, we establish controlled-release strategies for sterilization and crop growth enhancement within the agricultural sector. This report highlights three key topics: (1) Development of plasmonic-based colorimetric sensors and toxicity- analysis applications (Toxin APP and Colorfinds) for detecting parathion organophosphate pesticides, heavy metal ions, and EGCG (Epigallocatechin Gallate). (2) Synthesis of urea-hydroxyapatite (UHA) chitosan hydrogels as nano-fertilizer carriers, with different preparation methods evaluated for nutrient release efficiency in okra planting trials. (3) Development of eco-friendly Ag NP- immobilized chitosan hydrogels (Ag@Cs/Cs^{h} gel) as biopesticides, demonstrating potent and long- lasting antibacterial effects against *Ralstonia solanacearum*, providing a promising strategy for bacterial wilt management. The presentation will detail Agri-nanotechnology applications, including interaction mechanisms, nanomaterial classification, antibacterial efficacy, and nano-irrigation systems, contributing to sustainable and efficient agricultural practices.

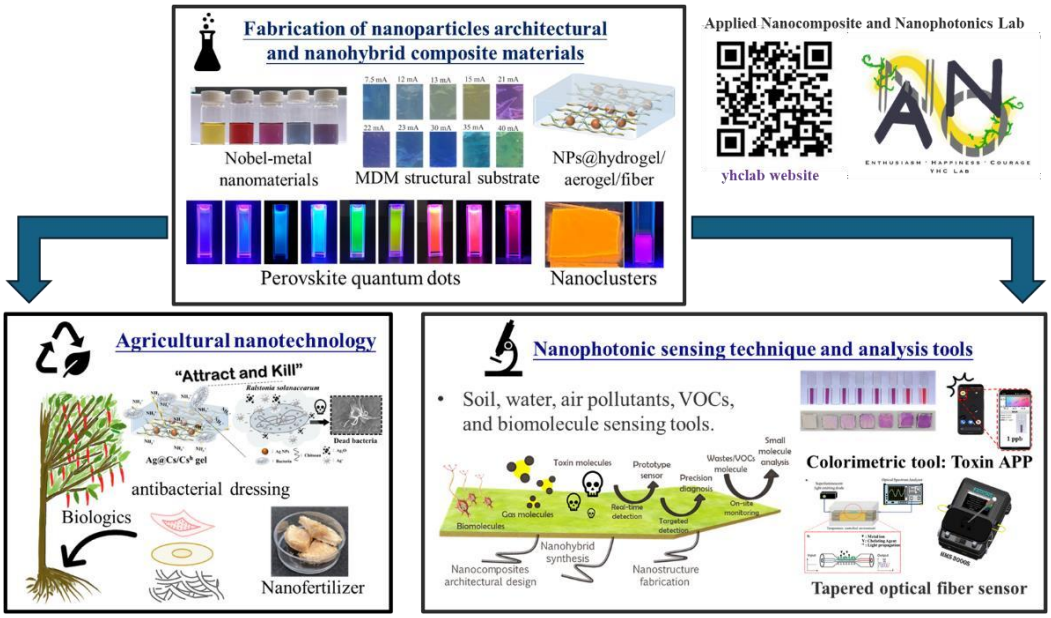

Figure. The schematic of nanohybrid composites as eco-friendly sensors, biopesticides, and biofertilizers.

Parallel Oral Presentation Sessions Schedule

Session 1: Room 3103
Mathematics, Statistics, Computer & Data Science

Overexpression of hsa_circ_0006060 in human papillomavirus 16- positive cervical cancer and its role in cervical carcinogenesis

Juthamas Subin[1,2], Chukkris Heawchaiyaphum[1,2], Chamsai Pientong[1,2], and Sirinart Aromseree[1,2 *]

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[2] HPV&EBV and Carcinogenesis (HEC) Research Group, Faculty of Medicine, Khon Kaen University, Khon Kaen, Thailand

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Abstract

Cervical cancer (CC) is mainly driven by persistent high-risk human papillomavirus (HPV) infection, with HPV16 as the most common type. Circular RNAs (circRNAs), stable-structured non-coding RNAs, have been implicated in cancer progression by acting as competing endogenous RNAs. This study aimed to identify dysregulated circRNAs in CC and functional roles in cervical carcinogenesis using bioinformatics approaches. Two RNA sequencing datasets comprising 12 HPV16-positive CC tissues and 5 HPV-negative normal cervical tissues were analyzed to identify differentially expressed circRNAs (DECs). Four computational tools were used to predict miRNA targets, while miRWalk was used for mRNA target identification. GO and KEGG were analyzed via shinyGo. In total, 5,384 DECs were identified in CC compared to normal tissues, with 136 circRNAs showing significant differences and could be annotated in CircBase (50 upregulated and 86 downregulated). Since circRNA biogenesis competes with pre-mRNA splicing, two circRNAs were selected among the top ten upregulated circRNAs based on their parental genes being downregulated in GEPIA2. To identify potential regulators influencing its expression, circRNA should have RNA-binding proteins (RBPs) with over two binding sites in the flanking region. Hsa_circ_0006060 was chosen, as it meets this criterion. Functional analysis revealed hsa_circ_0006060 acts as a sponge for hsa-miR-149-5p, hsa-miR-328-3p, hsa-miR-1301-3p, and hsa-miR-4730, with hsa-miR-149-5p reported to play tumor-suppressive role in CC. These miRNAs collectively regulate 280 cancer-related mRNAs, as indicated by GO and KEGG enrichment analyses. In summary, overexpression of hsa_circ_0006060 HPV16-positive CC tissues regulate target miRNAs and indirectly enhances mRNA translation, potentially activating pathways that contribute to CC progression.

Keyword: Cervical cancer, circular RNA, circRNA, Human papillomavirus, HPV16.

Regression Imputation Method with Composite Regression Coefficients

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Abstract

Missing data in real datasets can often make statistical inference difficult. Missing data imputation is a step in data cleaning and is essential for effectively learning from incomplete datasets. Herein, methods are proposed for imputing missing values in a dataset based on Regression Imputation (RI) with composite regression coefficients constructed using an equal-weighting scheme: RI-K-Nearest Neighbour Imputation (KNNI), RI-multiple imputation (MI), RI-Expectation-Maximization Imputation (EMI), KNNI-MI, KNNI-EMI, and MI-EMI. The efficacies of these methods were compared with those of four general methods: RI, KNNI, MI, and EMI. Simulation studies were conducted using data for one complete variable X and one partially missing variable Y, both of which were normally distributed. Furthermore, the linear relationship between X and Y was set at various levels with various missing data rates and sample sizes. The criterion for measuring the efficiencies of the methods was the average mean-squared error (AMSE). The findings reveal that RI-MI and MI-EMI performed the best for all missing data levels for a large sample size (n =100) and a linear relationship of 0.3 or 0.5. Moreover, the RI-EMI method performed as well as RI and EMI for n = 20 when the linear relationship was 0.9.

Keyword: Missing value, Imputation, Regression Imputation, Composite coefficient.

Constructing a Knowledge Graph of Programming Language Evolution from Wikipedia Infoboxes

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Abstract

Abstract Understanding the evolution of programming languages is essential for comprehending the development of software and technology. Identifying the relationships between different programming languages can assist learners and researchers in navigating the extensive landscape of languages and selecting the most relevant ones for further study. This research aims to construct a knowledge graph that maps these relationships, providing a structured resource for exploring the progression of programming languages. This study begins by extracting data from Wikipedia Infoboxes, which contain key details about programming languages, including their creation year, developers, technical features, and related languages. This data is analyzed to identify relationships and patterns. The information is then structured into a knowledge graph using Neo4j, a graph database designed to efficiently manage complex and interconnected data. To query and visualize these relationships, the Cypher Query Language (CQL) is employed, enabling users to explore how languages have influenced each other, evolved over time, and are interrelated. The results of this research offer valuable insights for learners and educators by providing a clear, interactive framework for exploring programming languages. The knowledge graph allows users to identify key connections and pathways to deepen their understanding and select languages for continued study based on prior knowledge and interests.

Keyword: Programming language evolution, Knowledge graph, Neo4j database, Cypher Query Language (CQL), Infobox data extraction.

Optimizing Wi-Fi Access Point Allocation: A Case Study for Classroom Buildings at Thammasat University

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Abstract

Reliable internet connectivity is crucial for educational institutions, particularly university campuses. To establish a campus network, universities typically install Wi-Fi access points in designated areas, allowing users to connect to the internet within the access points' coverage zones. This study aims to identify the optimal locations for installing Wi-Fi access points to ensure comprehensive coverage of areas in each campus building. This work introduces optimization models based on modifying the standard minimum set covering and maximal coverage problems. The minimum set covering model can be used to identify the fewest Wi-Fi access points needed to cover all specified classroom locations within a certain distance. When the number of available Wi-Fi access points is limited, the maximal-coverage location model is used to maximize the coverage of demand locations. These models are incorporated with factors such as the number of users in the classrooms and potential obstructions to Wi-Fi signals, like building walls. Numerical tests are conducted on classroom buildings at Thammasat University, involving 200-300 potential access points and demand points. Additionally, sensitivity analysis is performed for different coverage distances and the number of available Wi-Fi access points.

