AFOB MALAYSIA CHAPTER
Asian Federation of Biotechnology

BOOK OF ABSTRACTS

ASIAN FEDERATION OF BIOTECHNOLOGY REGIONAL SYMPOSIUM 2025

Biotechnology Horizons: Nurturing Sustainability for Global Well-being

27th – 30th July 2025 | THE EVERLY PUTRAJAYA, MALAYSIA

Organised by:

AFOB MALAYSIA CHAPTER
Asian Federation of Biotechnology

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GENERAL TENTATIVE PROGRAMME

Day 1	**27th July 2025**		
		3.00 PM	Registration *Everly Putrajaya Hotel Lobby*
		6.30 PM	Welcome Reception *Rebung 2 Restaurant, Putrajaya*
Day 2	**28th July 2025**		
8.00 AM	Registration *Entrance of Mesmera Ballroom 1, First Floor*	**12.00 PM**	Poster Presentation *Foyer, First Floor*
9.00 AM	Opening Ceremony *Mesmera Ballroom 1, First Floor*	**1.00 PM**	Lunch *Fuze Restaurant, Ground Floor*
10.00 AM	Morning Tea Break *Foyer, First Floor*	**2.30 PM**	Technical Sessions *Mesmera Ballroom 1, Inspirasi 1, Inspirasi 2*
10.30 AM	Plenary Speech 1 Prof. Dr. Noriho Kamiya *Mesmera Ballroom 1, First Floor*	**5.00 PM**	Afternoon Tea Break *Foyer, First Floor*
		7.00 PM	Gala Dinner *Mesmera Ballroom 1, First Floor*
Day 3	**29th July 2025**		
8.00 AM	Registration *Entrance of Mesmera Ballroom 1, First Floor*	**12.00 PM**	Poster Presentation *Foyer, First Floor*
9.00 AM	Plenary Speech 2 Prof. Dr. Yu-Kaung Chang *Mesmera Ballroom 1, First Floor*	**1.00 PM**	Lunch *Fuze Restaurant, Ground Floor*
10.00 AM	Morning Tea Break *Foyer, First Floor*	**2.30 PM**	Technical Sessions *Mesmera Ballroom 1, Inspirasi 1, Inspirasi 2*
10.30 AM	Technical Sessions *Mesmera Ballroom 1, Inspirasi 1, Inspirasi 2*	**4.30 PM**	Closing and Awards *Mesmera Ballroom 1, First Floor*
		5.30 PM	Afternoon Tea Break *Foyer, First Floor*
Day 4	**30th July 2025**		
8.00 AM	Excursion		

WELCOME ADDRESS

Prof. Ts. Dr. Suraini Abd Aziz
Chairman
Asian Federation of Biotechnology (AFOB) Regional Symposium 2025 (ARS2025)

President
Asian Federation of Biotechnology Malaysia Chapter

Assalamualaikum warahmatullahi wabarakatuh,
Salam Sejahtera, and a very warm welcome to all,

On behalf of the Asian Federation of Biotechnology Malaysia Chapter (AFOBMC), it is my great pleasure and honour to welcome you to the 15th Asian Federation of Biotechnology (AFOB) Regional Symposium 2025 (ARS 2025), held from 27 to 30 July 2025 at The Everly Hotel, Putrajaya, Malaysia.

This year's symposium embraces the theme "Biotechnology Horizons: Nurturing Sustainability for Global Well-Being" underscoring our collective dedication to harnessing biotechnology as a powerful catalyst for sustainable development, environmental responsibility, and enhanced quality of life for communities worldwide.

Organized by the AFOB Malaysia Chapter, ARS 2025 stands as a premier platform that brings together researchers, scientists, academics, and industry leaders from around the globe. It provides a valuable opportunity to exchange ideas, share groundbreaking research, and foster collaborations across the diverse and evolving fields of biotechnology. We are privileged to host an impressive lineup of distinguished speakers and participants whose expertise spans environmental biotechnology, bioprocess engineering, food and agricultural innovation, and medical biotechnology. Your active involvement will undoubtedly enrich the discussions and inspire innovative solutions to some of the most urgent global challenges we face today.

I would also like to convey my heartfelt appreciation to our partners, sponsors, and dedicated organizing committee and event team members for their unwavering support and tireless efforts in bringing ARS 2025 to life.

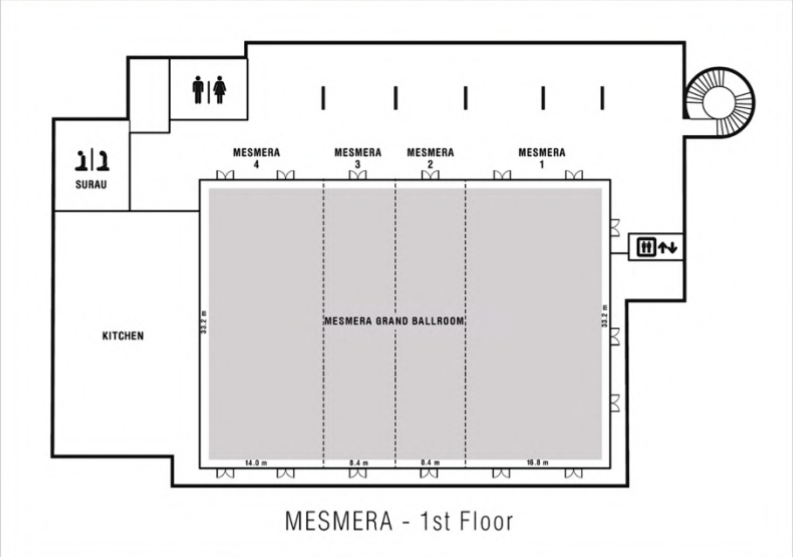
As we begin this exciting journey over the next few days, I encourage all of you to connect meaningfully, collaborate actively, and cultivate ideas that will shape the future of biotechnology - not only for scientific progress, but for the well-being of humanity and the sustainability of our planet.

Once again, welcome to ARS 2025. I wish you a productive, inspiring, and memorable symposium. Thank you.

CONFERENCE VENUE LAYOUT

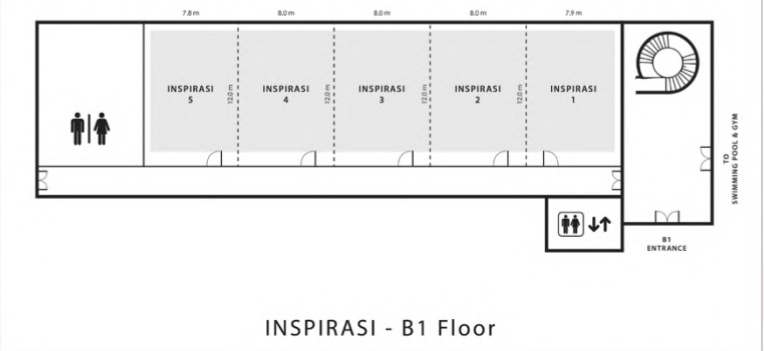
OVERALL LAYOUT

MESMERA BALLROOM 1, FIRST FLOOR



MESMERA - 1st Floor

INSPIRASI 1 AND INSPIRASI 2, B1 FLOOR



INSPIRASI - B1 Floor

EVENT PROGRAMME

Day 1 27 July 2025
1500 – 1800 Registration (Everly Putrajaya Hotel Lobby)
1830 – 2100 Welcome Reception (Rebung 2 Restaurant, Putrajaya)
Day 2 **28 July 2025**
0800 – 0830 Registration (Entrance of Mesmera Ballroom 1, First Floor)
0900 – 1000 Opening Ceremony and Welcoming Speech Opening Speech **Prof. Dr. Duk Jae Oh** **Secretary General** **Asian Federation of Biotechnology (AFOB)** **Sejong University, South Korea** Welcoming Speech **Prof. Ts. Dr. Suraini Abd Aziz** **ARS2025 Conference Chair** **President AFOB Malaysia Chapter** **Universiti Putra Malaysia, Malaysia** (Mesmera Ballroom 1, First Floor)
1000 – 1030 Morning Tea Break (Foyer, First Floor)
1030 – 1130 Plenary Talk 1 **Prof. Dr. Noriho Kamiya** **Kyushu University, Japan** Engineering biomolecules via biocatalysis for sustainable biomanufacturing. Session Chair: **Assoc. Prof. Ts. Dr. Mohamad Faizal Ibrahim** **Universiti Putra Malaysia, Malaysia** (Mesmera Ballroom 1, First Floor)
1130 Photo Session (Mesmera Ballroom 1, First Floor)
1200 Poster Presentation (Foyer, First Floor)
1300 Lunch (Fuze Restaurant, Ground Floor)

1400 - 1700 Technical Sessions		
Technical Session 1 *Biopharmaceutical and Medical Biotechnology* *Applied Microbiology* *Tissue Engineering and Biomaterials*	**Technical Session 2** *Bioenergy and Biorefinery* *Environmental Biotechnology* *Marine Biotechnology*	**Technical Session 3** *Bioenergy and Biorefinery* *Bioprocess and Bioseparation Engineering* *Nanobiotechnology, Biosensors and Biochips*
Session Chair: **Dr. Shafinaz Abd Gani** **Universiti Putra Malaysia, Malaysia** (Mesmera Ballroom 1, First Floor)	Session Chair: **Dr. Khalisanni Khalid** **Malaysian Agricultural Research and Development Institute, Malaysia** (Inspirasi 1, Basement 1 Floor)	Session Chair: **Assoc. Prof. Dr. Noorjahan Banu Mohamed Alitheen** **Universiti Putra Malaysia, Malaysia** (Inspirasi 2, Basement 1 Floor)
1400 – 1420 Keynote 1.1 **Prof. Dr. Duk Jae Oh** **Sejong University, South Korea** Development of DMSO-free, serum-free chemically defined cryopreservation media for mammalian cells.	**1400 – 1420** Keynote 2.1 **Prof. Dr. Ni Nyoman Tri Puspaningsih** **Universitas Airlangga, Indonesia** Bioproduction of exogenous feed enzyme (EFE), reducing the food loss and waste.	**1400 – 1420** Keynote 3.1 **Prof. Dr. Penjit Srinophakun** **Kasetsart University, Thailand** Potential of non-edible oils for high-quality bio-lubricants production.
1420 – 1440 Keynote 1.2 **Prof. Dr. Suchada Chanprateep Napathorn** **Chulalongkorn University, Thailand** Valorization of organic waste for sustainable polyhydroxyalkanoate (PHA) production: advancing the circular economy and environmental sustainability.	**1420 – 1440** Keynote 2.2 **Assoc. Prof. Dr. Shaza Eva Mohamad** **Universiti Teknologi Malaysia, Malaysia** Microalgae as a source of innovation for sustainable bioproducts and clean technologies.	**1420 – 1440** Keynote 3.2 **Prof. Dr. Yu Shen Cheng** **National Yunlin University of Science and Technology, Taiwan** Insect biorefinery as a practical platform for achieving SDGs and BiCRS.
1440 – 1455 Invited 1.1 **Dr. Nurriza Ab Latif** **Universiti Teknologi Malaysia, Malaysia** Integrating in silico and in vitro strategies to unlock nature's therapeutic potential.	**1440 – 1455** Invited 2.1 **Prof. Dr. Toshinari Maeda** **Kyushu Institute of Technology, Japan** Effect of photo irradiation on anaerobic digestion of waste sewage sludge.	**1440 – 1455** Invited 3.1 **Prof. Ir. Dr. Juferi Idris** **Universiti Teknologi MARA Sarawak, Malaysia** Steam-activated carbon from coconut-based self-sustained carbonization biochar for gas emission treatment.
1455 – 1510 Invited 1.2 **Assoc. Prof. Dr. Mohd Fauzi Mh Busra** **Universiti Kebangsaan Malaysia, Malaysia** Multifunctional natural-based biomaterials strategies for cutaneous tissue engineering: conventional approach towards bioconvergence 3D-bioprinting.	**1455 – 1510** Invited 2.2 **Assoc. Prof. Dr. Cahyo Budiman** **Universiti Malaysia Sabah, Malaysia** Bioproduction, engineering, and phenol removal efficiency of recombinant tyrosinase from shiitake mushroom (*Lentinula edodes*).	**1455 – 1510** Invited 3.2 **Dr. Kuan Shiong Khoo** **Yuan Ze University, Taiwan** Microalgae biotechnology: Views in upstream and downstream processing.
1510 – 1525 Invited 1.3	**1510 – 1525** Invited 2.3 **Ts. Dr. Nahrul Hayawin Zainal**	**1510 – 1525** Invited 3.3 **Assoc. Prof. Dr. Prakit Sukyai**

Prof. Dr. Awang Ahmad Sallehin Awang Husaini **Universiti Malaysia Sarawak, Malaysia** Fungal laccase as a green biocatalyst: recent advances in production, characterization, and multifunctional applications in waste valorization, environmental remediation, and biopreservation.	**Malaysian Palm Oil Board, Malaysia** Enhanced POME polishing using activated sludge with suspended media: A tertiary treatment approach.	**Kasetsart University, Thailand** Upcycling sugar refinery waste for bone tissue engineering.
1525 – 1540 Invited 1.4 **Assoc. Prof. Dr. Zazali Alias** **Universiti Malaya, Malaysia** Current status and potential of fern in biological research.	**1525 – 1540** Invited 2.4 **Dr. Kallaya Sritunyalucksana-Dangtip** **National Center for Genetic Engineering and Biotechnology (BIOTEC), Thailand** Innovet AMR 2.0-ShrimpGuard project: Development of phage-associated formulation to combat antimicrobial resistant *Vibrio spp.* in cultured shrimp.	**1525 – 1540** Invited 3.4 **Assoc. Prof. Dr. Wan Abd Al-Qadr Imad Wan Mohtar** **Universiti Malaya, Malaysia** Bioreactor dye-eating fungus (BioDeF) system.
1540 – 1555 Oral 1.1 (Online) **Prof. Dr. Gemerlyn G. Garcia** **Central Luzon State University, Philippines** Development of a diagnostic kit for re-emerging red tide in the Philippines.	**1540 – 1555** Invited 2.5 **Dr. Nor Hasmaliana Abdul Manas** **Universiti Malaysia Pahang Al-Sultan Abdullah, Malaysia** Laccase immobilization on biochar for carbazole degradation.	**1540 – 1555** Oral 3.1 **Assoc. Prof. Dr. Suriana Sabri** **Universiti Putra Malaysia, Malaysia** A genome-guided approach to uncover and purify potent antimicrobials from *Bacillus velezensis* PD9 for combating multidrug-resistant pathogens.
1555 – 1610 Oral 1.2 (Online) **Assoc. Prof. Dr. Nor'Aini Abdul Rahman** **Universiti Putra Malaysia, Malaysia** Characterization of bacterial isolates with PGPR traits and their effect on wheat seed germination.	**1555 – 1610** Oral 2.1 **Prof. Dr. Surendraraj Alagarsamy** **Kuwait Institute for Scientific Research, India** Novel thermostable alkaline protease isoenzymes from sabkha-derived marinobacter: functional characterization and industrial implications.	**1555 – 1610** Oral 3.2 **Assoc. Prof. Dr. Hoang Anh Hoang** **Ho Chi Minh City University of Technology, Vietnam** Phage therapy - a solution against antimicrobial resistance in fishery industry in Vietnam.
1610 – 1625 Oral 1.3 (Online) **Dr. Nurul Akmar Hussin** **Universiti Malaysia Sabah, Malaysia** Application of *Bacillus licheniformis*-derived chitinase as a biocontrol agent against termites.	**1610 – 1625** Oral 2.2 **Mr. Syeqqal Ismail** **Universiti Tun Hussein Onn Malaysia, Malaysia** Toxicological characterization of cresol compounds from food industry effluents with aryl hydrocarbon receptor (AhR) activation via molecular docking analysis.	
1700 Afternoon Tea Break (Foyer, First Floor)		
2000 – 2300 Gala Dinner (Mesmera Ballroom 1, First Floor)		

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<tr><td colspan="3">Day 3
29 July 2025</td></tr>
<tr><td colspan="3"><u>0830 – 0900</u>
Registration
(Entrance of Mesmera Ballroom 1, First Floor)</td></tr>
<tr><td colspan="3"><u>0900 – 1000</u>
Plenary Talk 2

Prof. Dr. Yu-Kaung Chang
Yuan Ze University, Taiwan
Recent advances in electrospun nanofiber membranes for protein purification, enzyme immobilization, and environmental remediation.

Session Chair:
Assoc. Prof. Dr. Madihah Md Salleh
Universiti Teknologi Malaysia, Malaysia

(Mesmera Ballroom 1, First Floor)</td></tr>
<tr><td colspan="3"><u>1000 – 1030</u>
Morning Tea Break
(Foyer, First Floor)</td></tr>
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Bioenergy and Biorefinery
Biocatalyst and protein engineering
Systems and Synthetic Biotechnology
Agricultural and Food Biotechnology</td><td>Technical Session 5
Bioprocess and Bioseparation Engineering
Bioindustry Promotion and Bioeducation
Agricultural and Food Biotechnology
Biocatalysis and Protein Engineering</td><td>Technical Session 6
Systems and Synthetic Biotechnology
Agricultural and Food Biotechnology
Environmental Biotechnology</td></tr>
<tr><td>Session Chair:
Prof. Ir. Dr. Juferi Idris
Universiti Teknologi MARA Sarawak, Malaysia

(Mesmera Ballroom 1, First Floor)</td><td>Session Chair:
Prof. Dr. Awang Ahmad Sallehin Awang Husaini
Universiti Malaysia Sarawak, Malaysia

(Inspirasi 1, Basement 1 Floor)</td><td>Session Chair:
Ts. Dr. Nozieana Khairuddin
Universiti Putra Malaysia, Malaysia

(Inspirasi 2, Basement 1 Floor)</td></tr>
<tr><td><u>1030 – 1050</u>
Keynote 4.1
Prof. Dr. Sung Ok Han
Korea University, South Korea
Towards a green platform: sustainable porphyrin biosynthesis in Corynebacterium glutamicum for multifunctional Use.</td><td><u>1030 – 1050</u>
Keynote 5.1
Assoc. Prof. Dr. Madihah Md Salleh
Universiti Teknologi Malaysia, Malaysia
Removal of phenolic compound from oil palm fronds improvement of biobutanol production by locally isolated Clostridium acetobutylicum species.</td><td><u>1030 – 1050</u>
Keynote 6.1
Assoc. Prof. Dr. Zetty Norhana Balia Yusof
Universiti Putra Malaysia, Malaysia
Harnessing Malaysian seaweed potential: a sustainable solution for crop health and enhanced production.</td></tr>
</table>

1050 – 1110 Keynote 4.2 **Prof. Dr. Mohd Shukuri Mohamad Ali** **Universiti Putra Malaysia, Malaysia** Evolution-driven protein engineering: insights from reconstructed and cold-active lipases of family I.3 from *Pseudomonas sp*.	**1050 – 1110** Keynote 5.2 **Assoc. Prof. Dr. Siti Sarah Othman** **Universiti Putra Malaysia, Malaysia** Innovating STEM education from lab to market.	**1050 – 1110** Keynote 6.2 **Assoc. Prof. Dr. Antonio Di Martino** **Tomsk Polytechnic University, Russia** Novel food packaging material based on the lignin and starch from the sugar palm *Arenga pinnata* fibers.
1110 – 1125 Invited 4.1 **Dr. Ahmad Bazli Ramzi** **Universiti Kebangsaan Malaysia, Malaysia** Bioengineering of bioplastic-producing microbes for plastic bio-upcycling applications.	**1110 – 1125** Invited 5.1 **Assoc. Prof. Dr. Yusuf Abduh** **Institut Teknologi Bandung, Indonesia** Synthesis of bioactive protein hydrolysates from dehulled seeds of *Hevea brasiliensis.*	**1110 – 1125** Invited 6.1 **Assoc. Prof. Dr. Dayang Salwani Awang Adeni** **Universiti Malaysia Sarawak, Malaysia** Tapping the potential of Sarawak's Nipa Sap: 'Gula apong' and emerging bio-products.
1125 – 1140 Invited 4.2 **Dr. Fina Amreta Laksmi** **Research Center for Applied Microbiology, National Research and Innovation Agency (BRIN), Indonesia** Advances in protein engineering of extremozymes for sustainable food, health, and industrial bioprocess applications.	**1125 – 1140** Invited 5.2 **Dr. Tan Teng Ju** **International Islamic University Malaysia, Malaysia** Investigation of antioxidant activity of basil essential oil and extracts produced by different extraction methods.	**1125 – 1140** Invited 6.2 **Assoc. Prof. Dr. Khanom Simarani** **Universiti Malaya, Malaysia** Unseen heroes: how microorganisms ensure food security and drive sustainability.
1140 – 1155 Oral 4.1 (Online) **Assoc. Prof. Dr. Hazel Monica M. Peralta** **Central Luzon State University, Philippines** Microsatellite-based characterization of *Paracalanus parvus* populations across coastal ecosystems of the straits of Malacca.	**1140 – 1155** Invited 5.3 **Dr. Nurul Adela Bukhari** **Malaysian Palm Oil Board, Malaysia** Succinic acid production from oil palm empty fruit bunches and its downstream purification process.	**1140 – 1155** Invited 6.3 **Dr. Muhamad Hafiz Abd Rahim** **Universiti Putra Malaysia, Malaysia** Biofertilizer potential of bacteria isolated from fermented banana peel in mushroom farming.
1155 - 1210 Oral 4.2 (Online) **Mrs. Nesheman Huma** **Bahria University Health Sciences Campus, Pakistan** From lab to field: designing RT-RPA based isothermal amplification method for citrus tristeza virus detection.	**1155 - 1210** Oral 5.1 **Dr. Meher Nahid** **Chattogram Veterinary and Animal Sciences University, Bangladesh** Reduction of acrylamide precursors in potatoes through nutrient management: A mitigation strategy.	**1155 - 1210** Invited 6.4 **Dr. Khalisanni Khalid** **Malaysian Agricultural Research and Development Institute, Malaysia** Encapsulation efficiency of probiotics with single and mixed prebiotic formulations for potential poultry feed additives.
1210 - 1225 Oral 4.3 (Online) **Prof. Dr. Danila S. Paragas** **Central Luzon State University, Philippines** Eco-friendly biopesticides from neem and lagundi extracts for sustainable management of onion armyworm (*Spodoptera exigua*).	**1210 – 1225** Oral 5.2 **Assoc. Prof. Dr. Suhaila Mohd. Omar** **International Islamic University Malaysia, Malaysia** Electrospinning of chitosan nanofibers derived from insect biomass.	**1210 - 1225** Oral 6.1 **Dr. Kanokwan Pundee** **King Mongkut's University of Technology Thonburi, Thailand** Optimization of coir pith vermicompost tea as a potent biocontrol agent against plant pathogens.

1225 – 1240 Oral 4.4 (Online) **Assoc. Prof. Dr. Siti Hamidah Mohd Setapar** **Universiti Teknologi Malaysia, Malaysia** Cultivation of microalgae using fruit waste as a nutrient source.	**1225 – 1240** YR Speaker 2.1 **Mr. Aris Fafon** **Kasetsart University, Thailand** Development of Cassava Flour-Modified Bacterial Cellulose Scaffolds Coated with BSA for Tissue Engineering.	
1240 – 1255 Oral 4.5 (Online) **Dr. Noor Liyana Yusof** **Universiti Putra Malaysia, Malaysia** Enhancing cold storage quality of carambola via vacuum impregnation with melatonin, GABA, and oxalic acid.	**1240 – 1255** YR Speaker 2.2 **Mrs. Afifah Husna Mat Saad** **Universiti Putra Malaysia, Malaysia** Solvent-free biodiesel synthesis using immobilized reconstructed ancestral lipase LUCA.	
1240 – 1330 Poster Presentation (Foyer, First Floor)		
1330 – 1430 Lunch (Fuze Restaurant, Ground Floor)		
1430 – 1615 Technical Sessions		
Young Researcher Session 1 Session Chair: **Dr. Tan Teng Ju** **International Islamic University Malaysia, Malaysia** (Mesmera Ballroom 1, First Floor)	**Young Researcher Session 2** Session Chair: **Assoc. Prof. Dr. Khanom Simarani** **Universiti Malaya, Malaysia** (Inspirasi 1, Basement 1 Floor)	**Young Researcher Session 3** Session Chair: **Ts. Dr. Nahrul Hayawin Zainal** **Malaysian Palm Oil Board, Malaysia** (Inspirasi 2, Basement 1 Floor)
1430 – 1445 Speaker YR 1.1 **Mr. Muhammad Kabir Hassan** **King Mongkut's University of Technology Thonburi, Thailand** Cellfectin mediated delivery of exogenous dsRNA enables spray-induced gene silencing in *Colletotrichum gloeosporioides.*	Invited 5.4 **Dr. Muhammad Daaniyall Abd Rahman** **Universiti Putra Malaysia, Malaysia** Estimating of the economic impacts of biotechnology industries using input-output analysis.	**1430 – 1445** Speaker YR 3.1 **Mr. Hu Jintao** **Universiti Putra Malaysia, Malaysia** Process optimization and structural insight into RTX LUCA Lipase catalyzing long-chain fatty acid production from waste cooking oil.
1445 – 1500 Speaker YR 1.2 **Ms. Enas Sakkaamini** **Kyushu University, Japan** Osmolyte-based polymer systems for protein stabilization.	**1430 – 1445** Speaker YR 2.3 **Mrs. Yang Zhimei** **Universiti Malaya, Malaysia** Effects of co-application of chemical and organic fertilizers on SOC sequestration in tobacco-planting soils.	**1445 – 1500** Speaker YR 3.2 **Ms. Nurul Bari'ah Hamzah** **Universiti Teknologi Malaysia, Malaysia** Composting potential of pineapple waste for circular agricultural applications.
1500 – 1515 Speaker YR 1.3 **Ms. Siti Norishamizal Azfar Mohd Zamri** **Universiti Teknologi MARA, Malaysia** Molecular determination of genetic diversity by enterobacterial repetitive intergenic consensus PCR (ERIC-PCR) and antibiotic resistance pattern of *Klebsiella pneumoniae* from raw and cooked foods.	**1445 – 1500** Speaker YR 2.4 **Ms. Syazayasmin Sabparie** **Universiti Malaysia Sarawak, Malaysia** Endophytic *Trichoderma* Spp. as biocontrol agents against *Phytophthora capsici*, *Pyricularia oryzae*, and *Fusarium verticillioides.*	**1500 – 1515** Speaker YR 3.3 **Mrs. Wan Nur Syakilla Wan Ahmad Nasri** **Universiti Teknologi MARA, Malaysia** Neurotoxicity effects of antarctic soil fungi on differentiated SH-SY5Y human neuroblastoma cells.