Keyword: Campus network, Wi-Fi Access point, Optimization, Set-covering, Maximal-coverage,

AI-Driven Behavioural Detection System for Exam Integrity

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Abstract

Academic dishonesty remains a persistent challenge in educational assessment, necessitating innovative solutions to uphold examination integrity. This study proposes an AI-driven behavioural detection system that leverages state-of-the-art deep learning and computer vision techniques to identify suspicious behaviours indicative of potential cheating. The system integrates YOLOv8 for real-time candidate detection, FaceMesh for precise facial landmark analysis, and DeepSORT for continuous motion tracking. A novel aspect of this approach is the detection of prolonged head deviations (e.g., sustained lateral head movements exceeding 5 seconds), which may signal attempts to communicate or access unauthorized information. Operating at 30 frames per second, the system achieves an accuracy exceeding 90%, with automated alerts triggered within less than one second. The proposed method significantly enhances the efficiency and reliability of proctoring, reducing human monitoring burdens while reinforcing the credibility of academic assessments. This research contributes to the advancement of intelligent proctoring systems, paving the way for more secure and transparent examination environments.

Keywords: AI-driven proctoring, behavioural analysis, deep learning, academic integrity, computer vision.

Nonparametric Bootstrap Confidence Interval for Population Size in Capture-Recapture under a Linear Regression Models

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Abstract

Capture-recapture models were initially developed in ecology to estimate wildlife population sizes and have since been widely applied in biological, medical, and social sciences for demographic estimations. This study explores various linear regression models for estimating total population size based on the relative frequency of observed individuals under both homogeneous and heterogeneous simulated conditions. Additionally, we examine confidence interval estimation using the nonparametric bootstrap method, which eliminates the need for a variance formula. The performance of point estimators is evaluated based on **bias** and **mean squared error**, while the reliability of interval estimators is assessed using **coverage probability**. The proposed approach is further demonstrated through applications in diverse fields.

Keyword: Capture-Recapture, Population Estimation, Linear Models, Resampling Techniques, Confidence Interval

Factor Identification for Longan Price Prediction: A Case Study of Northern Thailand

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Abstract

The price of Longan sold at the orchard reflects the income that Longan farmers will receive. Each year, the price of Longan fluctuates due to various factors. This research aims to select the factors affecting Longan prices each year. Initially, from a review of related literature, three groups of factors with references indicating their impact on Longan prices were identified: Longan supply quantity, export volume, and domestic consumption demand. There are a total of 14 factors. A questionnaire was then designed to survey 400 farmers in the Northern region. The questionnaire data indicated additional factors affecting Longan prices, such as the type of chemical fertilizers used, increasing the number of factors expected to influence Longan prices. The data on the factors expected to affect Longan prices will be cleaned and analyzed for correlation by considering the Variance Inflation Factor (VIF) to detect multicollinearity. If the VIF of a factor is greater than 10, that factor will be removed. After analyzing the VIF, the factors affecting Longan prices will be used to develop a Longan price prediction model for future research.

Keywords: Longan Price, Variance Inflation Factor (VIF), Multicollinearity, Questionnaire, Prediction model

An AI-Powered Assistive System for Safe Navigation of the Visually Impaired

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Abstract

Ensuring safe mobility for visually impaired individuals remains a critical challenge, particularly in navigating traffic intersections and urban environments. This study introduces Visionary Guardian, an AI-powered assistive system that integrates real-time object detection with intelligent alert mechanisms to enhance pedestrian safety. The system employs YOLOv8 for high-precision detection of 10 key object categories, such as vehicles, pedestrians, traffic signals, and obstacles, achieving an impressive 95.48% accuracy with Precision and Recall values of 0.96. Detected hazards are communicated via audio and text-based alerts through a mobile application, providing real-time feedback within 0.1 seconds.

Field evaluations with visually impaired participants demonstrate the system's practical applicability and user acceptance, with high satisfaction ratings in terms of safety enhancement (4.7/5) and ease of use (4.5/5). The proposed solution bridges the gap between advanced AI technologies and real-world assistive applications, enabling greater autonomy and confidence in daily navigation. While the system performs optimally under normal lighting conditions, future work will address challenges in low-visibility and adverse weather environments to further refine its robustness. This research contributes to the advancement of inclusive AI-driven assistive technologies, setting a foundation for next-generation smart navigation solutions for visually impaired individuals.

Keyword: Assistive technology, visually impaired, object detection, YOLOv8, deep learning, AI-driven navigation.

Enhancing Blood Cell Classification and Fundamental Screening with Advanced 2D Imaging, Explainable Statistical Methods with Deep Learning Techniques

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Abstract

White blood cell (WBC) classification is vital for diagnosing haematological and immune disorders. This study explores Machine Learning (ML) and Deep Learning (DL) techniques to enhance classification accuracy and efficiency. Using 50,000 2D images from the University of Northern British Columbia, we develop models to classify WBCs into eosinophils, lymphocytes, monocytes, and neutrophils. Our approach integrates data augmentation, feature extraction, and advanced classifiers, including Convolutional Neural Networks (CNNs). Performance metrics such as accuracy, precision, recall, and F_1-score guide model optimization. Results show VGG16 in CNNs achieve the highest accuracy 97.5%, precision 97%, recall 97%, and F_1-score 97%.

Keyword: White Blood Cell, VGG16, Machine Learning, CNNs

An IoT-Enabled Smart Trash Can with Real-Time Monitoring and Automated Alerts

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Abstract

Efficient waste management is essential for maintaining public hygiene and environmental sustainability. This study presents the development of an IoT-enabled smart trash can designed to enhance waste monitoring and disposal efficiency. The proposed system integrates an Arduino-based microcontroller with ultrasonic sensors to enable automated lid control and real-time waste level detection**.** The system features dual-sensor integration**,** where the first sensor detects motion for automatic lid operation, while the second sensor monitors the fill level of the trash bin. Once the bin reaches a predefined threshold, a notification is sent via LINE Notify**,** enabling timely waste collection.

Experimental evaluations demonstrate the system's high accuracy and reliability, with precise motion detection and seamless waste level monitoring**.** The incorporation of a reinforced base structure further improves system stability. The real-time alert system reduces overflow incidents and optimizes waste collection scheduling, making it particularly suitable for high-traffic environments such as hospitals, schools, and restaurants. This research contributes to the advancement of smart waste management solutions, integrating IoT technology to minimize environmental impact and improve urban cleanliness. Future enhancements will focus on automated waste segregation, solar-powered operation, and data-driven waste management strategies**.**

Keywords: Smart waste management, IoT, Arduino, ultrasonic sensors, real-time monitoring, LINE Notify.

Deep Learning-Based Detection of Drowsy and Unsafe Driving for Accident Prevention

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Abstract

Road safety is a critical concern, with distracted driving—particularly mobile phone usage—being a major contributor to traffic accidents. Despite legal restrictions, enforcement remains challenging due to the lack of efficient monitoring tools. This research proposes an AI-driven system for detecting and tracking unsafe driving behaviours in real time. The system employs ConvLSTM (Convolutional Long Short-Term Memory) networks to analyse sequential head movements and identify risky behaviours, including prolonged gaze deviation (over 5 seconds), eye closure (over 3 seconds), yawning, and mobile phone usage while driving.

The dataset consists of 40 training videos and 10 test videos, each containing various driving behaviours labelled for supervised learning. The system utilizes MediaPipe FaceMesh for facial landmark detection, extracting features such as head orientation and eye openness. Experimental results indicate high classification performance, with accuracies exceeding 90% across key behavioural categories. The proposed approach enhances driver monitoring by providing real-time alerts, reducing the likelihood of accidents caused by driver inattention or drowsiness. Future improvements will focus on expanding dataset diversity, refining model robustness under different lighting conditions, and integrating the system into in-vehicle safety mechanisms.

Keywords: Unsafe driving detection, deep learning, ConvLSTM, facial landmark tracking, real-time monitoring.