1515 – 1530 Speaker YR 1.4 **Mr. Muhammad Hezreef Arif Mohd Kamarul Arif Pang** **Universiti Kebangsaan Malaysia, Malaysia** Development of modular CRIPSR/dCas13a platform for programmable RNA knockdown in bioengineered bacterial chassis.	**1500 – 1515** Speaker YR 2.5 **Mr. Muhammad Syahmi bin Mohd Zaid** **Atta-ur-Rahman Institute for Natural Product Discovery, Malaysia** Epigenetic modifications in soil fungi for anti-biofilm activity against oral pathogen, *Streptococcus mutans.*	**1515 – 1530** Speaker YR 3.4 **Ms. Nur Afiqah Ali** **Universiti Malaysia Sarawak, Malaysia** Utilization of chicken eggshell-derived catalyst as eco-friendly alternative for biodiesel production.
1530 – 1545 Speaker YR 1.5 **Mr. Oluwasola Michael Akinola** **Universiti Putra Malaysia, Malaysia** AptamerGen: deep learning framework for designing multi-target aptamers against digestive enzymes.	**1515 – 1530** Speaker YR 2.6 **Ms. Koonsirin Buraphan** **King Mongkut's University of Technology Thonburi, Thailand** Characterization of plant growth-promoting bacteria from mungbean root nodules in Thailand and their biofertilizer potential.	**1530 – 1545** Speaker YR 3.5 **Mr. Hazlam Shamin Ahmad Shaberi** **Universiti Kebangsaan Malaysia, Malaysia** Engineering *Synechocystis sp*. PCC 6803 for phototrophic production of psychrophilic polyethylene terephthalate hydrolase.
1545 – 1600 Speaker YR 1.6 **Ms. Ponnhmalar Subramaniam** **Universiti Kebangsaan Malaysia, Malaysia** Protein analysis of Wharton's Jelly mesenchymal stem cell secretome under hypoxic and normoxic conditions: potential for cell-free therapy in atopic dermatitis.	**1530 – 1545** Speaker YR 2.7 **Mr. Yusuf Ibrahim Sadisu** **King Mongkut's University of Technology Thonburi, Thailand** Potential of *Bacillus subtilis* 55-7 from Thailand as a dual function biofertilizer and biocontrol agent.	**1545 – 1600** Speaker YR 3.6 **Mr. Aisamuddin Ardi Zainal Abidin** **Sunway University, Malaysia** Could SmTCL-1 Long Terminal Repeats (LTR) Retrotransposons in symbiont algae symbiodinium be the key to saving corals from global warming?
1600 – 1615 Speaker YR 1.7 (Online) **Mr. Hassan Mohammed Sani** **Universiti Putra Malaysia, Malaysia** Optimising *Tetragenococcus halophilus* Growth for Enhanced Probiotic Feed in Red Hybrid Tilapia: Impacts on Health and Growth Performance.	**1545 – 1600** Speaker YR 2.8 **Mr. Mohammad Ali Zaber** **Chattogram Veterinary and Animal Sciences University, Bangladesh** Modulating acrylamide precursors through nutrient based strategies to control acrylamide formation in potato chips.	**1600 – 1615** Speaker YR 3.7 **Mr. Faisal Amir** **National Yunlin University of Science and Technology, Taiwan** Hydrothermal liquefaction of agricultural waste and aquatic biomass: a sustainable approach to biochar and biofuel production.
1615– 1630 Speaker YR 1.8 (Online) **Ms. Rathi Devi Nair Gunasegavan, Malaysia** Biogenic synthesis, characterization and biological activity of zinc oxide nanoparticles from red dragon fruit peels.	**1600 – 1615** Speaker YR 2.9 **Ms. Iwana Zainudin** **Universiti Putra Malaysia, Malaysia** Surface charge engineering of microbial esterase for enhanced performance in acidic conditions.	**1615– 1630** YR Speaker 3.8 **Ms. Siti Farah Hanim Alhafiz** **Universiti Putra Malaysia, Malaysia** Evaluating *Nannochloropsis* sp. as a functional feed additive for Lates calcarifer Asian Sea Bass: growth performance and immunomodulatory effects.
1615– 1645 Afternoon Tea Break (Foyer, First Floor)		

1645 – 1730

Closing and Awards Reception Ceremony

Closing Speech

Assoc. Prof. Ts. Dr. Mohamad Faizal Ibrahim
Universiti Putra Malaysia, Malaysia

Award Presentation
(Mesmera Ballroom 1, First Floor)

Day 4
30 July 2025

0730 – 1530

Excursion

Join us for an exciting excursion around Kuala Lumpur, featuring stops at Tugu Negara (National Monument), Masjid Negara (National Mosque), the historic Old KL Railway Station, Merdeka 118 Tower, Central Market, Merdeka Square, the iconic Sultan Abdul Samad Building, and KL Tower!

Poster Sessions

Session 1	28 July 2025
P 1.1	**Ms. Nur Raihan Aqilah Binti Mohammad Azmin** **Universiti Teknologi MARA, Malaysia** Exploring Phytochemicals of Endophytic Actinomycete Extracts using Liquid Chromatography Tandem Mass Spectrometry Data Analysis
P 1.2	**Mr. Mohamad Izwan Dzulkifli** **Malaysian Agricultural Research and Development Institute, Malaysia** Influence of Alginate Concentration on Enumeration and Characterization of Probiotic Microbeads for Poultry Feed Additives
P 1.3	**Prof. Dr. Su-Der Chen** **National Ilan University, Taiwan** Effect of soaking and radio frequency roasting processing on germinated buckwheat tea
P 1.4	**Mr. Kim Haram** **Dankook University, South Korea** D-Lactate Assessment for Ensuring the Safe Use of Microorganisms as Food Ingredients
P 1.5	**Mr. Chae Yeongjae** **Dankook University, South Korea** Genome Sequence Analysis of Enterococcus faecalis and Its Functional Probiotic Potential
P 1.6	**Mr. Jun Won Oh** **Korea University, South Korea** Green Bioprocess for Uroporphyrin I Production: Red Algae Saccharification and Microbial Transformation by *Corynebacterium glutamicum*
P 1.7	**Mr. Wu-Young Jeong** **Korea University, South Korea** Biosynthesis of Designer Metalloporphyrin through Programmable Porphyrin Production using Modular Cell Factory
P 1.8	**Mr. Dong-hyeok Hwang** **Korea University, South Korea** Modular Oligo-Transport Integration for Promoting Algal Sugar Assimilation and Porphyrin Production
P 1.9	**Mr. Tomonori Koga** **Kyushu University, Japan** Development of quantitative metabolic analysis methods using kinetic model in a complex microbial system
P 1.10	**Assoc. Prof. Dr. Yukihiro Tashiro** **Kyushu University, Japan** Establishment of Two-Stage Meso- and Thermophilic Anaerobic Digestion of Food Waste for Methane production
P 1.11	**Mr. Tan Ingram** **Kyushu University, Japan** A Self-Assembled Peptide Nanofibers for Enhanced Intratumoral Penetration
P 1.12	**Prof. Dr. Chia-Hung Kuo** **National Kaohsiung University of Science and Technology, Taiwan** Efficient extraction and physicochemical characteristics of soy protein from soybean meal
P 1.13	**Assoc. Prof. Dr. Jung-Chin Tsai** **Ming Chi University of Technology, Taiwan** Immobilization of Carbonic Anhydrase on Functionalized Regenerated Cellulose Nanofiber Membranes for Carbon Dioxide Capture and Mineralization
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Participant only

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PLENARY SPEAKER 1

Prof. Dr. Noriho Kamiya

Kyushu University, Japan

Engineering Biomolecules via Biocatalysis for Sustainable Biomanufacturing

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Abstract: A variety of biomolecules, essential components of life, have been used in various sectors of the bioindustry. Engineering of biomolecules from chemical and physical point of view is of great interest because it expands the molecular potential in biotechnology. Toward sustainable biomanufacturing, we are interested in applying enzyme-catalyzed reactions to a variety of biotechnological fields. In particular, we have exploited microbial transglutaminase (MTG), an enzyme that catalyzes the formation of covalent bonds between Gln and Lys residues, to obtain a variety of functional bioconjugates, such as lipid-protein conjugate as artificial antifungal protein and antibody-drug conjugate as an example of biopharmaceuticals. We have also been interested in integrating enzyme-catalyzed hydrogelation and fluorescence-activated droplet sorting (FADS) technology into high-throughput screening (HTS) of mammalian cells with enhanced protein secretion capability. This FADS system is also applicable to the HTS of recombinant MTG produced by cell-free protein synthesis. Finally, we have developed a sustainable protein production platform based on silkworm bioresources. Overall, the use of biocatalysis provides unique opportunities to design new functional biomolecules that should be supported by sustainable biomanufacturing.

Keywords: Bioconjugation; Biopharmaceutical; Insect biorefinery; Lipid; Transglutaminase.

PLENARY SPEAKER 2

Prof. Dr. Yu-Kaung Chang

Yuan Ze University, Taiwan

Recent Advances in Electrospun Nanofiber Membranes for Protein Purification, Enzyme Immobilization, and Environmental Remediation

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Abstract: A novel electrospun polyacrylonitrile (PAN) nanofibrous membrane with enhanced antimicrobial properties was developed through a multi-step functionalization process. Initially, the PAN nanofiber membrane underwent alkaline hydrolysis, followed by chitosan (CS) grafting to form a modified CS nanofiber membrane (P-COOH-CS). The modified membrane was further functionalized with different dye molecules, creating P-COOH-CS-Dye membranes. Finally, poly (hexamethylene biguanide) hydrochloride (PHMB) was immobilized to produce P-COOH-CS-Dye-PHMB. Comprehensive physical characterization was conducted on all synthesized nanofibrous membranes, and their antibacterial performance was systematically evaluated. Under optimal synthesis conditions, P-COOH-CS-Dye-PHMB demonstrated nearly 100% antibacterial efficiency against high concentrations of Escherichia coli. Additionally, the membrane exhibited excellent durability, maintaining its antibacterial efficiency with only a 5%–7% reduction after five wash cycles. These findings highlight the potential of P-COOH-CS-Dye-PHMB as a highly effective and reusable antibacterial nanofibrous membrane, suitable for applications in the textile, medical, and food industries.

Keywords: Electrospun nanofiber membrane, Antibacterial efficiency, Reactive dyes, Chitosan functionalization, Poly (hexamethylene biguanide) (PHMB), Wash durability.

Keynote 1.1

Prof. Dr. Duk Jae Oh

Sejong University, South Korea

Development of DMSO-Free, Serum-Free Chemically Defined Cryopreservation Media for Mammalian Cells

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Abstract: DMSO (dimethyl sulfoxide) is the most commonly used cryoprotective agent. However, the use of DMSO is somewhat controversial as studies have shown that it affects cell viability and gene expression particularly in stem cells. In this study, chemically-defined cryopreservation media for CHO cells and HEK293 cells are developed without the use of DMSO and animal derived components such as serum. Cryoprotective candidates that can possibly prevent cell damage during cryopreservation process are screened and evaluated systematically. And candidate substances were largely classified into mainly cell-penetrating cryoprotective agents, polymers, and antioxidants. These can regulate intracellular or extracellular ice formation and minimize physical damage to cells by regulating osmotic pressure buildup across the cellular membrane. Recently, since it has been suggested that the chemical damage by ROS generation should be suppressed for effective cryopreservation, the additional supplementation of antioxidants in the freezing media has been also considered. We used Plackett-Burman design, and general full factorial design to develop and optimize serum-free, chemically defined formulations comparable to DMSO containing cryopreservation medium. We have identified cell membrane-permeable (or penetrating) substances that have the key roles to replace DMSO and other effective cryoprotective substances, and optimized the formulation of cryopreservation media. When compared with commercially available DMSO-free cryopreservation media, the developed in-house DMSO-free cryopreservation media showed competitive performance particularly in cryopreservation of CHO and HEK293 cells. The feasibility of newly developed cryopreservation media were evaluated for long-term study up to 9 months. The strategy used in this study can be applied for the development of cryopreservation media for therapeutic cells, where more non-toxic, long-term stable, ready-to-use cryopreservation media are requested.

Keywords: DMSO (dimethyl sulfoxide); cryopreservation medium; cell freezing; serum-free.