Parallel Oral Presentation Sessions Schedule

Session 2: Room 3100
Innovations in Science & Technology

Analysis of single-photon interference pattern in three-slits experiment using the pilot-wave function

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Abstract

This study presents a comprehensive analysis of single-photon interference patterns in a three-slit experiment using the pilot-wave function approach based on de Broglie-Bohm mechanics. Unlike conventional quantum mechanics, which predicts probabilistic distributions, the pilot-wave model offers a trajectory-based analysis of individual photons, modeling them as Gaussian wave packets. Using path integral formalism, this research examines the probability distribution and intensity of interference fringes, confirming the alignment of patterns with standard quantum mechanics and supporting Born's rule and the superposition principle. Notably, the pilot-wave approach reveals well-defined photon trajectories, providing a deterministic perspective on quantum motion. The absence of third-order interference corroborates Born's rule, indicating that interference arises solely from pairwise path combinations. These findings suggest that Bohmian mechanics can offer valuable insights into quantum interference, potentially influencing future research in quantum optics and quantum computing.

Keyword: Three-slit experiment, single-photon interference, pilot-wave theory, Bohmian mechanics, Born’s rule, quantum interference, superposition principle, photon trajectories, Gaussian wave packet, quantum mechanics.

Efficacy of Cathelicidin Against Hypervirulent and Virulent Clinical Isolates of *Acinetobacter baumannii*: A Promising Approach for Infection Management

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Abstract

Acinetobacter baumannii, a Gram-negative bacterium, is a significant cause of hospital-acquired pneumonia and is increasingly implicated in community-acquired infections. Its multidrug resistance (MDR) and immune evasion mechanisms contribute to high mortality rates, prompting the World Health Organization to identify it as a critically urgent target for novel therapeutic strategies since 2017. This study investigates the bactericidal efficacy of cathelicidin, or LL-37, a human antimicrobial peptide secreted by epithelial cells and neutrophils, against clinically relevant isolates of *A. baumannii*. While LL-37 has been previously reported as a bactericidal agent against the reference strain *A. baumannii* ATCC 19606, its effectiveness against more virulent clinical isolates has not been conclusively demonstrated. We evaluated the activity of LL-37 against a hypervirulent isolate, exhibiting plasma-resistant characteristics from a dead patient, and a virulent isolate, susceptible to plasma and retrieved from a survivor. Our findings demonstrate that LL-37 exhibits bactericidal activity at concentrations ranging from 8 to 32 µg/ml against both isolates, while lower concentrations (4 µg/ml) preferentially inhibit the growth of the virulent strain. Notably, LL-37's ability to be produced endogenously suggests minimal toxicity to human cells. These results position LL-37 as a promising candidate for the treatment of *A. baumannii* infections, highlighting its potential for integration with immune-modulating strategies and conventional therapies.

Keyword: *Acinetobacter*, bacteria, LL-37, Cathelicidin, Antimicrobial peptide.

Development of an Electrochemical Biosensor for Analyzing Glucose Solutions, with Potential Future Applications in HbA1c Detection.

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Abstract

Developing electrochemical biosensors for glucose measurement is crucial in biomedical and food analysis. In this study, the design and fabrication of electrochemical biosensors were utilized to measure solutions containing glucose, including honey diluted with water in a 1:1 ratio and glucose solutions in water at ratios of 1:1 and 2:1. The design and construction of the electrochemical biosensors were performed using UV photolithography. The design involved creating a sensing area with a three-electrode setup, comprising a working electrode, a reference electrode, and a counter electrode. Each electrode was designed to be coated with different materials to enhance signal detection efficiency and improve the sensing area through a soft lithography process, enabling controlled and rapid measurements. The measurements were conducted using a potentiostat to capture the electrochemical signals, which exhibited distinct response patterns, indicating the sensor's sensitivity to varying glucose concentrations. However, the signals were found to have high noise levels, which will be improved in future developments. The results from this study provide a significant foundation for developing biosensors to measure HbA1c, a critical marker in diabetes monitoring. Future improvements will focus on enhancing signal quality, increasing specificity, and improving sensor stability to enable accurate and reliable measurement of HbA1c levels.

Keywords: Biosensor, Glucose Detection, Potentiostat, Electrochemical Analysis, HbA1c

DESIGN AND SIMULATION OF A SINGLE-PHASE GRID-TO-VEHICLE (G2V) SYSTEM WITH PSO-OPTIMIZED PI CONTROL

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Abstract

The global transition to clean energy emphasizes carbon emission reduction, with electric vehicles (EVs) playing a crucial role in reducing fossil fuel dependency. EV charging infrastructure relies on the electric grid for power transmission, while the Grid-to-Vehicle (G2V) system enhances battery charging efficiency by regulating current and voltage. This study designs and simulates a G2V system to evaluate its feasibility and impact on the grid. The proposed system integrates a single-phase grid, low-pass filter, H-bridge rectifier, bidirectional DC-DC converter operating on buck converter for charging, and rechargeable battery, with all components' electrical parameters carefully designed and analyzed to ensure safe and efficient charging while optimizing system sizing. The grid supplies power to the rectifier for AC-DC conversion, while the buck converter regulates voltage and current for optimized lithium-ion battery charging. The switching process introduces harmonics, requiring an advanced control strategy and low-pass filtering to minimize total harmonic distortion in compliance with grid codes. A proportional-integral controller, optimized through Particle Swarm Optimization (PSO), manages DC bus voltage regulation and active power flow via the rectifier to enhance efficient AC-DC conversion efficiency. Additionally, an additional PI-PSO controller regulates the buck converter to maintain optimal battery charging conditions. Simulation results demonstrate the system's superiority over conventional PI controllers, showing improved DC bus voltage regulation both transient and steady-state responses, compliance with grid standards, near-unity power factor, and a total harmonic current distortion (THD*i*) of 1.59%, achieving a 50% reduction.

Keyword: G2V system, carbon footpring reduction, proportional-integral control, PSO, EV charging, power quality.

THE ELECTROCHEMICAL BIOSENSOR FOR DETECTION OF GLUCOSE USING PLATINUM NANOPARTICLE AND GLUCOSE OXIDASE IMPLANTED CARBON PASTE ELECTRODE

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Abstract

Glucose biosensors for glucose detection in blood are crucial for the diagnosis of diabetes, a disease of global concern. In this study, we developed a glucose biosensor using platinum nanoparticles (PtNP) and glucose oxidase (GOx) implanted in a carbon paste electrode (CPE), denoted as PtNP/GOx/CPE. The modified materials were synthesized and characterized using cyclic voltammetry (CV), and electrochemical impedance spectroscopy (EIS). The modified PtNP/GOx/CPE on CV and EIS technique demonstrated excellent electrocatalysis and conductivity, showing an increased current from 0.00 μA to 2.61 μA and decreased electron transfer resistance from 6.00 to 4.50 kΩ compared to the bare CPE. Operating at an applied potential of +1.40 V for the amperometric technique, the biosensor exhibited high sensitivity (5.390 $\mu A \cdot mM^{-1}$), a wide calibration range (1–18 mM), and a low detection limit (0.185 mM) without interference from substances such as caffeine and uric acid. The practicality of the biosensor was evaluated in real human whole blood samples.

Keywords: Glucose biosensor, PtNPs, GOx, CPE

COMPUTATIONAL INVESTIGATION OF PLASMA ACTUATOR EFFECTS ON AIRFLOW DYNAMICS AROUND A CIRCULAR CYLINDER STRUCTURE

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Abstract

Plasma actuators are promising active flow control devices designed to mitigate structural oscillations and reduce drag forces induced by turbulent airflow, which can compromise the integrity of structures such as high-rise buildings, chimneys, and vehicles. These actuators generate plasma through electric discharge, influencing airflow dynamics and providing a versatile, non-intrusive method of aerodynamic control. This study employs computational simulation to investigate the effects of plasma actuators on the drag coefficient of circular cross-sectional structures with a diameter of 0.1 m under wind speeds ranging from 1 to 10 m/s, corresponding to Reynolds numbers of 6×10^3–6×10^4. The plasma actuators are aligned parallel to the airflow direction at ±90°. The simulations have been conducted using the finite volume method within OpenFOAM software, employing a simplified modification of the Suzen model to capture the influence of plasma on airflow. Results demonstrate that the application of plasma actuators significantly reduces the average drag coefficient, with reductions most pronounced at lower wind speeds. However, as wind speed increases, the effectiveness of the actuators in reducing drag tends to diminish, indicating potential limitations in high-speed applications

Keyword: Plasma actuator, Drag reduction, OpenFOAM Simulations

Optimization of Nonthermal Plasma Technology for Insecticide Degradation: An Experimental Design

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Abstract

Nonthermal plasma technology (NTP), a novel technology in food and agriculture application, has recently gathered more attentions. Pesticide degradation via nonthermal plasma technology has been studied for a few decades. Imidacloprid is a widely used insecticide for controlling pests in various agricultural products including rice, basil, and various fruits and vegetables. However, imidacloprid can persist in the environment, food, and water which could potentially impact on human health, non-target organism, and ecosystems. Therefore, this research aims to determine the optimal condition of NTP with design of experiment (DOE) for maximizing the degradation percentage of imidacloprid. Air was used as a working gas in this experiment. The 2^k full factorial design was used in this experiment. Plasma discharge time, air flow rate, and incubation time are the independent variables. The results show that the most appropriate NTP condition is plasma discharge time of 15 min, air flow rate of 8 L/min, and incubation time of 15 min could reduce maximum imidacloprid residues. According to analysis of variance, blocks (humidity) have significant effect on degradation percentage of imidacloprid residues. The higher imidacloprid residues degradation in high humidity might resulted from the formation of hydroxyl radical. Therefore, the hydroxyl radicals could be the main parameter in pesticide degradation application.