Keynote 1.2

Assoc. Prof. Dr. Suchada Chanprateep Napathorn

Chulalongkorn University, Thailand

Valorisation of Organic Waste for Sustainable Polyhydroxyalkanoate Production: Advancing the Circular Economy and Environmental Sustainability

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Abstract: Biodegradable plastics have been developed as sustainable alternatives to conventional synthetic plastics, addressing the growing environmental concerns associated with non-biodegradable, petrochemical-derived plastics. Derived from renewable resources, biodegradable plastics can be fully degraded into fundamental components such as H_2O, CO_2, and non-toxic small organic compounds. Their key advantages include the utilization of renewable feedstocks, inherent biodegradability, and competitive technological properties, making them a promising solution for sustainable development. Among biodegradable plastics, polyhydroxyalkanoates (PHAs) have been recognized as a sustainable and eco-friendly bioplastic, offering an excellent alternative to conventional synthetic plastics. However, the high production costs associated with raw materials and downstream processing pose challenges to the commercialization of PHAs. To align with sustainable development goals (SDGs) and the bio-circular-green (BCG) economy, the valorisation of organic waste presents a viable approach to addressing both societal and economic concerns. Southeast Asian countries generate abundant organic waste, which, coupled with their diverse microbial ecosystems, provides an opportunity for sustainable bioplastic production. In our study, we applied an in-house screening method to identify thermotolerant and thermophilic bacteria capable of PHA production from organic waste sources such as crude glycerol, cassava pulp, and super sorghum sap. Additionally, we initiated preliminary research on utilizing C1 carbon sources. We also investigated PHA degradation capabilities and PHA-degrading enzyme activity, which will help pave the way for future advancements in biological upcycling of PHAs after disposal. The newly isolated bacterial strains have been preserved in the department's culture collection and will subsequently undergo whole-genome sequencing. Our findings contribute to the development of cost-effective and sustainable bioplastic production, offering insights into microbial-driven PHA production and degradation pathways to support environmental sustainability and waste valorisation efforts.

Keywords: Biodegradable plastics; polyhydroxyalkanoates; organic waste valorisation; biological upcycling; sustainability.

Keynote 2.1

Prof. Dr. Ni Nyoman Tri Puspaningsih

Universitas Airlangga, Indonesia

Bioproduction of Exogenous Feed Enzyme (EFE), Reducing the Food Loss and Waste

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Abstract: The climate crisis on earth has an impact on climate change, pollution, and biodiversity loss. The climate change underscored the tangible impact on the health of humans, animals, plants, and microbial biodiversity especially during COVID-19 pandemic in 2020. Indonesia through Ministry of National Development Planning has prioritized circular economy in the long-term development plan 2025 – 2045 as a policy direction in green economy implementation. Circular economy is an economic model which aims to minimise resource use, design value of products as long as possible, and return the residues from production and consumption into the product cycle. Its approach consists of 9Rs (refuse, rethink, reduce, reuse, repair, refurbish, remanufacture, recycle, and recover). Universitas Airlangga is part of Asean BCG Network also support the circular economy in Indonesia, specially to reduce the food loss and waste. UCoE-Research Center for Bio-molecule Engineering (BIOME), Universitas Airlangga established the teaching industry of excelzyme to convert the agro-industrial biomass waste to be more added-value material as raw material for bioenergy, animal feed, prebiotic, and organic-fertilizer. Excelzyme (National patent No. IDM000293741 in 2011 extended 2021) is groups of local lignocellulolytic enzyme with several biochemical properties of thermophilic, alkalophilic, and halophilic. Three variants of excelzyme have also established as XfeedZyme (National patent, No. IDM001283576) as exogenous feed enzyme for poultry and ruminant feed, BleachZyme (National patent No. IDM001297274) as biocatalyst for ink removing recycling paper, and AgroTechZyme as biocatalyst for composting the organic fertilizer and extracting the crude palm oil residue. Cost-effective production of recombinant enzymes is crucial for biotechnology industries. Teaching industry of excelzyme has successfully developed the effective and efficient production of XFeedZyme using 10, 20, and 200 litre bioreactor. The fermentation technique used modified chemically defined medium, non-IPTG inducer, and fed-batch fermentation system, respectively.

Keynote 2.2

Assoc. Prof. Dr. Shaza Eva Mohamad

Universiti Teknologi Malaysia, Malaysia

Microalgae as a Source of Innovation for Sustainable Bioproducts and Clean Technologies

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Abstract: Rapid improvements in biorefinery technology, new regulatory directives, product quality constraints, and the production efficiency have necessitated the development of more advanced and powerful downstream bioprocesses for biotechnology and biopharmaceuticals as well as bioenergy industrial. This has transformed in dramatically improvements in traditional biorefinery processes as well as the development of entirely new approaches. In this talk, I will highlight some of these recent advances. This includes extractive technology, e.g., extractive fermentation, extractive bioconversion liquid biphasic system, liquid biphasic flotation system, and newly developed liquid biphasic flotation assisted with ultrasound, microwave, electricity etc. Alcohol/salt liquid biphasic flotation (LBF) system with aid of ultrasonication which have the ability of killing two birds with one stone, it not only capable in cell rupturing, it also able to recover bioproducts simultaneously and continuously. The effect of varying crude feedstock concentration, flotation time, type of salt, concentration of salt, type of alcohol, concentration of alcohol, initial volumes of salt and alcohol were investigated. The type of low molecular weight aliphatic alcohols include methanol, ethanol, 1-propanol and 2-propanol, whereas the type of salts tested were dipotassium hydrogen phosphate (K_2HPO_4), magnesium sulphate ($MgSO_4$), ammonium sulphate ($(NH_4)_2SO_4$) and potassium dihydrogen phosphate (KH_2PO_4). The optimal condition for the microalgae protein extraction was achieved with ammonium sulphate at 250 g/L, 2-propanol at 60 % (v/v), $V_{R,initial}$ of 1.0, crude biomass load of 20 g/L, air flowrate of 4 mm^3/min and flotation time of 10 min. The recycling of phase components was also introduced to minimize the use of alcohol and salt in the corresponding LBF. It was demonstrated that top phase (alcohol) recycling can achieve increasing performance for three consecutive recycling runs. Under optimized process conditions, the proportion of protein recovered in the top phase was 88.86 % for the third recycle run in microalgae recovery studies.

Keynote 3.1

Prof. Dr. Penjit Srinophakun

Kasetsart University, Thailand

Potential of Non-edible Oils for High-quality Bio-lubricants Production

Penjit Srinophakun & Kritpornpawee Pindit

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Abstract: Urging an awareness of global warming and environmental impact, bio-lubricants are of interest and call attention worldwide due to less toxic and biodegradability compared to petroleum-based lubricant. Vegetable oils have high lubricity, viscosity index, flash point and low evaporation rate but facing food-feed-fuel controversial. Nevertheless, vegetable oil cannot apply wide applications in substation of petroleum lubrication unless some properties are improved. As a result, five-step molecular modification was used in this study to make vegetable oils higher viscosity index, flash point, oxidation stability and lower pour point. The modification needs to be done at the double bonds position of fatty acid molecules. Therefore, unsaturated fatty acid oil was preferred and this investigation carried out the modification of jatropha as a show case. In fact, the unsaturated fatty acid composition of jatropha and rubber seed oils is approximately 80% and they are non-edible oil which avoids the food deficiency issue. The study performed hydrolysis, urea crystallization, epoxidation, epoxide ring-opening and esterification. After the reactions, bio-lubricant from jatropha oil had 28.95 cSt viscosity at 40 °C, 7.23 cSt viscosity at 100 °C, 168.94 viscosity index, less than -18 °C pour point and 226 °C flash point which met the ISO VG 32 for hydraulic fluid. Then the process of bio-lubricant production was designed using ASPEN simulator for 1,000 L product. With the price of unit operations and utilities in Thailand, it was found that the project was feasible for investment with the net present value of 12.60 million Baht, internal rate of return of 15.2% and the payback period of 4 years and 3 months.

Keynote 3.2

Prof. Dr. Yu Shen Cheng

National Yunlin University of Science and Technology, Taiwan

Insect Biorefinery as a Practical Platform for Achieving SDGs and BiCRS

Yu-Shen Cheng[1]*, Cheng-Hsuan Hsu[1,2], Shu-Hui Liu[3], Chi-Wen Lin[2,3], and Tzung-Han Chou[1]

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Abstract: As the global push for carbon neutrality intensifies, scalable and sustainable carbon removal solutions are urgently needed. This presentation introduces an advanced insect biorefinery platform that supports both Biomass Carbon Removal and Storage (BiCRS) and the United Nations Sustainable Development Goals (SDGs). Using black soldier flies (*Hermetia illucens*) and mealworms (Tenebrio molitor), the system converts agro-industrial residues—such as mushroom stems and vegetable pulp—into a suite of low-carbon products, including protein-rich animal feed, biochar, microbial bioplastics, nanoemulsion biodiesel, and sustainable construction materials. The modular system integrates AI-assisted insect cultivation, automated processing, and downstream applications like microalgae-based CO_2 capture and microbial electrosynthesis. Life cycle assessment (LCA) shows a carbon reduction potential of up to 2.5 tons CO_2e per ton of waste, with over 70% carbon fixation efficiency. This insect biorefinery demonstrates a replicable model for net-zero transitions, aligning technological innovation with circular resource use. It highlights a practical pathway for climate action, waste valorization, energy transition, and carbon credit generation—directly supporting SDG targets in agriculture, climate, energy, and sustainable production.

Keyword: Insect Biorefinery; Life cycle assessment; Sustainable development goals; Biomass Carbon Removal and Storage; Agroindustrial wastes.

Keynote 4.1

Prof. Dr. Sung Ok Han

Korea University, South Korea

Towards a Green Platform: Sustainable Porphyrin Biosynthesis in *Corynebacterium glutamicum* for Multifunctional Use

Myeong-Eun Lee[1,2], Byeong-Hyeon Cho[1], Jun Won Oh[1], and Sung Ok Han[1,2,*]

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Abstract: Porphyrins consist of four pyrrole rings with a delocalized π-electron system and can coordinate metal ions at their core. They function as essential prosthetic groups in fundamental biological processes such as respiration, photosynthesis, and various enzyme-catalyzed reactions. Uroporphyrin I (UP I), coproporphyrin III (CP III), and protoporphyrin IX (PP IX) were selected as representative functional porphyrins. First, to enhance the production of the key precursor 5-aminolevulinic acid (5-ALA), genes from the C4 and C5 pathways (*hemA*, *hemL*, and *alaS*) were introduced, along with *dtxR*, a regulatory gene that activates porphyrin biosynthesis. Second, optimization of intermediate genes involved in porphyrin production was performed through combinatorial gene expression and codon usage optimization, leading to the highest porphyrin yields. Third, to increase the intracellular NADPH pool, multiple cofactor regeneration strategies were implemented, resulting in up to a 1.57-fold increase in porphyrin production. Fourth, fed-batch fermentation enabled porphyrin production to reach a maximum concentration of 2.1 g/L. Fifth, for application development, antibacterial assays, photosensitive membrane tests, and sunscreen efficacy evaluations were conducted. These tests demonstrated over 90% antibacterial activity, a favorable sun protection factor (SPF), and broad UV-A absorption. Finally, to establish a green production platform, whole-cell biocatalysts and microbial cell factories capable of utilizing biomass waste such as agricultural and food processing residues were developed. By evaluating saccharification efficiency, these engineered strains were able to grow on biomass-derived sugars and produce valuable compounds, thereby converting biomass waste into fermentable sugars and bio-based products. The integration of biomass saccharification with porphyrin biosynthesis presents a promising route for a sustainable, industrially viable bioprocess with broad application potential.

Keyword: Porphyrins biosynthesis, Antibacterial activity, Photosensitive membrane, Sunscreen efficacy, Biomass waste valorization, Green platform.

Keynote 4.2

Prof. Dr. Mohd Shukuri Mohamad Ali

Universiti Putra Malaysia, Malaysia

Evolution-Driven Protein Engineering: Insights from Reconstructed and Cold-Active Lipases of Family I.3

Mohd Shukuri Mohamad Ali

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Abstract: Lipases from bacterial Family I.3 are characterized by unique amino acid sequences and specialized secretion mechanisms, yet the evolutionary forces shaping their structural and functional diversity remain largely unexplored. This talk presents an integrated study combining evolutionary reconstruction, molecular simulation, and structural analysis to reveal how sequence divergence has driven biocatalytic adaptation across time and temperature extremes. To investigate this, a phylogenetic analysis of 83 bacterial lipase sequences sharing ≥30% identity with cold-active AMS8 lipase from Antarctic Pseudomonas sp. was performed. Ancestral sequence reconstruction (ASR) was used to infer the last universal common ancestor (LUCA) of Family I.3. The LUCA gene was synthesized, expressed in E. coli, and refolded from inclusion bodies. Biochemical characterization revealed a thermostable enzyme with optimal activity at 70 °C and pH 10. LUCA also retained activity in the presence of metal ions and tolerated up to 25% (v/v) organic solvents—highlighting its industrial potential. Complementing this, a molecular dynamics (MD) and small-angle X-ray scattering (SAXS) approach was applied to characterize AMS8 lipase, which is highly flexible and challenging to crystallize. SAXS-derived ab initio models confirmed a monomeric structure, aligning well with homology models across MD simulations. The stable N-terminal and flexible C-terminal regions suggest structural adaptation to cold environments. Together, these insights reveal how evolutionary trajectories shape enzyme properties and demonstrate how ASR, MD, and SAXS can be synergistically employed for rational enzyme engineering. Such evolution-driven strategies enable the development of robust biocatalysts tailored for industrial applications under extreme conditions.