Keyword: Design of Experiment, Nonthermal Plasma Technology, Pesticide Degradation, Ozone, Hydroxyl radicals

Effects of blending ratio on the properties of epoxidized natural rubber/chloroprene rubber blend

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Abstract

The integration of natural rubber with synthetic rubber offers an alternative approach to optimize material properties for more diverse applications. In this study, epoxidized natural rubber (ENR) was blended with synthetic chloroprene rubber (CR) to obtain the ENR/CR blends at various ENR:CR ratios, e.g., 100:0, 75:25 and 25:75. The blending processes were conducted using an internal mixer. The resulting blends were then molded by a compression molding machine. The properties of the ENR/CR blends, namely curing characteristic, crosslink density, swelling ratio and mechanical properties were thoroughly examined. The results showed that the balance cure characteristic between natural and synthetic rubbers was found. The incorporating of CR helped to improve the reversion behaviour of ENR. More equilibrium degree of vulcanization was obtained. The addition of CR retarded vulcanization efficiency and delayed optimum cure time. The swelling degree of ENR/CR blends decreased, while the chemical resistance increased along with higher CR ratio, relating to the enhancing of crosslink density. Increase of CR ratios led to lower tensile strength and elongation at break. Hardness and modulus with respect to stiffness of the rubber blends also improved with the higher CR content, showing that the ENR/CR blends could withstand the permanent deformation better than pure ENR.

Keyword: Rubber blend, Epoxidized natural rubber, Chloroprene rubber, Curing characteristic, chemical resistance

Parallel Oral Presentation Sessions Schedule

Session 3: Room 3104
Biological Science & Environment

THE ROLE OF CHITOSAN AGAINST *Acinetobacter baumannii*: EVALUATING ANTIMICROBIAL ACTIVITY IN RELATION TO BACTERIAL IMMUNE RESISTANCE

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Abstract

Acinetobacter baumannii is a Gram-negative bacterium becoming a major cause of nosocomial infections**.** World Health Organization reported in 2024 that it become the top critical priority pathogen due to its resistance to multidrug, phagocytic cells, and harsh conditions. 4.95 million global deaths have been reported because of a lack of appropriate treatment and colistin is the last resort to treat *A. baumannii*. An alternative treatment is urgently needed which can be found in chitosan. It is a polysaccharide promising low toxicity, antimicrobial, and anti-inflammatory effects. The study aims to investigate the antimicrobial effect of chitosan against *A. baumannii* clinical isolates including a hypervirulent, exhibiting plasma-resistant characteristics from a dead patient, and a virulent isolate, susceptible to plasma and retrieved from a survivor. Broth microdilution assay was applied to determine minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) of chitosan. The result shows that chitosan can inhibit 1,000 CFUs of both hypervirulent *A. baumannii* at 1.2 mg/mL and virulent *A. baumannii* at 0.6 mg/mL. For MBC, 2.5 mg/mL of chitosan can kill both. To examine the toxicity of chitosan, the method that was used is the microculture tetrazolium technique assay (MTT assay). The result showed that 0.6 and 0.3 mg/mL of chitosan have 96% and 97% neutrophil viability, respectively, followed by 1.2 mg/mL of chitosan for 88% cell viability. The study concluded that MIC values of *A. baumannii* have low toxicity effect on polymophonuclear cells, so they can be the althernative therapeutic and supplement model in the future clinical application.

Keywords: *Acinetobacter,* chitosan, bacterial infection, treatment, antimicrobial.

THE CHARACTERIZATION AND LYTIC ACTIVITY OF PHAGES AGAINST ANTIBIOTIC MULTIDRUG RESISTANT *KLEBSIELLA PNEUMONIAE*

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Abstract

Klebsiella pneumoniae is one of the pathogen in ESKAPE group and is an increasing prevalent multidrug-resistant bacterium, which cause of nosocomial infections worldwide. The antibiotic resistance crisis is the main problem in public health because of difficulties to treat infectious diseases as the last line antibiotics usage are reported. Phage therapy is alternative treatment that have high efficiency and specific against bacterial species and safely in human. In this study, phage S40 was characterized and its killing activity was evaluated against multidrug-resistant *K. pneumoniae*, including colistin-resistant isolates. Phage S40 produces plaques that are 1-2 mm in diameter, with surrounding translucent halos that diffuse across the bacterial lawn. The transmission electron micrograph showed that phage S40 was classified as *Myoviridae* family. Host range determination revealed that phage S40 is specifically able to lyse 22.33% (7/30) of tested *K. pneumoniae*. It can maintain stable activity at a temperature range of 4°C to 50°C and a pH range of 3–10. The antibacterial activity demonstrated that phage S40 effectively kills *K. pneumoniae* with a 5-log reduction after 8 hours and a 3.5-log reduction after 24 hours of treatment. The haemolytic properties of this phage at both low and high concentrations do not indicate cytotoxicity. Thus, phage S40 shows great potential as a targeted therapeutic approach against multidrug-resistant *Klebsiella pneumoniae*, especially colistin-resistant strains. Its stability under various environmental conditions and lack of cytotoxicity suggest that it could be developed into a safe and effective alternative to traditional antibiotics.

Keywords: Multidrug-resistant *Klebsiella pneumoniae*, phage, characterization

Dynamic Changes in Exometabolites of Biocrusts: Exometabolite Release During Short and Prolonged Wetting

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Abstract

Biological soil crusts (biocrusts) play a crucial role in dryland ecosystems by influencing nutrient cycling and microbial activity. Desert biocrusts are dormant in extreme environments. However, the dynamic changes in exometabolites upon biocrust activation remain poorly understood. In this study, we investigated the exometabolite composition of soil water from two common biocrust types from Joshua Tree National Park; light algal crust (LAC) and cyanolichen crust (CLC) after 3 minutes and 96 hours of wetting. A total of 50 known metabolites were identified, with significant temporal and compositional differences observed between the samples. Principal Component Analysis (PCA) revealed distinct clustering between early (3 minutes) and late (96 hours) time points, indicating metabolic shifts. Volcano plot analysis showed that most metabolites were significantly more abundant immediately after wetting, with amino acids, purines, and pyrimidines being the dominant compounds. Over time, both LAC and CLC samples exhibited unique metabolite profiles, suggesting different microbial adaptation strategies for each crust type after 96 hours of incubation. These findings highlight the exometabolites in microbial responses to water activation of biocrust communities.

Keyword: biocrust; water activation, metabolic response; exometabolomic; cyanolichen

POTENTIAL ANTI-AMOEBIC EFFECTS OF *Clitoria ternatea* L. FLOWER EXTRACT AGAINST *Acanthamoeba culbertsoni* TROPHOZOITE AND CYST FORMS

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Abstract

Acanthamoeba species can cause rare but severe human infection such as *Acanthamoeba* keratitis (AK) that occurs mostly in contact lens wearers. Currently, no therapeutic agent can completely prevent AK. Natural plant compounds, such as those found in *C. ternatea* L. can serve as effective agents in treating eye infections. Thus, this study aims to evaluate the anti-amoebic effects of *C. ternatea* L. flower extract against *Acanthamoeba culbertsoni* trophozoite and cyst forms, as well as host cell cytotoxicity. T4 genotype *A. culbertsoni* isolated from contact lens paraphernalia was used in the present study. The amoebicidal assay was performed to find the effects of tested compound on the viability of *Acanthamoeba*. Encystation and excystation assays were performed to examine their ability to inhibit the phenotypic alterations of *A. culbertsoni*. Finally, the MTT assay was performed to investigate the possible cytotoxicity of compound to human keratinocyte (HaCaT) cell lines. The crude extract of *C. ternatea* flower and its anthocyanins showed anti-amoebic potential *in vitro* against *A. culbertsoni*, reducing its ability to encyst and excyst at 100 µm. Concentration 30 mg/mL showed the most potent activities among all concentrations and significantly reduced the viability to 8 x 10^2 cells/mL ($p < 0.05$). The cytotoxicity profile revealed that this compound showed lower to moderate cytotoxicity i.e., 18% and 49%, respectively, against HaCaT cells *in vitro*. Based on these findings, it is suggested that this compound should be tested further for a mode of action and *in vivo* studies as potential therapeutic agents against *Acanthamoeba* infection.

Keyword: Amoebicidal, anthocyanins, blue pea, cytotoxicity, HaCaT cell

Investigating the Clinical Implications of Complement Resistance in *Acinetobacter* Complex: Correlation with Patient Mortality and Plasma Susceptibility

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Abstract

The *Acinetobacter calcoaceticus-baumannii* (ACB) complex, particularly *Acinetobacter baumannii*, is a leading cause of healthcare-associated infections and poses a significant challenge due to its multidrug resistance (MDR) and immune evasion mechanisms. While MDR has garnered global attention, our previous study found no significant association with patient mortality. Recent research has demonstrated the ACB complex's ability to grow in human plasma and serum; however, the clinical significance of its immune evasion strategies has yet to be thoroughly investigated. This research aimed to explore this aspect by examining the survival of ACB complex isolates in human plasma and its correlation with patient outcomes. We collected 34 clinical ACB complex isolates and retrospectively analyzed patients' hospital records. A plasma susceptibility test assessed growth kinetics in normal versus heat-inactivated human plasma, utilizing the Varioskan spectrophotometer to calculate doubling time ratios and establish a specific cut-off for plasma susceptibility. Our findings indicated that doubling time ratios under 0.500 can reliably classify isolates as plasma susceptible. Notably, we observed a statistically significant association between complement resistance and patient mortality, with a mortality rate of 55.56% ($p = 0.0031$, OR = 18.75, 95% CI: 2.502 – 214.6). This study highlights the critical link between complement resistance and mortality in patients infected with ACB complex isolates, providing a valuable cut-off for identifying high-risk strains. These insights are essential for enhancing clinical practices and informing therapeutic strategies against this formidable pathogen.

Keyword: *Acinetobacter*, bacteria, immune evasion, mortality, infection.

HAZARD ANALYSIS AND CRITICAL CONTROL POINTS (HACCPs) FOR SUSTAINABLE VALUC CHAIN OF BHUTAN ORGANIC BLACK TEA

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Abstract

The study aims to enhance the safety and productivity of a Bhutan organic black tea by developing a HACCP program analyzing the value chain. The research focuses on the challenges faced by tea farmers like risk of food hazards, lack of tea experts and modern technology, and difficulties in obtaining organic certifications. A mixed-methods technique is used, combining field visits, semi-structured interviews, surveys, and laboratory analyses. Insights were collected from organic tea producers and processing facilities in Bhutan and Thailand to compare safety control measures and identify pain points and gaps. The key findings highlight area such as improving tea processing steps, improving regulatory compliance, and implementing an organized HACCP program. The study identifies opportunities for market expansion to international level through better value chain integration and sustainable practices. This research offers a structured framework contributing to advancement of organic black tea in Bhutan that can be adapted to other organic agricultural products.

Keyword: Bhutan**;** organic black tea; HACCP; value chain; sustainability

Land Cover Effects on Microclimate and PM Reduction Efficiency of Pocket Parks: A Case Study in Nakhon Pathom, Thailand

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Abstract

Air pollution, particularly from particulate matter ($PM_{2.5}$ and PM_{10}), is a major concern for those participating in outdoor activities. While greenspace is widely recognized as mitigating PM concentrations, it can also have adverse consequences by promoting PM accumulation. The impact of greenspace on PM levels is therefore complex and influenced by various factors. This study aims to investigate $PM_{2.5}$ and PM_{10} concentration changes across various land cover types, focusing on the potential of pocket parks (a dominant urban greenspace type) to mitigate PM levels and the factors influencing their removal efficiency. PMs concentrations were measured using mobile monitoring across five land cover types. The percentage change in PM concentration from background concentration (%ΔPM) was compared among the land cover types. Specifically for pocket parks, correlations were analyzed between %ΔPM and vegetation traits and meteorological factors. The results show that PMs concentrations varied among land cover types. Roadside areas showed the highest increase in PMs concentration from background concentration ($\%\Delta PM_{2.5}$ = 8.02, $\%\Delta PM_{10}$ = 7.32), whereas water bodies exhibited the greatest reduction potential ($\%\Delta PM_{2.5}$ = -7.58, $\%\Delta PM_{10}$ = -9.49). For pocket parks, PM reduction efficiency could be positive or negative. Correlation analysis revealed that meteorological factors (wind speed, temperature, relative humidity) and vegetation traits (%grass cover, Shannon index) significantly influenced PM reduction efficiency of pocket parks. Therefore, we recommend promoting high grass cover and diverse tree plantings to enhance PM reduction in pocket parks, particularly in conditions with low wind speed, low temperature, and high humidity.

Keyword: particulate matter, land cover type, pocket park, vegetation traits, meteorological factors

Generation of radon progeny attached aerosol for effective dose estimation in human lungs

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Abstract

Radon and its progeny are significant contributors to radiation exposure, particularly in indoor environments. The inhalation of airborne short-lived radon progeny is a recognized carcinogen for the lungs. The attachment of radon progeny to aerosols plays a crucial role in their deposition and inhalation into the respiratory system, ultimately affecting the effective radiation dose delivered to the lungs. In this study, we investigate the generation and characterization of radon progeny attached to aerosols. The research aims to (1) develop a method for producing radioactive aerosols with attached radon progeny in the 10–150 nanometer size range, and (2) estimate the effective radiation dose to the lungs based on the particle size distribution. The developed method simulates realistic scenarios of radon progeny attachment to ultrafine particles, which is crucial for accurate dose assessment. By analyzing the relationship between aerosol size and lung deposition, this study provides valuable insights into the health risks associated with inhaled radon progeny. The findings contribute to the refinement of radon exposure models, leading to more precise and scientifically grounded risk assessments for radon-induced lung cancer and improved public health strategies in various environments.

Keyword: radon progeny, aerosol, particle size distribution, lung dose estimation and radiation exposure.

EFFECT OF CITRIC ACID AND ASCORBIC ACID ON THE THERMAL RESISTANCE OF *Salmonella* Typhimurium IN HONEYDEW PUREE

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Abstract

Outbreaks of foodborne illnesses caused by *Salmonella* have increasingly been linked to fruit products, raising significant public health concerns. Minimally processed fruits, such as purees, are particularly vulnerable due to their high moisture content and lack of thermal processing. This study aimed to evaluate the effect of citric acid and ascorbic acid on the thermal resistance of *Salmonella* Typhimurium in honeydew puree by determining its decimal reduction time (D-value) at 65°C. Honeydew puree was prepared from fresh melons and tested for contaminants before inoculation with *Salmonella* Typhimurium using a bacterial lawn method. A 10% solution of citric acid or ascorbic acid was added to the respective treatment groups, while a control sample remained untreated. All samples were subjected to heat treatment at 65°C for various time intervals. Surviving bacterial populations were enumerated using Modified Tryptic Soy Agar supplemented with Yeast Extract (MTSAYE) media. The inactivation kinetics of *Salmonella* Typhimurium were analyzed using the USDA Integrated Pathogen Modeling Program (IPMP), and the inactivation data were fitted to mathematical models for parameter estimation. The Mafart-Weibull model exhibited the best goodness-of-fit, as indicated by the lowest root-mean-square error (RMSE) value. The results showed that the addition of citric acid significantly reduced *Salmonella* Typhimurium's thermal resistance (D-value: 0.0248 ± 0.0157 minutes; RMSE: 0.117 log CFU/g), while ascorbic acid increased its thermal resistance (D-value: 3.28 ± 0.933 minutes; RMSE: 0.346 log CFU/g), suggesting a protective effect. The untreated puree had a D-value of 0.121 ± 0.034 minutes and an RMSE of 0.121 log CFU/g. All treatments exhibited $\alpha<1$, indicating concave inactivation curves, where bacterial reduction was faster initially and slowed over time. Statistical analysis confirmed significant differences between treatments ($P < 0.05$). The findings revealed that different types of acids affect the thermal resistance of *Salmonella* Typhimurium in honeydew puree. The addition of citric acid enhanced bacterial inactivation, making it a promising hurdle for improving the microbial safety of minimally processed fruit products. However, the addition of ascorbic acid increased *Salmonella*'s heat resistance, suggesting a potential protective effect that requires further investigation.

Keyword: Honeydew puree, *Salmonella* Typhimurium, D-value, IPMP, Mafart-Weibull model, acids.