Keynote 5.1

Assoc. Prof. Dr. Madihah Md Salleh

Universiti Teknologi Malaysia, Malaysia

Removal of Phenolic Compound from Oil Palm Fronds Improvement of Biobutanol Production by locally isolated *Clostridium acetobutylicum* species

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Abstract: Oil Palm Frond (OPF) juice has been the focus of Malaysian bioenergy producers through acetone-butanol-ethanol (ABE) fermentation. However, due to the high concentration of phenolic compounds in the hydrolysate, usually gallicacid and ferulic acids, the fermentation medium turns acidic which hinders the growth of most microorganisms. A suitable method of phenolic compound removal with a minimal effect on the sugar stability of OPF juice has been employed using Amberlite XAD-4 resin. During the detoxification process, the effects of temperature and pH on the removal of phenolic compounds and sugar stability were also assessed. The Amberlite XAD-4 resin managed to adsorb about 32% of phenolic compound from the OPF hydrolysate at an optimum temperature of 50 °C and hydrogen ion concentration (pH) of 6. In addition, it maintained as much as 93.7 % of the sugar in the OPF juice. The effect of detoxifying OPF hydrolysate was further tested for biobutanol production in batch culture using strain *Clostridium acetobutylicum* SR1, L2, and A1. Strain L2 gave the highest improvement in biobutanol and total solvent production by 22.7% and 14.41%, respectively, in medium with detoxified OPF juice. Meanwhile, compared to non-detoxified OPF juice, the acid production of strain L2 significantly decreased by 2.99-fold when using detoxified OPF juice, despite a 1.2-fold increase in sugar consumption. Conclusively, using Amberlite XAD-4 resin to detoxify OPF hydrolysate at pH 6 and 50 °C removed the phenolic compound while increasing the strain L2 capability to improve biobutanol and total solvent production.

Keywords: ABE Fermentation, Biobutanol, Detoxification, Phenolic Compounds, Oil Palm Frond Hydrolysate

Keynote 5.2

Assoc. Prof. Dr. Siti Sarah Othman

Universiti Putra Malaysia, Malaysia

Innovating STEM Education from Lab to Market

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Abstract: This keynote shares the journey of a molecular biologist and academic from a leading Malaysian university who transformed a research-based solution into an impactful STEM education enterprise. The need for accessible, hands-on science learning during the pandemic inspired the development of a home-based DNA experiment kit to help students and teachers continue exploring molecular biology despite school closures. What began as an outreach tool quickly gained traction, leading to the formation of EDSTEM SDN BHD—a startup focused on making STEM learning engaging and accessible through locally developed education kits, science camps, and teacher empowerment programmes. This keynote address explores how academic research can be translated into real-world applications that bridge gaps in science education, promote scientific literacy, and nurture future innovators. It also reflects on the challenges and opportunities faced in transitioning from a university setting to entrepreneurship, particularly in the Asian context, where cross-sector collaboration is essential. The talk aims to inspire academics to extend the impact of their research beyond the lab, encourage students to view science as a tool for community change, and engage industry stakeholders in supporting inclusive, scalable STEM solutions. Ultimately, this session advocates for a shift in mindset—one where biotechnology innovation serves not only industrial advancement but also the broader goal of equipping the next generation with the curiosity, skills, and confidence to shape the future.

Keywords: STEM Education; STEM Startup; Inquiry-based learning; Science Outreach; Community Engagement; Research Commercialisation;.

Keynote 6.1

Assoc. Prof. Dr. Zetty Norhana Balia Yusof

Universiti Putra Malaysia, Malaysia

Harnessing Malaysian Seaweed Potential: A Sustainable Solution for Crop Health and Enhanced Production

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Abstract: Fungal phytopathogens globally threaten crop yields and quality, impacting food security. In oil palm, *Ganoderma boninense* causes significant losses, prompting reliance on environmentally harmful synthetic chemicals. This project explores Malaysian seaweed extracts as a sustainable solution, leveraging their documented antifungal and biostimulatory properties. Seaweed extracts are known to have growth-stimulating activities in crop production. This research investigates the potential of local seaweed extracts, including *Caulerpa* and *Sargassum* species, for disease management in oil palm, and has further expanded protective action to chili plants and brinjals as well. The extracts were screened for antifungal activity against *G. boninense* and the yield and quality of the crops. Dichloromethane extracts of certain *Caulerpa* species exhibited promising antifungal action. The project also explores the formulation of seaweed-based antifungal/biostimulant products and assesses the cultivation potential of the selected seaweeds. This work aims to promote greener, safer practices for stress and disease mitigation not only in oil palm cultivation but also for other food crops and vegetables, contributing to the Sustainable Development Goals of zero hunger, responsible consumption, and production.

Keywords: Antifungal; biostimulant; crops; oil palm; seaweeds;.

Keynote 6.2

Assoc. Prof. Dr. Antonio Di Martino

Tomsk Polytechnic University, Russia

Novel Food Packaging Material Based on The Lignin and Starch From The Sugar Palm Arenga Pinnata Fibers

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Abstract: In the food industry, packaging is essential to keeping goods safe, fresh, and attractive to customers. Nevertheless, it is impossible to overlook how packaging affects the environment. For decades, traditional packaging materials—especially plastic—have served as the foundation of the food industry as they offer advantages like cost-effectiveness, durability, and adaptability. However, there is a substantial environmental cost associated with these benefits. Southeast Asian nations including Malaysia, Thailand, Vietnam, the Philippines, and Indonesia are homes to the sugar palm *Arenga pinnata* tree, which significantly boosts local economies and agricultural sustainability. Fibres found in sugar palm stems are a source of biomass that includes cellulose, hemicellulose, and lignin—all of which are extremely useful biopolymers. Furthermore, the use of sugar palm starch as a raw material for packaging shows great promise in lowering environmental contamination from non-biodegradable packaging waste. The research project's objective was to use lignin and starch obtained from the sugar palm tree to generate a biofilm that would serve as a suitable substitute for conventional food packaging materials. The biofilm was made by solvent casting, and in addition to its chemical structure, surface characteristics, and UV shielding ability, its thermal, mechanical, morphological, and antioxidant properties were assessed. The significance of lignin as an addition in the biofilm generated by starch has been demonstrated. The findings show that the addition of lignin enhanced the biofilm's mechanical and thermal response as well as its ability to block UV light. Additionally, lignin increased the antioxidant activity of the starch biofilms, which is crucial for maintaining the food's quality. According to the present research, lignin isolation and combination with sugar palm starch can be used as starting components to produce packaging materials that have a minimal negative impact on the environment while raising the value of sugar palm fibres.

Keywords: Sugar Palm; Lignin; Starch; Biofilm; Food Packaging.

Invited 1.1

Dr. Nurriza Ab Latif

Universiti Teknologi Malaysia, Malaysia

Integrating In Silico and In Vitro Strategies to Unlock Nature's Therapeutic Potential

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Abstract: This study presents an integrated *in silico–in vitro* strategy to evaluate the therapeutic potential of natural compounds targeting oral biofilms, leukemia, and breast cancer. Molecular docking using AutoDock Tools and Discovery Studio predicted interactions between selected phytochemicals such as essential oil constituents, *Kappaphycus alvarezii* extract, and *Acalypha indica* flavonoids with key protein targets (e.g., *Streptococcus mutans* GtfC, PI3K/JAK2, FASN thioesterase domain). Binding energy (ΔG) and inhibition constant (K_i) calculations identified promising candidates including cinnamyl acetate, kulactone, and rutin. Experimental validation confirmed the computational predictions: (1) lavender/cinnamon oil mouthwash achieved 64.6% biofilm reduction against *S. mutans*; (2) *K. alvarezii* extract yielded kulactone and 6-aldehydoisoophiopogonone A as potential PI3K/JAK2 inhibitors; and (3) *A. indica* flavonoids (IC_{50} = 38.23 µg/mL) showed cytotoxicity against MCF-7 cells, targeting FASN (fatty acid synthase). The integration of computational approach with experimental validation accelerates the discovery of natural product-derived therapeutics while enhancing mechanistic understanding. Results highlight the potential of natural compounds as alternatives to conventional antimicrobials and anticancer drugs, with future work needed to optimize pharmacokinetics and preclinical evaluation.

Keywords: Molecular docking; natural compounds; antibiofilm; anticancer;.

Invited 1.2

Assoc. Prof. Dr. Mohd Fauzi Mh Busra

Universiti Kebangsaan Malaysia, Malaysia

Multifunctional Natural-based Biomaterials Strategies for Cutaneous Tissue Engineering: Conventional Approach towards Bioconvergence 3D-Bioprinting

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Abstract: The management of skin wound healing is multifactorial, influenced by patient specific variables such as lifestyle, underlying health conditions, social support, wound etiology, and therapeutic strategy. In response to these complexities, tissue engineering and regenerative medicine have emerged as transformative fields, aiming to align clinical care with the paradigm of personalized and precision medicine. Although split-thickness skin grafts (SSG) remain the clinical gold standard for treating full-thickness skin injuries, they are associated with significant limitations—including donor site morbidity, limited autologous skin availability, and heightened risk of infection. These challenges are particularly pronounced in the treatment of extensive or chronic wounds, where delayed healing, infection, and excessive scar formation frequently result in treatment failure and increased mortality. To address these issues, our Functional Biomaterials Technology research group is dedicated to developing multifunctional, ready-to-use biomaterial-based solutions derived from sustainable, green resources. These biomaterials—such as collagen, gelatin, and cellulose—are engineered into diverse delivery formats incorporating natural bioactives, growth factors, and secretomes to enhance cutaneous regeneration. Our efforts are aligned with regulatory standards for local medical device approval, ensuring clinical readiness. Furthermore, we integrate both conventional and cutting-edge fabrication technologies to optimize product performance for various wound types. This comprehensive approach supports rapid, effective wound management strategies and represents a significant step toward future-ready, smart wound care therapies.

Keywords: Tissue Engineering & Regenerative Medicine; Bioinks; Advance Biomaterials; Functionalised Materials; Clinical Applications.

Invited 1.3

Prof. Dr. Awang Ahmad Sallehin Awang Husaini

Universiti Malaysia Sarawak, Malaysia

Fungal Laccase as a Green Biocatalyst: Advances in Production, Characterization, and Applications in Waste Valorization, Environmental Remediation, and Biopreservation

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Abstract: Laccase, a multicopper oxidase, is gaining prominence as a sustainable biocatalyst owing to its ability to oxidize a broad spectrum of phenolic and non-phenolic compounds using molecular oxygen. This study examines recent advancements in the production and biochemical characterization of fungal laccase, with a focus on strains isolated from white-rot, endophytic, and entomopathogenic fungi, under optimized fermentation conditions. The purified enzyme exhibited desirable kinetic parameters and thermal stability, making it suitable for industrial applications. The research further investigates the multifunctional potential of laccase in four key domains: (i) biodegradation and valorization of lignocellulosic agricultural waste, (ii) oxidative degradation of organic pollutants such as phenols and endocrine disruptors, (iii) decolorization of recalcitrant azo dyes from textile effluents, and (iv) biopreservation of wood and bamboo as a natural building material as well as furniture. Enzyme immobilization and mediator-assisted systems were evaluated to enhance operational efficiency and reusability. The findings demonstrate that laccase offers a viable green alternative to chemical catalysts, supporting sustainable waste management, environmental remediation, and material preservation. This work contributes to the broader integration of enzyme-based technologies into the circular bioeconomy and green industrial practices.

Keywords: Fungal laccase, Lignocellulosic, Bioremediation, Green technology, Circular bioeconomy.

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Invited 1.4

Assoc. Prof. Dr. Zazali Alias

Universiti Malaya, Malaysia

Current Status and Potential of Fern in Biological Research

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Abstract: There has been an increase in total number of fern species in Malaysia from 647 species to 859 extant species and is highest in Pahang and Johor and the least is in Perlis. 2 out of 4 endemic fern species with conservation status 'Extinct' are changed under 'Vulnerable' and 'Critically Endangered' as of 2021. The number includes both native and non-native ferns. Peninsular Malaysia's ferns expressed innumerable biological activities that are useful both in pharmacology and in other industries. Medicinal properties of Malaysia' ferns include antibiotic, antitumor, antiviral, antifungal, anti-metalotoxic, antipyretic, and antidiabetic properties, wound healing properties, and cholinesterase inhibitory activities that are useful for Alzheimer's Disease treatment. Other potentials of ferns are termicidal and anti-butyl-cholinesterase that are useful as bio-insecticides, tyrosinase inhibitory activity for depigmentation agents and anti-browning compound, antimicrobial and antioxidant activities for food packaging materials, allelopathic activity for bio-pesticides, antivibrio and antiparasitic activity for aquaculture parasite control, and lastly, heavy metal accumulating activity as bio-sensor. There are a few selections of extraction methods of bioactive compounds in ferns, the most common ones are methanol extraction and water extraction as these two are the most efficient in extracting different compounds of different polarity. In terms of progress on fern study, more effort to be put to catch up to the global research trends. Thus, studies should explore the potential of fern as source of biologically active molecules.