Poster Presentation Sessions

Session 2: Room 3201
Innovations in Science & Technology

Biological Activity of *Strobilanthes tonkinensis* Extract for Applying in Thai Perfume

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Abstract

This research aimed to investigate the phytochemical composition and antioxidant activity of *Strobilanthes tonkinensis*, an aromatic herb. Fresh leaves of *S. tonkinensis* (ST) were extracted using the maceration method with either ethanol or distilled water, followed by phytochemical screening. The results indicated that the ethanolic ST extract had a higher percentage yield compared to the aqueous extract. Both extracts contained flavonoids, phenolics, terpenoids, and steroids. The antioxidant activity and total phenolic content of the aqueous and ethanolic ST extracts were also assessed. DPPH scavenging assay results revealed that the ethanolic extract exhibited higher antioxidant activity (132.36 μg/mL) than the aqueous extract (149.13 μg/mL). Additionally, the total phenolic content of the ethanolic extract (5.75 mg/g DW) was greater than that of the aqueous extract (4.31 mg/g DW). Both extracts were incorporated into Thai perfume formulations along with various essential oils. The physiochemical properties of the prepared perfumes were evaluated, demonstrating good appearance characteristics and a pH range of 7-8. Both formulations had a pleasant fragrance and caused no skin irritation.

Keyword: *Strobilanthes tonkinensis*, Thai perfume, Biological activity

Biological activity of *Strobilanthes cusia* (Nees) Kuntze Extract and Application

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Abstract

This study aimed to evaluate the antioxidant activity and total phenolic content of the aqueous extract (HAE) of Hom (*Strobilanthes cusia* (Nees) Kuntze), which was obtained using the maceration extraction technique. Additionally, the study focused on the development of cooling gel sheets containing Hom extract as a potential method for fever reduction. Various formulations were prepared by combining Hom extract with different polymers, such as xanthan gum, HPMC, and Carbopol 934 NF, in varying ratios. These formulations were assessed based on physical appearance, pH, homogeneity, consistency, viscosity, swelling behavior, stability, and skin irritation potential. The results indicated that Hom extract exhibits antioxidant activity and contains total phenolic compounds. Furthermore, the evaluation of physical properties revealed that formulations with Hom extract and a high concentration of HPMC demonstrated optimal homogeneity, consistency, viscosity, swelling properties, stability, and non-irritating effects on the skin.

Keyword: *Strobilanthes cusia*, Application, Hydrogel

STUDY OF ACIDITY AND MICROBIAL BURDEN IN COMMERCIAL AND HOMEMADE PAD THAI SAUCES DURING TWO MONTHS INTERMITANTLY EXPOSED STORAGE

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Abstract

Pad Thai is a Thai food popular with both Thais and foreigners. Many choose to buy ready-made Pad Thai sauce for its convenience (add to other ingredients, stir, cook, and eat), making it a popular product for modern restaurants and housewives. Pad Thai sauce is an iconic flavor ingredient in Thai cuisine. The sauce is made from natural ingredients such as tamarind juice, sugar, and fish sauce. Currently, there are many ready-made Pad Thai sauces available in the market or online. Most Pad Thai sauces do not have preservatives added making microbial contamination during storage after opening a food safety concern. To evaluate this threat, the acidity and microbial burden of two ready-made Pad Thai sauces and a homemade Pad Thai sauce were studied over a two-month period after opening and exposing all three Pad Thai sauces to the environment. Samples of the three Pad Thai sauces were stored at two different temperatures, 4 and 25 degrees Celsius, to simulate both refrigerated and room temperature storage. Each Pad Thai sauce sample was evaluated at day 0 (the starting day), day 30 (one month), and day 60 (two months). For each evaluation, the pH value was measured along with quantification of total microorganism detection of Total plate count, Coliform bacteria, and Total Yeasts and Molds.

Keyword: Pad Thai Sauce, Acidity, Microbiological quality

Acoustic, Thermal, and Mechanical Properties of Bio-composite Materials Derived from Waste Paper, Mulberry Fiber, and Perlite for Sound-absorbing Panels

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Abstract

This research focuses on developing sound-absorbing materials made from paper mulberry (Sa) fibers, paper waste, and perlite to enhance sound absorption efficiency. In the experiment, the specimens are hand-formed by casting into molds and left to dry at room temperature, aiming for a porous structure and suitable density for sound absorption. The analysis is divided into three parts—acoustic, thermal, and mechanical properties. It examines the sound absorption coefficient, thermal conductivity, flexural strength, and compressive strength. Additionally, the effect of perlite on sound wave distribution and thermal insulation is studied, while paper mulberry fibers and paper waste reinforce the material's strength. This bio-composite materials development holds potential for applications as sound-absorbing panels for buildings, acoustic barriers, ceiling boards, and interior automotive lining, effectively reducing noise and improving sound quality in various environments.

Keywords: Bio-composite materials; Sound Absorption; Acoustic Properties

POLY(LACTIC ACID)/POLYHEDRAL OLIGOMERIC SILSESQUIOXANE HYBRID POLYMER: SYNTHESIS AND CHARACTERIZATION

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Abstract

Poly(lactic acid) (PLA) is a widely studied biodegradable polymer with significant scientific interest. In recent years, PLA application is limited by its low thermal stability, low ductility and high brittleness. This research aims to synthesize PLA nanocomposite by incorporation with polyhedral oligomeric silsesquioxane (POSS) nanoparticles as a hybrid polymer through ring-opening polymerization to enhance its properties. The synthesized product was fundamentally characterized by Fourier transform infrared spectroscopy (FTIR), nuclear magnetic resonance spectroscopy (NMR) and differential scanning calorimetry (DSC). FTIR results revealed the disappearance of the -CH_2-NH_2 signals (~3300-3400 cm^{-1}) from NH_2-POSS molecules, while a new signal corresponding to -CH_2-NH-CO- (~1648 cm^{-1}) emerged. NMR results indicated a shift in the -CH_2- signals linked to -NH_2 on NH_2-POSS from δ 2.6 ppm to δ 3.2 ppm in PLA-POSS. This indicates a transformation of the functional group from -NH_2 to -NH-CO-, confirming the successful synthesis of the PLA-POSS hybrid polymer. The results of DSC showed glass transition temperature and melting temperature of the PLA-POSS at 25.00 °C and 278.75 °C, respectively.

Keyword: Poly(lactic acid), Polyhedral oligomeric silsesquioxane, Hybrid polymer

LIQUID-LIQUID EXTRACTION FOR DETERMINATION OF CATIONIC SURFACTANT USING *CAESALPINIA SAPPAN L.* AS NATURAL REAGENT

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Abstract

This study developed a method for extracting cationic surfactants using an ion-association reaction between Cetyltrimethylammonium bromide (CTAB) which forms a positively charged ion and a negatively charged ion dissociated from *Caesalpinia sappan L.* (Fang) which used as a natural reagent under basic conditions. The ion-associated compound was extracted into the organic solvent resulting in a red-pink organic phase. The maximum absorbance of this complex was observed at 550 nm. Various parameters affecting the extraction efficiency were studied, and the linearity range for CTAB surfactant analysis was determined to be 0–200 µM, with a regression equation of $y = 0.238x - 0.126$ with a correlation coefficient $(R^2 = 0.9951)$. The optimized method was applied to determination of cationic surfactant in real water samples obtained from wastewater treatment sources. The study evaluated the accuracy and precision of the analysis, with the percentage recovery found to be within an acceptable range.

Keyword: Cationic surfactant, *Caesalpinia sappan L., Natural reagent*

Poster Presentation Sessions

Session 3: Room 3201
Biological Science & Environment

Curcumin derivative CU4c combined with gemcitabine inhibits the proliferation of non-small cell lung cancer A549 cells *in vitro* and in mouse xenograft models

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Abstract

Non-small cell lung cancer (NSCLC) is the predominant form of lung cancer. Gemcitabine (Gem), a chemotherapeutic drug for NSCLC, has side effects that limit its efficacy. Thus, it is crucial to develop novel compounds able to synergize with Gem and reduce adverse effects. We previously observed that the novel curcumin derivative CU4c was a more effective histone deacetylase inhibitor (HDACi) than curcumin. This research explored whether CU4c improves Gem's effectiveness in lung cancer A549 cells *in vitro* and in mouse xenograft models. MTT results revealed that CU4c reduced A549 cell growth in a dose- and time-dependent manner (IC_{50} = 126.95±6.06, 104.09±0.60, and 42.34±4.58 µM at 24, 48, and 72 h, respectively). In contrast, CU4c treatment had no adverse effects on noncancerous Vero cells (IC_{50} >200 µM after 24-72 h incubation). The Chou-Talalay approach assessed drug interactions, revealing that CU4c synergistically enhanced the antiproliferative efficacy of Gem against A549 cells. In A549 cells, CU4c treatments combined with Gem-induced cell cycle arrest during the S and G2/M phases by upregulating p21 protein expression. Furthermore, CU4c enhanced the apoptotic impact of Gem in A549 cells by raising the Bax/Bcl-2 ratio. The co-treatment led to an increase in pERK1/2 and Ac-H3 expression levels. Combined Gem and CU4c treatments significantly reduced tumor growth in nude mice. The hematoxylin and eosin (H&E) staining showed that CU4c reduced Gem's visceral organ toxicity. In summary, CU4c improved Gem's efficacy while reducing its toxicity. This compound could be used with Gem as a chemosensitizer for NSCLC.

Keywords: lung cancer, curcumin derivative CU4c, drug combination, HDAC inhibitor, xenograft model

Antioxidant capacity and Phenolic Content of *Elsholtzia griffithii*: Prospects for Pharmaceutical and Cosmeceutical Applications

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Abstract

This study aims to investigate the total antioxidant capacity (TAC) and phenolic content of essential oil and crude extracts derived from *Elsholtzia griffithii*. The hydro-distillation method was used to extract the essential oil, and the crude extracts were extracted by sonication. However, the antioxidant activity was verified by using the DPPH assay, and the Folin-Ciocalteu assay was used to assess the phenolic content.

The findings indicated that the essential oil carried a high total antioxidant capacity, as evaluated by an inhibition of 69.38 ± 0.59%, when diluted 1:1 with methanol, which examined by DPPH assay (R^2 = 0.9903). However, the crude extract presented a significantly higher total phenolic content, with a value of 3,026.01 ± 7.49 mg GAE/kg. The data implies that the essential oil has a high total antioxidant capacity and a high total phenolic content (TPC) when evaluated by using Folin-Ciocalteu assay (R^2 = 0.9826).

Regarding crude extract, which reveals a higher phenolic content, might not solely serve as mainly function as an antioxidant but also provide additional intriguing bioactivities, including anti-inflammatory, antibacterial, and skin health-promoting attributes. Therefore, these properties imply the prospective uses in the pharmaceutical, cosmeceutical or nutraceutical industries, such as skincare formulations for oxidative stress reduction and anti-inflammatory remedies.

This study provides beneficial insights into the bioactive composition of *Elsholtzia griffithii* and its potential for usage in health-promoting or agriculture. For the future study, it should verify which phytochemicals can boost high antioxidant capacity in essential oils.

Keywords: *Elsholtzia griffithii*, antioxidant, essential oil, phenolic content

Anatomical variations of anterior spinal artery in the Thai population: a preliminary study

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Abstract

Background: Anterior spinal artery (ASA) plays a crucial role in supplying the anterior two-thirds of spinal cord, which is vital for the proper functioning of motor pathways within human body. The precise location and branching pattern of ASA are of considerable importance for surgical and endovascular procedures. Therefore, this study aims to investigate the variations, including vascular origin and branching pattern of the ASA in Thai population.
Materials and methods: The present study was conducted at Division of Anatomy, School of Medical Sciences, University of Phayao, Thailand. Fifteen adult cadaveric brains (30 sides) were selected and examined. For each brain, the site of arterial origin and branching pattern were recorded. Additionally, the distances between site of ASA origin and vertebrobasilar junction, as well as between ASA origin and neighboring posterior inferior cerebellar artery (PICA), were measured on both left and right sides.
Results: Anatomical pattern of the ASA demonstrated great variability and was classified into three major types: type I (40%), type II (20%), and type III (40%). These were further subdivided into seven subtypes: type Ia, Ib, Ic, IIa, IIb, IIc, and IIIa. However, the distances between ASA and vertebrobasilar junction, as well as between ASA and PICA on both left and right sides, did not exhibit statistically significant differences ($p > 0.05$).
Conclusions: This preliminary project provides valuable information on the origin and branching pattern of ASA for future studies. Furthermore, understanding the anatomical variations of the ASA is crucial for preventing vascular complications during surgical procedures.

Keywords: anterior spinal artery, spinal cord, vertebrobasilar junction, posterior inferior cerebellar artery, endovascular procedures

The Development of Composite Hydrogel of Alginate with Crude Extract of Giant Mimosa (*Mimosa pigra L.*) Leaf and Coal Fly Ash to Waste Water Treatment for Ornamental Fish Tanks.

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Abstract

This research aims to study the optimal concentration of Super P.D. 7 catalyst substance for extracting compounds from giant mimosa leaves, developing a composite hydrogel of alginate combined with crude extract of giant mimosa leaves and coal fly ash to reduce ammonia levels in wastewater from ornamental fish tank. The study also investigates the release efficiency of the crude extract and the ammonia adsorption ability of the developed hydrogel composite beads. The findings are as follows:

1. Extraction using a Super Catalyst P.D. 7 solution at a concentration of 0.12% w/v for 14 days resulted in the highest levels of tannin extract and total phenolic compounds, equaling 23.97 ± 1.03 mg TNE/g and 6.43 ± 1.32 mg GAE/g extract, respectively.
2. The composite hydrogel beads made from alginate were approximately 5.64 ± 0.35 millimeters in size.
3. The hydrogel composite beads of formula 5, with a coal fly ash to crude extract ratio of 0.1: 0.2 grams, showed the highest ammonia adsorption efficiency.
4. When tested with synthetic wastewater, the BOD value decreased from 105 mg/L to 57 mg/L, and ammonia levels were reduced by 36% after 6 hours.

Therefore, this research can create innovations for use in the ornamental fish farming industry, promoting sustainability in line with the green economy, being highly eco-friendly, reducing agricultural waste through a bio-economy approach, and fostering the creation of value-added products. This supports community sustainability based on a circular economy model.

Keywords: Crude extract of Giant Mimosa Leaves, Coal fly ash, Ammonia reduction, Ornamental fish tank.

The promotion of using irradiation technology to enhance the quality of galangal chili paste (Nam Phrik Kha)

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Abstract

Galangal chili paste (Nam Phrik Kha) is another local food product from the North that is popular in the region but is not yet widely distributed in the country and has a short shelf life. Therefore, this research aims to improve the quality of Nam Phrik Kha with gamma irradiation, comparing it with dried Nam Phrik Kha. This study was conducted by irradiating Nam Phrik Kha with gamma rays at doses of 2, 4, and 6 kGy, and the dried samples were obtained by hot air oven drying at 60°C for 3 hours. After that, the non-irradiated, irradiated, and dried samples were tested on various aspects and shelf life at room temperature. The results showed that irradiation can decrease the number of microbial contaminants in Nam Phrik Kha. This study involved evaluating the odor substances of the samples using two types of electronic noses: one based on the sensor array principle and the other utilizing gas chromatography. Based on the test results, the dried samples showed significant differences compared to both irradiated and non-irradiated samples. The sensory scores of the dried Nam Phrik Kha were significantly lower than those of the non-irradiated and irradiated Nam Phrik Kha. When stored for 90 days, the Nam Phrik Kha irradiated at 4 kGy had the highest sensory scores. From this study, it can be concluded that gamma irradiation at a dose of 4 kGy is optimal for improving the quality and preserving the aroma and flavor of Nam Phrik Kha, while drying is the least effective method."

Keyword: Galangal chili paste, Irradiated food, Gamma radiation

THE DURATION OF FLOWERING AND FRUITING OF ALIEN PLANT SPECIES IN THE DECIDUOUS DIPTEROCARP FOREST, LAMPANG PROVINCE, THAILAND

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Abstract

Studying flowering and fruiting periods is a crucial phenological event. Although the deciduous dipterocarp forest is an important forest type in Northern Thailand, few phenological studies have been conducted. Moreover, there has never been a study of the phenological events of alien plants in the country. Thus, the present study focused on the duration of flowering and fruiting of alien plant species in the deciduous dipterocarp forest in Lampang province, Thailand. The alien plants with reproductive organs were observed and collected at monthly intervals from November 2018 to October 2019 and September to December 2020. Plant life forms and fruit types were recorded, and all plant specimens were identified. The results showed 26 alien plant species, belonging to 13 families and 23 genera. The most species-rich family was Fabaceae (8 species, 30.77%). The most abundant life form was herbaceous plant (15 species, 57.69%). Flowering and fruiting periods showed similar patterns throughout the year. Most of these species produced flowers and fruits from the end of the rainy season to the winter season (October-January). The lowest flowering and fruiting periods happened at the end of the summer season (April). Interestingly, the highest number of fruiting was observed in a month after the peak of flowering. Twenty-four species produced fruits during the study period. Among these taxa, 22 species (91.67%) were dry fruits, and 2 species (8.33%) were fleshy fruits. Considering the natural distribution of species, the alien plants in the present study were mostly distributed from America (24 species, 92.30%).