Keywords: antibiotics; biopesticides; biological properties; fern; inhibitors

Invited 2.1

Prof. Dr. Toshinari Maeda

Kyushu Institute of Technology, Japan

Effect of Photo Irradiation on Anaerobic Digestion of Waste Sewage Sludge

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Abstract: Since a large amount of sewage sludge (WSS) has been generated daily, it is necessary to explore effective methods for utilizing WSS. Although a photo-fermentation system sometimes alters the characteristics of microbial functions, there are no attempts to perform the photo-fermentation using WSS which is regularly treated under a dark-fermentation style. In this study, the effect of photo-fermentation (photo-irradiation) on anaerobic digestion using WSS was revealed. Photo-irradiation during the anaerobic digestion of WSS significantly reduced the amount of methane and hydrogen sulfide. Methane production was also suppressed at 13 days by 5.6-fold under the light whereas hydrogen sulfide was consumed almost completely at 6 days. However, it was shown that the activity of sulfate-reducing bacteria in WSS under the light treatment increased. Photo-irradiation also stimulated the growth of green-sulfur bacteria and induced anoxygenic photosynthesis, by which the fermented samples turned green linking with the consumption of hydrogen sulfide. The production of organic acids lowered in the samples irradiated by light. Finally, a dark/light switching fermentation was able to reduce only hydrogen sulfide while methane production remained almost the same. The amounts of methane and hydrogen sulfide were 35 mmol/g VS and undetected at 58 days in the samples with photo irradiation compared with the control samples showing whereas 37 mmol/g VS of methane and 15 ppm/g VS. Thus, the dark/light switching fermentation allows us to not only produce methane gas as a bioenergy source and but also consume hydrogen sulfide which is a corrosive gas.

Keywords: anaerobic digestion; dark-fermentation; photo-irradiation; methane production; hydrogen sulfide consumption;.

Invited 2.2

Assoc. Prof. Dr. Cahyo Budiman

Universiti Malaysia Sabah, Malaysia

Bioproduction, Engineering, and Phenol Removal Efficiency of Recombinant Tyrosinase from Shiitake Mushroom (*Lentinula edodes*)

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Abstract: Phenolic compounds are hazardous wastewater pollutants due to their toxicity, persistence, and carcinogenicity. Conventional chemical and physical treatment methods are commonly used but face challenges such as high operational cost, secondary pollution, and limited efficiency at low phenol concentrations. Thus, there is a growing need for safer and more sustainable alternatives. Tyrosinase offers a promising enzymatic approach for phenol bioremediation due to its substrate specificity and eco-friendly nature. While bacterial tyrosinases have been widely studied, fungal-derived tyrosinases, particularly from mushroom, remain underexplored, especially in recombinant form. This study aimed to produce recombinant tyrosinase from *Lentinula edodes* (shiitake mushroom), a species abundantly available in Sabah, and evaluate its catalytic activity for phenol removal in water. The tyrosinase gene was retrieved from GenBank, codon-optimized for *Escherichia coli*, and cloned into the pGEX-6P-1 vector. The full-length tyrosinase (Tyr-Edo) was successfully expressed in *E. coli* and purified, yielding a properly folded enzyme with catalytic activity against L-DOPA (0.53 U/mg). Tyr-Edo showed optimal activity at pH 6.0 and 45 °C, and effectively removed phenol, in aqueous system, in a concentration-, pH-, and temperature-dependent manner. Furthermore, directed evolution via error-prone PCR generated a mutant variant (mut-TyrEdo) with a 12-fold increase in L-DOPA catalytic activity and a 5-fold improvement in phenol removal efficiency. Altogether, this study highlights the potential of recombinant mushroom tyrosinase as a viable and environmentally friendly biocatalyst for phenol bioremediation, offering a promising solution for industrial wastewater treatment applications.

Keywords: Tyrosinase, Lentinula edodes, phenol bioremediation, recombinant protein

Invited 2.3

Ts. Dr. Nahrul Hayawin Zainal

Malaysian Palm Oil Board, Malaysia

Enhanced POME Polishing Using Activated Sludge with Suspended Media: A Tertiary Treatment Approach

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Abstract: Palm oil mill effluent (POME) final discharge contains a high amount of organic matter and suspended solids. This may harm the environment, especially if discharged to the watercourse without prior treatment. This study developed a treatment system using activated sludge with suspended packing media to treat POME final discharge at the tertiary pond. A pilot plant system with a capacity of 1000 L was used as a process tool to study the effects of hydraulic retention time (HRT) on the removal of biological oxygen demand after a three-day incubation (BOD_3) and chemical oxygen demand (COD) from the maturation pond. The BOD_3 and COD reduction increased by the day when the HRT increased. At the optimal conditions of HRT-4 day, the removal percentages of BOD_3 and COD were determined to be 91.1% and 69.8%, respectively, where the pollutant concentrations were below the standard requirement limit by the Department of Environment (DOE). The activated sludge process with the suspended packing media that has been developed can be used as an alternative POME polishing treatment since it is simple in process with low cost and maintenance.

Keywords: Palm oil mill effluent, tertiary treatment system, biological oxygen demand, chemical oxygen demand, total suspended solids

Invited 2.4

Dr. Kallaya Sritunyalucksana-Dangtip

National Center For Genetic Engineering And Biotechnology (BIOTEC), Thailand

Innovet AMR 2.0-ShrimpGuard Project: Development of Phage-Associated Formulation to Combat Antimicrobial Resistant *Vibrio* spp. in Cultured Shrimp

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Abstract: Shrimp aquaculture is significant for many developing countries, enhancing food security with a sustainable protein source and generating export revenue. However, the widespread use of antimicrobials to mitigate Vibriosis, coupled with inappropriate waste management, exerts constant pressure on microbial communities. This long-term exposure leads to increased antimicrobial resistance (AMR) and persistent bacterial dissemination in aquatic systems. To overcome this problem, the future of antimicrobials lies in the development of innovative bio-sourced molecules. The project "Innovet AMR 2.0-ShrimpGuard" granted by the International Development Research Centre (IDRC), Canada and the UK Department of Health and Social Care's (DHSC) Global AMR Innovation Fund (GAMRIF), aims to develop an innovative solution, combining Vibriophages and immune enhancers, as a method of choice to combat Vibriosis. This novel approach will serve as an alternative to traditional antimicrobials used in shrimp culture. The ShrimpGuard formulation will target specific bacterial killing mechanisms with bacteriophages and utilize non-specific activation of immunity to enhance shrimp health. Efficacy will be tested at laboratory and pilot levels in hatchery cultivation to optimize effectiveness and establish a practical protocol for real-world use, particularly in environments affected by climate change. The knowledge gained will be disseminated through seminar series to major stakeholders: the industrial sectors including farmers, feed companies, and processing plants; the ASEAN Network for Aquatic Animal Health Centers; and academic groups, including national and international research institutes and universities. The knowledge sharing sessions will focus on raising AMR awareness and exploring potential solutions, ShrimpGuard formulation as a sustainable alternative to traditional antimicrobials in shrimp farming. Additionally, platform development aimed at enhancing industry practices will be included. The project output is not only to provide the innovative solution to reduce antimicrobial use, but also to strengthen a multi-disciplinary and multi-sectoral network for evidence-based AMR policy in Thailand and other ASEAN low and middle-income countries.

Keywords: Antimicrobial resistance (AMR), ShrimpGuard, Shrimp farming, Vibriosis, Vibriophages, Sustainability of aquaculture

Invited 2.5

Dr. Nor Hasmaliana Abdul Manas

Universiti Malaysia Pahang Al-Sultan Abdullah, Malaysia

Laccase Immobilization on Biochar for Carbazole Degradation

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Abstract: Carbazole is a nitrogen-containing organic pollutant commonly found in wastewater and poses a serious threat to environmental health. Enzymatic bioremediation using laccase has gained attention as a sustainable and eco-friendly approach for its degradation. However, the practical application of free laccase is limited due to its low stability and high cost. This study explored the immobilization of laccase on rice husk biochar (RHB) to improve its operational stability and economic viability for environmental remediation. Three immobilization strategies were examined—adsorption, covalent bonding, and a combined approach—each employing different activation and cross-linking methods. Among these, the covalent bonding method demonstrated superior immobilization efficiency and enzyme reusability. Key process parameters, including contact time and concentrations of laccase and glutaraldehyde, were optimized to enhance immobilization performance. Kinetic and isotherm analyses suggested that both physisorption and chemisorption mechanisms were involved in the immobilization process. Although the immobilized enzyme exhibited slightly lower carbazole removal efficiency compared to its free counterpart, it retained a significant portion of its initial activity after repeated use. These findings underscore the potential of biochar-immobilized laccase as a robust and recyclable biocatalyst for the degradation of persistent organic pollutants like carbazole.

Keywords: Laccase; biochar; immobilization; glutaraldehyde; kinetics; optimization; carbazole; degradation; bioremediation;.

Invited 3.1

Prof. Ir. Dr. Juferi Idris

Universiti Teknologi MARA Sarawak, Malaysia

Steam-Activated Carbon from Coconut-Based Self-Sustained Carbonization Biochar for Gas Emission Treatment

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Abstract: Coconut industry produces a significant amount of coconut shell and husk waste, which has immense potential for a sustainable solution. This study explores the potential of self-sustained carbonization and steam activation to produce biochar and activated carbon which derived from coconut shell and husk biomass for gas emission treatment. Self-sustained carbonization was conducted in a pilot-scale brick reactor. The pilot-scale brick reactor was built with double-walls brick stones which acts natural heat insulator for the reactor. In self-sustained carbonization, coconut shell and husk biomass were transformed into coconut shell and husk biochar on its own using coconut shell and husk biomass as the fuel. The coconut shell and husk biochar produced by self-sustained process was then undergone steam activation to generate steam-activated carbon. To evaluate the effectiveness of temperature and time, a steam activation process system was designed for activated carbon production by setting the firing temperature of 600, 700, 800, and 900°C for 30 min and activation time of 60, 90, and 120 min at 800°C. All biochar from self-sustained carbonization and activated carbon from biochar generated by steam activation were undergo surface modification with methanol using orbital shaker twice at 130 r min-1 for 24 h. Activated carbon generated from the activation process and methanol modification were transferred into a stainless-steel adsorption column to evaluate the adsorption capacity and removal efficiency of carbon dioxide (CO_2). Self-sustained carbonization yielded 20.00 – 26.00% of coconut shell biochar and 12.00 – 15.00% of coconut husk biochar. The results indicated that the surface area and total pore volume of coconut shell and husk biochar produced by self-sustained carbonization was significantly enhanced by methanol modification process. After methanol modification, the surface area of coconut shell biochar increased from 1.54 ± 0.02 to 158.18 ± 0.67 m2 g-1, whereas the surface area of coconut husk biochar increased from 2.28 ± 3.23 to 92.21 ± 2.57 m2 g-1. Activated carbon from coconut shell biochar generated under 800°C, 0.20 MPa, 60 min of steam activation condition and methanol modification has the highest BET surface area (SBET :479.71 ± 6.50 m2 g-1), whereas activated carbon from coconut husk biochar generated under 800°C, 0.20 MPa, 120 min of steam activation condition and methanol modification has the highest BET surface area (SBET : 445.29 ± 8.31 m2 g-1), Modified activated carbon from coconut shell biochar stands out with a breakthrough time of 159 s, CO_2 adsorption capacity of 62.96 mg mg-1, and CO_2 removal efficiency of 99.97%. Meanwhile, modified activated carbon from coconut husk biochar exhibits a breakthrough time of 60 s, CO_2 adsorption capacity of 23.76 mg mg-1, and a high CO_2 removal efficiency of 99.52%. This study shows that the self-

sustained carbonization, steam activation, and methanol modification can produce carbon-rich adsorption material to mitigate greenhouse gas emissions, hence promoting sustainable solutions.

Keywords: Coconut Shell, Coconut Husk, Biochar, Activated Carbon, Self-Sustained Carbonization

Invited 3.2

Dr. Kuan Shiong Khoo

Yuan Ze University, Taiwan

Microalgae Biotechnology: Views in Upstream and Downstream Processing

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Abstract: Microalgae biotechnology has been extensively exploited in recent years due to their potential in producing various value-added compounds (e.g. proteins, lipids, carbohydrates and carotenoids) as an alternative bio-based products. The upstream processing of microalgae has also been explored for replacing wastewater management (i.e. bioremediation) which is considered a profitable method of carbon sequestration through the process of microalgae photosynthesis. For example, the concept of upcycling food waste with microalgae biotechnology demonstrated a practical strategy towards achieving net-zero waste over the life cycle of food waste management. Despite its challenges to scale up the overall cultivation conditions, the speaker will also share the possibilities to implement practical concept of Internet of Things (IoT) using monitoring and controlling sensors that were able to optimize the growth condition of microalgae in real-time. The speaker will also introduce the advancement of artificial intelligent (AI) with microalgae biotechnology, for instance, using collective data (either dataset or image) as input obtained from laboratory to further predict the experimental data for microalgae dry cell weight and other conditional output with high precision and accuracy.

Keywords: Microalgae biotechnology; food waste management; upcycling; internet of things; artificial intelligent;.

Invited 3.3

Assoc. Prof. Dr. Prakit Sukyai

Kasetsart University, Thailand

Upcycling Sugar Refinery Waste for Bone Tissue Engineering

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Abstract: This study explores the valorisation of sugarcane filter cake (SFC), an agro-industrial waste from the sugar refining process, as a sustainable source for the synthesis of hydroxyapatite (HA), a bioceramic widely used in biomedical applications. The synthesized HA was characterised and demonstrated physicochemical properties similar to natural bone minerals, with no observable cytotoxicity on MC3T3-E1 pre-osteoblast cells. Furthermore, a composite scaffold combining bacterial cellulose (BC), hydroxyapatite (HA), and polydopamine (PDA) was successfully fabricated. This BC/HA/PDA scaffold exhibited suitable morphology and promoted cell adhesion, indicating its potential for bone tissue engineering. The results confirm that agro-industrial by-products like SFC can be upcycled into high-value biomaterials, promoting both environmental sustainability and innovation in medical materials.

Keywords: Antimicrobial; Nano-encapsulation; Nanotechnology; Bioactive compounds.

Invited 3.4

Assoc. Prof. Dr. Wan Abd Al-Qadr Imad Wan Mohtar

Universiti Malaya, Malaysia

Bioreactor Dye-Eating Fungus (BioDeF) System

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Abstract: Conventional wastewater treatment approaches, while demonstrably effective, frequently prove to be financially burdensome and can potentially generate substantial adverse environmental consequences. Furthermore, the emergence of trace pollutants, encompassing substances such as microplastics, pharmaceutical residues, and various toxins, contributes to a decline in the overall efficiency of these conventional treatment processes. Filamentous fungi, exemplified by the Ganoderma genus, may present encouraging and hopeful opportunities for implementation within these applications. This bioremediation technology, also referred to as "ganoremediation," offers advantages both in terms of economic viability and a broader range of applications in wastewater treatment. In this current research, we highlight its capabilities and outline future research directions for ganoremediation utilizing bioreactors called Bioreactor-Dye Eating Fungus (BioDeF) system. Diversified research has demonstrated promising results with the removal of a wide range of organic and inorganic pollutants. In the near future, large-scale bioreactors harnessing the efficiencies of Ganoderma may facilitate the effective and comprehensive purification of wastewater.

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Invited 4.1

Dr. Ahmad Bazli Ramzi

Universiti Kebangsaan Malaysia, Malaysia

Bioengineering of bioplastic-producing microbes for plastic bio-upcycling applications

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Abstract: Abstract: Bioplastic-producing microbes are considered as industrially-important hosts for biotechnological production of biodegradable plastics using sustainable and renewable resources. Bioplastics specifically polyhydroxyalkanoates (PHAs) are produced using sugars, fatty acids added with co-substrates tailored for specific type of biopolymer accumulated in the microbial cells. With the advancement of microbial synthetic biology and metabolic engineering, PHA-producing hosts can be further genetically-modified to utilize non-natural substrates via the introduction of heterologous genes coding for the desired bioconversion process. Petroleum-derived synthetic plastics such as polyethylene plastics are being extensively studied as potential new feedstock for biological recycling and upcycling into value-added products via the assimilation of monomers derived from depolymerized plastics. To establish a streamlined strain development for plastic-tobioplastic production, this work employed microbial engineering strategies using *Cupriavidus necator* and Pseudomonas putida as the PHA-producing chassis. To this end, pSV-Ortho-PHA (pSVOP) expression platform was constructed to allow the production of recombinant PET hydrolase (PETase) in both bacteria using the same selected genetic parts. To test the effect of protein localization on PETase activity, several plasmid constructs were designed to either surface display or secrete the enzyme in engineered C. necator and P. putida strains. Using this orthogonal system, the highest activity was attained by recombinant PETase fused with native signal sequence (ss-PETase). The utility of this microbial synthetic biology platform will be further discussed pertinent to our present endeavors in the bioengineering of *C. necator* for the bioconversion and upcycling of low-density polyethylene (LDPE) plastic into PHA as the final products. The findings obtained from this study therefore highlight the feasibility of employing microbial engineering approaches in developing new fermentation routes for sustainable biomanufacturing applications.

Keywords: PHA-producing chassis; PET hydrolase; Orthogonal expression; Plastics bio-upcycling; Bioengineering; Biomanufacturing

Invited 4.2

Dr. Fina Amreta Laksmi

Research Centre for Applied Microbiology, National Research and Innovation Agency (BRIN), Indonesia

Advances in Protein Engineering of Extremozymes for Sustainable Food, Health, and Industrial Bioprocess Applications

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Abstract: The rising demand for robust biocatalysts that function effectively under extreme industrial conditions highlights the significant potential of enzymes derived from extremophiles, known as extremozymes, for use in food, health, and industrial biotechnology applications. Conventional enzymes derived from mesophilic organisms typically demonstrate restricted thermal and operational stability. In contrast, extremozymes possess enhanced thermostability and functionality in extreme environments, rendering them particularly valuable for diverse bioprocesses. The research group at the Center for Applied Microbiology Research, BRIN, investigates various classes of extremozymes, such as DNA polymerases, rare sugar isomerases, and therapeutic enzymes. Extremophilic DNA polymerases, including Taq, Pfu, Bst, and reverse transcriptases, are widely utilized in nucleic acid amplification technologies such as PCR, RT-PCR, LAMP, sequencing, cloning, and clinical diagnostics due to their remarkable thermostability, fidelity, and processivity. In the production of rare sugars, D-allulose 3-epimerase and L-arabinose isomerase facilitate the bioconversion of D-fructose into low-calorie sweeteners such as D-allulose and Dtagatose, which provide significant health advantages, including anti-diabetic, anti-obesity, and antioxidant effects. Recent studies in structural biology have clarified the three-dimensional structure of L-arabinose isomerase, offering essential insights into its catalytic mechanism, substrate binding, and stability characteristics. The results endorse structure-guided protein engineering as a means to improve enzyme performance and industrial relevance. The development of L-asparaginase as a potential cancer therapy is currently underway. These advancements collectively enhance national initiatives aimed at achieving enzyme self-sufficiency and foster sustainable, biobased industrial processes in accordance with global development objectives. Current research highlights Indonesia's advancing capabilities in enzyme technology across the food, pharmaceutical, diagnostic, and healthcare sectors.

Invited 5.1

Assoc. Prof. Dr. Muhammad Yusuf Abduh

Institut Teknologi Bandung, Indonesia

Synthesis of bioactive protein hydrolysates from dehulled seeds of *Hevea brasiliensis*

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Abstract: Dehulled seeds from rubber tree (*Hevea brasiliensis*) contain a considerable amount of protein that can be increased with the help of biological agents to produce bioactive protein hydrolysates. This study aimed to investigate the effects of solid-state fermentation of dehulled rubber seeds using *Aspergillus spp* on the crude protein content, protein recovery, degree of hydrolysis, composition of amino acids and bioactivity of the protein hydrolysates. Fermentation was carried out at room temperature (27 ℃) for 7 d using *Aspergillus niger, Aspergillus oryzae, and Aspergillus sojae* to enhance the protein content and bioactivities of the protein hydrolysate. Biomass dry weight was monitored daily, followed by protein extraction and hydrolysis of the fermented dehulled rubber seeds. The crude protein content, protein recovery, degree of hydrolysis, antioxidant activity, antiinflammatory activity, antimicrobial activity and amino acid composition of the protein hydrolysates were also determined. The growth of *Aspergillus spp* cultures was found to be optimum on the 5th day of fermentation. Fermentation of dehulled rubber seeds with Aspergillus spp. effectively increased the crude protein content (34.2-65.2 %), protein recovery (41.4-46.8 %) and degree of hydrolysis (64.6-81.5 %), up to 181 %, 29 % and 21% as compared to the control (unfermented dehulled rubber seeds). The fermentation also enhanced the antioxidant and anti-inflammatory activity of the protein hydrolysate with the IC50 (half of maximal inhibitory concentration) decreased up to 79 % and 65 %, respectively. In addition, the fermentation also enhanced the antimicrobial activity of the protein hydrolysate with the diameter of the inhibition zone against *S. aureus* (0.17-0.71 mm) and *E. coli* (0.41 – 0.89 mm) increased up to 262 % and 151 %, respectively. The fermentation greatly influenced amino acid composition of the protein hydrolysates with the fractionated protein hydrolysates comprise of L-Alanin (84.6-86.7 mg/kg) and LArginin (386.2-387.5 mg/kg).

Keywords: *Aspergillus spp*.; amino acid; bioactivity; Dehulled rubber seeds; protein hydrolysate

Invited 5.2

Dr. Tan Teng Ju

International Islamic University Malaysia, Malaysia

Investigation of Antioxidant Activity of Basil Essential Oil and Extracts Produced by Different Extraction Methods

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Abstract: Antioxidant activity is one of the biological activities that contribute to commercialization of basil products. Selecting the appropriate extraction process is critical to ensuring that the procedure does not have an adverse effect on its antioxidant activity. This study investigates the effects of three different extraction methods: steam distillation, Soxhlet extraction, and supercritical fluid extraction (SFE) on the yield, chemical composition, total phenolic content, and antioxidant activity of basil essential oil and extracts. For Soxhlet extraction, four distinct organic solvents were used: isopropanol, ethyl acetate, petroleum ether, and hexane. Gravimetric analysis and gas chromatography-mass spectrometry (GC-MS) analysis were used to analyze the yield and chemical composition of basil essential oil and extracts, respectively. The total phenolic content was determined using the Folin-Ciocalteu reagent, whilst the antioxidant activity was determined using the 2,2-Diphenyl-1-picrylhydrazyl (DPPH) test. The results showed that Soxhlet extraction with isopropanol gave the highest yield among treatments. SFE extract was capable to retain most of the chemical compounds as well as a considerable amount of key component estragole. However, in the total phenolic content determination, ethyl acetate extract had the greatest total phenolic content (16.83±2.27 mg GAE/g DW), while SFE extract had a fairly high value (15.29±1.36 mg GAE/g DW). The similar trend was observed for the antioxidant assay, in which ethyl acetate extract demonstrated the highest radical scavenging activity (IC_{50} value of 3.35±0.20 mg/ml), followed by SFE extract (IC_{50} value of 10.82±0.25 mg/ml). Essential oil from steam distillation showed the lowest radical scavenging activity (IC_{50} value of 49.73±0.01 mg/ml) among the methods studied. This work concluded that Soxhlet extraction using ethyl acetate produced the basil extract with the greatest antioxidant activity. SFE also could serve as a viable alternative to Soxhlet extraction due to its environmentally friendly approach in producing basil extract with decent antioxidant activity.

Keywords: Basil; supercritical fluid extraction; Soxhlet extraction; steam distillation; antioxidant activity.

Invited 5.3

Dr. Nurul Adela Bukhari

Malaysian Palm Oil Board, Malaysia

Succinic Acid Production from Oil Palm Empty Fruit Bunches and its Downstream Purification Process

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Abstract: The shift from a fossil-based to a sustainable bio-based economy is essential for mitigating climate change and environmental challenges. A key element of this transition is the valorisation of lignocellulosic biomass, such as empty fruit bunches (EFB), a major by-product of the palm oil industry. EFB contains a high proportion of cellulose and hemicellulose, making it a promising feedstock for value-added microbial bioconversion. One such high-value product, succinic acid (SA), is a platform chemical used in biodegradable plastics, solvents, cosmetics and pharmaceuticals. This work highlights the technology development and downstream processes in high-purity SA production. EFB was initially pretreated with 2% (w/v) dilute ferric chloride at optimal conditions of 130°C for 30 minutes. The pretreated EFB was then subjected to enzymatic hydrolysis and fermentation to produce SA by *Actinobacillus succinogenes*, yielding 0.5–0.6 g of SA per gram of sugar in a bioreactor. A simplified separation method was developed, achieving >90% recovery of high-purity SA from the fermentation broth. The overall process demonstrated high efficiency, with an estimated yield of 207–222 kg of SA per tonne of raw EFB. This level of recovery highlights the economic viability of the process and supports its potential for future industrial-scale bioprocessing.

Keywords: Oil palm biomass, Ferric chloride pretreatment, Enzymatic hydrolysis, Fermentation, Downstream process

Invited 5.4

Dr. Muhammad Daaniyall Abd Rahman

Universiti Putra Malaysia, Malaysia

Estimating of the Economic Impacts of Biotechnology Industries Using Input-Output Analysis

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Abstract: From the economics perspective, the growth of biotechnology industries has emerged as one of sources of wealth for the economy through its ability to stimulate both downstream and upstream economic activities along the supply chain, which eventually creates jobs and improves people's incomes. However, to quantify the impact of the biotechnology industries on the economy remained a challenge due to limitation of industrial classification and data availability. This paper aims to estimate the impact of biotechnology industries on the economy, focusing on the industrial multiplier and spillover effects. To meet the objective of the study, we combine input-output analysis and 101 BioNexus status companies' profile. We classify biotechnology industries into three categories namely *agricultural and food*; *industrial and environmental*; and *medical and healthcare*. These industries are matched to the Malaysia Standard of Industrial Classification (MSIC) to conform to a standardized statistical methodology by the Department of Statistics Malaysia (DOSM). However, due to data availability, the study uses Selangor biotechnology industries as a case study. The findings suggest that *agricultural and food* yields the largest value-added multiplier as compared to the other two industries, indicating its economic potential to generate income for the state. In terms of spillover effects, *industrial and environmental* is categorized as "key industry" due to its strong spillover effects to downstream and upstream activities within its supply chain. It is recommended that for short-term economic impact, policymakers shall prioritize investment in *agricultural and food* biotechnology through enhancing R&D funding, infrastructure support, and commercialization incentives to boost this segment's growth. Meanwhile, continuous support is also needed to the *industrial and environmental* biotechnology, particularly focusing on integration of this industry into broader green growth, waste management, and industrial innovation strategies, which can amplify productivity gains across related industries.