Keyword: alien plant species, flowering, fruiting, phenology, Thailand

Nutrient Requirements of Okra Grown in Clay Loam

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Abstract

Nutrient management is essential for okra production in terms of growth, yield, and fruit quality. Okra has different nutrient requirements depending on the variety and growing conditions. This study aims to investigate the nutrient requirements of okra grown in clay loam. The experiment was conducted in clay loam soil in Sa Yai Som Subdistrict, U-Thong District, Suphan Buri Province. The experiment was designed using a Randomized Complete Block (RCB) design with five replications. The study included four nutrient management treatments: 1) Control 2) Application of chemical fertilizer at a rate of 24-4-6 3) Application of chemical fertilizer at a rate of 24-4-6 + cow manure at 6.25 ton per hectare 4) Application of chemical fertilizer at a rate of 24-4-6 + cow manure at 6.25 ton per hectare + arbuscular mycorrhizal fungi (AMF) at 3 grams per plant. The results showed that the application of chemical fertilizer at a rate of 24-4-6, combined with cow manure at 1 ton per rai and arbuscular mycorrhizal fungi at 3 grams per plant, produced the highest standard okra yield of 12.27 tons per hectare. The nutrient uptake of nitrogen (N), phosphorus (P), potassium (K), calcium (Ca), and magnesium (Mg) at different growth stages was as follows: At 15 days, uptake values were 0.005, 0.001, 0.003, 0.002, and 0.001 grams per plant, respectively. Next at 30 days, uptake values were 1.30, 0.14, 1.11, 0.69, and 0.19 grams per plant, respectively. And then at 45 days, uptake values were 3.01, 0.48, 3.72, 2.29, and 0.60 grams per plant, respectively. And finally at 60 days, uptake values were 4.16, 0.70, 5.05, 3.75, and 0.93 grams per plant, respectively.

Keyword: Okra, Nutrient management, Fertilizer, Cow manure, Arbuscular mycorrhiza

THE INFLUENCE OF SUCROSE CONCENTRATION ON BACTERIAL GROWTH DYNAMICS DURING VANILLA POD FERMENTATION

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Abstract

Vanilla (*Vanilla planifolia* Andrews, Orchidaceae) is an orchid that produces long, slender pods containing tiny seeds inside, and its pods emit a distinct aroma widely used for flavoring food, beverages, pharmaceuticals, and cosmetics. Microorganisms play a key role in converting glucovanillin, a natural compound found in vanilla, into vanillin through enzymatic and biochemical processes. This conversion takes place during the curing and fermentation and is responsible for the characteristic aroma and flavor of vanilla. This study aims to determine the optimal sucrose concentration (1.0% w/v, 0.5% w/v, and 0.25% w/v) for bacterial growth in vanilla pods and to monitor bacterial populations throughout the fermentation process. The results showed that sucrose concentration significantly affected bacterial growth (ANOVA, F-test = 12.3, $p < 0.000$). The maximum number of bacterial counts was at 1.0% w/v sucrose, of approximately 17.25×10^6 cells/mL. At the experimental conditions of 0.5% w/v sucrose and 0.25% w/v sucrose, bacterial growth was significantly comparable, with optimum bacterial counts observed on the fourth day at 12.08×10^6 cells/mL and 12.38×10^6 cells/mL, respectively. Next-generation sequencing (NGS) using 16S rRNA gene sequencing was conducted to determine the diversity of microorganisms in vanilla pods. The species identifications were *Bacillus cereus*, *B. subtilis*, *B. lehensis*, and *B. aerius*. The research findings enhance the understanding of the role of bacteria in the curing process of vanilla, leading to more efficient fermentation and consistent vanilla product quality. As a result, it can create high-value vanilla products, increase economic returns for farmers, and facilitate the development of vanilla-derived probiotics.

Keyword: bacterial growth, sucrose concentration, *Vanilla planifolia*.

NUTRITIONAL VALUE OF SILKWORM PUPAE AND THEIR PROCESSING INTO FUTURE PROTEIN FOODS

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Abstract

Silkworm pupae are waste materials from the silk production industry. Silkworm pupae are a quality food source because they contain high protein, essential fatty acids, vitamins and minerals. They also have antioxidant properties and the potential to act as an immune system for the liver and blood vessels. This research aimed to evaluate the nutritional value, study the chemical composition of silkworm pupae, and proceed into protein foods. It was found that fresh silkworm pupae contained 16.82% protein, while dried silkworm pupae contained 3.68%, 13.85% and 60.48% moisture, ash and fat, respectively. Preliminary analysis of the lipid composition revealed that Triglyceride (TG), Diglyceride (DG), Monoglyceride (MG) and free fatty acid were the components. For the silkworm pupa extract, the total phenolic content was found to be 397 mg GAE/g and the antioxidant activity of DPPH method revealed that the concentration of silkworm pupae extract that inhibited 50% (IC50) was 1.98x106 ppm and FRAP the concentration of ferrous sulfate in silkworm pupae extract was 480.24 μM or 0.04 mg Fe (II)/g dry weight

Keyword: Silkworm pupae, protein, lipid, total phenolic, antioxidant

Comparison of Antioxidant Activity and Vitamin B Content in Soybean and Black bean Tempeh

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Abstract

Tempeh, plant-based protein contains phytochemical and vitamin B. The objective of this study was to determine antioxidant capacities and vitamin B content from soybean and black bean. In order to approve that antioxidant activity in tempeh was activated by *Rhizopus oligosporus* during fermentation, the antioxidant capacities as express by total phenolic content and antioxidant activity in tempeh also compared with boiled raw material. The result showed that total phenolic contents in both tempeh were higher than unfermented bean. However, black bean tempeh consisted of 0.46 mg GAE/g total phenolic content which higher than that of soybean one. In soybean tempeh, DPPH value was three times higher than unfermented soybean while FRAP value in tempeh was lower than raw material. ABTS value in soybean tempeh was about two times higher than boiled soybean. DPPH and FRAP values in black bean tempeh were two times higher than unfermented black bean while ABTS value was slightly differ. Vitamin B3 (Nicotinic acid) was the most abundant vitamin B in soybean tempeh which the concentration of 4409 ng/g. However, the primary vitamin B found in black bean tempeh was 6315. In general antioxidation capacities of soybean tempeh was higher than black bean tempeh ng/g vitamin B5 (panthothinic). Overall, vitamin B complex found in soybean and black bean tempeh were 10.493 μg/g and 11.220 μg/g, respectively. To sum up, the finding in this study indicated that both soybean and black bean tempeh is a good alternative protein which contained phytochemical and various vitamin B.

Keyword: Soybean; Black bean; Tempeh; Antioxidant activity; Vitamin B content

Impact of gamma radiation on chemical and physicochemical properties and microbial load of green banana (*Musa* AA group) "Kluai Khai" flours

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Abstract

This study investigated the effects of gamma irradiation (2, 5, and 10 kGy) on the physicochemical properties of green banana flour (GBF) compared to a non-irradiated control (0 kGy). Gamma irradiation significantly altered the flour's properties, including increased amylose content, degraded granule crystallinity, and reduced pasting properties and gelatinization temperatures. Higher doses enhanced swelling power and solubility index while maintaining the flour's B-type crystalline structure. Irradiation also induced chemical changes, including increased fat and ash content, along with visible color modifications. Additionally, irradiation effectively reduced microbial load, suggesting its potential as a method for enhancing GBF's functional properties and ensure food safety. These findings highlight that gamma irradiation could play a valuable role in improving the quality and versatility of GBF in food applications.

Keyword: Green banana flour, Gamma radiation, Pasting properties, Microbial load, "Kluai Khai" flours

Development of efficient micropropagation protocol of *Dendrocalamus* sp. by temporary immersion bioreactor system for production in the large sector

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Abstract

The 'Sang Mon bamboo', *Dendrocalamus* sp., commonly known as economic bamboo in Thailand, was reported by economic demand to increase production in the large sector. The aim of this study is to find suitable conditions for the micropropagation of the *Dendrocalamus* sp., such as concentrations of plant growth regulators (PGRs), shoot and root induction, survival, and acclimatization on plantlets. The results showed that semi-solid MS medium supplemented with 3 mg/L 6-benzylaminopurine (BAP) in combination with 2 mg/L α-naphthalene acetic acid (NAA) induced a maximum number of shoots, with an average of 24.66 shoots increased/explant. The best results at 8 weeks were presented with an average shoot length of 8.33 cm. In addition, the amount of the bamboo roots was presented with a highly average range of 5.00-8.33 roots/explant. The temporary immersion bioreactor system (TIB) was showed that feeding frequency of 2 hours in MS medium containing 500 ml, and able to initiate 10 shoots/explant increased the number of shoots per clump, shoot height, number of leaves, leaf length and leaf width after 8 weeks with 37.77 shoots, 18.33 cm, 14.33 leaves, 3.00 cm, and 1.50 cm. respectively. In addition, a 99% survival rate was found on all types of substrates in greenhouse and field conditions. Moreover, the assessment of genetic fidelity by RAPD fingerprinting with 7 random primers showed no polymorphism between sampling of original and micropropagation plants. The tissue culture protocol can produce over 1,382 times the quantity of the plants compared with the stem cutting method.

Keyword: Bamboo, *Dendrocalamus* sp., Micropropagation, Temporary immersion bioreactor system