Keywords: Input-Output Analysis; biotechnology; economic impacts; BioNexus

Invited 6.1

Assoc. Prof. Dr. Dayang Salwani Awang Adeni

Universiti Malaysia Sarawak, Malaysia

Tapping the Potential of Sarawak's Nipa Sap: 'Gula apong' and Emerging Bio-products

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Abstract: Nipa sap is a sweet, translucent liquid derived from the nipa palm (*Nypa fruticans*), commonly consumed as a refreshing beverage by local communities. In Sarawak, Malaysia, it serves as a raw material for the production of nipa sugar, locally known as *gula apong*, a semi-solid sweetener characterized by its golden caramel color. However, nipa sap tends to spoil within three hours after collection due to rapid spontaneous fermentation. This study aimed to extend the shelf life of nipa sap using selected preservation methods. The effectiveness of these methods was evaluated based on the physicochemical properties, microbiological stability, and sensory quality of the sap. The results indicated that High Temperature, Short Time (HTST) pasteurization and sodium benzoate (SB) treatment successfully extended the shelf life of nipa sap up to 14 days at room temperature. Glucose levels remained stable throughout the storage period, while ethanol concentrations were kept low. Among the tested methods, HTST pasteurization achieved better sensory acceptance. Additionally, the study examined the physicochemical and antioxidant properties of *gula apong* produced in Sarawak. Sucrose was identified as the predominant sugar (61.40–90.70 g/L), followed by glucose (26.67–37.69 g/L) and fructose (20.13–30.13 g/L), with all sugars present in comparable concentrations. A significant amount of kaempferol, a flavonoid (24.03 mg/100 mL), was detected, alongside key minerals such as potassium (1065.50 ± 55.9 mg/L), sodium (501.00 ± 14.14 mg/L), and magnesium (20.50 ± 2.50 mg/L). The application of HTST pasteurization presents a practical and effective method for extending the shelf life of nipa sap, making it a viable option for local producers to improve production efficiency and product quality. Furthermore, the nutritional and antioxidant composition of *gula apong* highlights its potential as a functional sweetener with added health benefits, promoting its value beyond traditional culinary uses.

Keywords: Nipa palm sap; 'gula apong'; high temperature short treatment; bioethanol

Invited 6.2

Assoc. Prof. Dr. Khanom Simarani

Universiti Malaya, Malaysia

Unseen Heroes: How Microorganisms Ensure Food Security and Drive Sustainability

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Abstract: Microorganisms play an indispensable role in addressing global challenges related to food security and environmental sustainability. As natural biocatalysts, they contribute to agricultural productivity, food preservation, and ecosystem balance. In sustainable agriculture, beneficial soil microbes such as nitrogen-fixing *Rhizobium*, phosphate-solubilizing *Bacillus*, and mycorrhizal fungi play a critical role in enhancing nutrient availability, promoting plant growth, and mitigating abiotic stress. These microbial interactions not only reduce dependency on synthetic agrochemicals but also increase crop yields, help maintain soil health and fertility, thereby supporting sustainable agricultural intensification. In food processing, microbial fermentation not only extends shelf life but also enhances nutritional profiles and sensory attributes. Lactic acid bacteria, *Saccharomyces cerevisiae*, and other industrially relevant strains are extensively employed in the food production such as dairy products, beverages, and functional foods. Such applications contribute to food preservation, reduce post-harvest losses, and improve access to nutritious food, particularly in resource-limited settings. Moreover, microorganisms are key agents in sustainable waste management and bioenergy production. Through anaerobic digestion and composting, microbial communities convert organic waste into biogas and nutrient-rich compost, offering eco-friendly alternatives to chemical inputs and fossil fuels. This supports circular economy practices that minimize environmental impact. Advancements in microbial biotechnology also enable the development of biofertilizers, biopesticides, and genetically engineered microbes with enhanced capabilities to combat plant diseases and improve stress resistance. These innovations contribute to climate-resilient agriculture, ensuring food systems remain productive in the face of environmental changes. Thus, microorganisms are powerful allies in our efforts to ensure global food security and promote sustainability. Harnessing their potential through responsible research, development, and application can lead to more resilient food systems and a healthier planet.

Keywords: Food Security, Sustainable Agriculture, Fermentation, Bioeconomy, Microbial Biotechnology.

Invited 6.3

Dr. Muhamad Hafiz Abd Rahim

Universiti Putra Malaysia, Malaysia

Biofertilizer Potential of Bacteria Isolated from Fermented Banana Peel in Mushroom Farming

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Abstract: Banana peels and their associated fermentative bacteria may offer a sustainable agriculture due to the valorization of food waste, nutrient cycling, and reducing chemical inputs. This study evaluated the potential of microbially-enriched banana peel (via fermentation) and its bacterial isolates as biofertilizers. Peel substrates were fermented at 30 °C, during which pH, titratable acidity, and microbial growth were monitored. Biofertilizer efficacy was assessed in vitro via phosphate solubilization, indole-3-acetic acid (IAA) production, and antifungal activity against the mushroom pathogen *Trichoderma* sp. Finally, in vivo trials applied isolates to mushroom cultures to measure spawn completion time and dry yield; harvested mushrooms were analyzed for the general antioxidant capacity. Overall, fermentation lowered pH from 6.8 to 4.2 and raised titratable acidity from 0.2 % to 0.8 %, with colony counts peaking on day 8. PCR confirmed *Liquorilactobacillus mali*, *Lactiplantibacillus plantarum*, and *Leuconostoc mesenteroides* as predominant. On day 8, phosphate solubilization clear-zone diameters reached 2.40 cm for fermented peel, 2.37 cm for *L. plantarum*, and 2.23 cm for *L. mali*. *L. mali* produced the highest IAA (12.67 ppm), followed by *L. mesenteroides* (8.83 ppm). Antifungal assays showed >97 % inhibition by all three isolates. In vivo, treated mushrooms reached full spawn in six weeks, yielding up to 9.6 g dry weight (with *L. mali*). Antioxidative assays revealed enhanced antioxidant activity, especially in *L. plantarum*– and *L. mali*–treated samples. These results demonstrate that fermented banana peel and its lactic acid bacteria isolates can serve as effective biofertilizers, promoting mushroom growth and enriching bioactive compound content, thus supporting circular-economy practices in agriculture.

Keywords: Banana peel biofertilizer; Lactic acid bacteria isolates; Phosphate solubilization activity; Indole-3-acetic acid production; Mushroom growth promotion

Invited 6.4

Dr. Khalisanni Khalid

Malaysian Agricultural Research and Development Institute, Malaysia

Encapsulation Efficiency of Probiotics with Single and Mixed Prebiotic Formulations for Potential Poultry Feed Additives

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Abstract: Probiotics and prebiotics play a crucial role in enhancing poultry health by promoting beneficial gut microbiota and improving nutrient absorption. Encapsulation of these agents can protect them during feed processing and storage, ensuring their viability and efficacy. This study investigates the encapsulation efficiency of probiotics combined with single and mixed prebiotic formulations intended for poultry feed additives. Probiotic strains (*Lactobacillus plantarum* and *L. fermentum*) were encapsulated with single prebiotics (maltodextrin) and mixed prebiotic formulations (combinations of maltodextrin and Arabic gum) using sodium alginate through ionic gelation. The probiotic-prebiotic-alginate mixtures were extruded into a calcium chloride solution to form gel beads. The encapsulated formulations, along with non-encapsulated controls, were analysed for its enumeration and encapsulation efficiency. Encapsulation efficiency differed between formulations with single and mixed prebiotics. Probiotics encapsulated with single prebiotics showed higher encapsulation efficiency. Maltodextrin showed higher encapsulation efficiency with 99.62% and 99.61% compared to Arabic gum with 97.04% and 71.33% for encapsulation of *L. plantarum* and *L. fermentum*, respectively. On the other hand, lower encapsulation efficiency had resulted from combination of both prebiotics especially on *L. fermentum* with only 58.68%. The study highlights that single prebiotic formulations provide higher encapsulation efficiency for probiotics, while mixed prebiotics still offer substantial benefits in terms of viability and functionality. The protective alginate matrix effectively maintains the stability of probiotics during storage and gastrointestinal transit. These findings suggest that both single and mixed prebiotic encapsulations are viable strategies for developing effective poultry feed additives. Encapsulation enhances the efficiency and viability of probiotic formulations for poultry feed additives. Single prebiotics provide higher encapsulation efficiency, while mixed prebiotics contribute to a diverse and functional probiotic-prebiotic synergy. This research underscores the potential of encapsulation technologies in optimising probiotic and prebiotic delivery systems for improved poultry health and productivity.

Keywords: Probiotics; Prebiotics; Single Prebiotic; Mixed Prebiotic; Encapsulation; Poultry Feed; Encapsulation Efficiency;.

Oral 1.1 (Online)

Prof. Dr. Gemerlyn G. Garcia

Central Luzon State University, Philippines

Development of a Diagnostic kit for Re-emerging Red Tide in the Philippines

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Abstract: Emerging cases of Red Tide (RT) reportedly caused unparalleled losses in shellfish production in the Philippines. Effective monitoring of RT by the authorities (BFAR) and its control may largely depend on accurate and timely detection of the disease as this strengthens the decision to reinforce enclosures of other prone areas. The impact of the re-emerging RT in the shelfish industry has triggered the interest of researchers to work on the development of a kit to deliver diagnostic results to farm raisers. A research initiative which envisioned to develop a paper-based diagnostic platform for Red tide was undertaken. The work involved the application of relevant microbiological and molecular protocols like DNA extraction, PCR amplification and DNA sequencing of the SxtA4 gene to define the identity of the RT pathogen in RT-vulnerable areas of Luzon and Visayas. The DNA profile of the SxtA4 gene is made up of 750 bp and used as a basis in identifying local strains of RT-causing pathogens. The results of the study revealed close phylogenetic relationships among RT pathogens from different areas in Asia. The project also explored recent technics in nanotechnology which used a metal precursor and microbial extract as a reducing agent to synthesize silver nanoparticle (AgNP). A portion of the SxtA4 gene was used in combination with the synthesized AgNP and used as a probe for cases of RT. Series of experiments were undertaken to functionalize the kit in a paper as a supporting matrix, with 4 essential components that make up the kit. Effort was also made to determine the efficiency of the developed kit based on sensitivity, specificity and accuracy parameters with a PCR data as the tentative gold standard. The kit functions as a sensitive, specific, rapid and robust screening platform for clinical cases of RT.

Keywords: *Alexandrium sp.;* Philippines; *Pyrodinium sp*.; Red Tide diagnostic kit; SxtA4 gene;.

Oral 1.2 (Online)

Prof. Dr. Nor'aini Abdul Rahman

Universiti Putra Malaysia, Malaysia

Characterization of Bacterial Isolates with PGPR Traits and Their Effect on Wheat Seed Germination

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Abstract: Chemical fertilizers are widely used across the globe to supply essential nutrients to the soil-plant system. However, their high cost, limited availability, and negative environmental impact present significant challenges for sustainable agriculture. In this context, plant growth-promoting rhizobacteria (PGPR) offer a promising alternative. These beneficial soil bacteria colonize the plant rhizosphere and promote plant growth through a range of direct and indirect mechanisms. In this study, a total of seventeen isolates were screened in vitro to evaluate their plant growth-promoting (PGP) potential. Growth profiling and kinetic analyses were conducted for each bacterial isolate. These isolates exhibited key PGPR traits, including phosphorus and potassium solubilization, siderophore production, and ACC deaminase activity. Identification through 16S rRNA sequencing revealed that most isolates belonged to the genera Pseudomonas and Bacillus. The PGP efficacy of these isolates was assessed by evaluating wheat seedling germination using both Petri dish and rolled paper methods. Several isolates significantly improved germination rate, shoot length, and dry biomass of both roots and shoots. Selected strains demonstrating the highest efficacy were further evaluated in a wheat pot experiment.

Keywords: plant growth promoting rhizosphere, screening, seed germination

Oral 1.3 (Online)

Dr. Nurul Akmar Hussin

Universiti Malaysia Sabah, Malaysia

Application of *Bacillus licheniformis*-Derived Chitinase as a Biocontrol Agent Against Termites

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Abstract: Chitinases are hydrolytic enzymes with high biotechnological value, particularly in the development of eco-friendly biocontrol agents. In this study, crude chitinase was extracted from a *Bacillus licheniformis* strain (USMW10IK) isolated from the gut of *Globitermes sulphureus*, a wood-feeding termite species. The extracted enzyme was evaluated for its biotermiticidal potential through four bioassay methods: no-choice feeding, sand-treated medium, topical exposure on filter paper, and topical exposure on sterile sand. Termite mortality was assessed over 24–48 hours. Among the tested methods, the topical application on filter paper resulted in significant mortality after 24 hours, while the sterile sand method showed comparable results after 48 hours. In contrast, the no-choice and sand-treated feeding methods did not produce significant effects. These findings indicate that direct cuticle contact enhances the biocidal activity of chitinase. The study highlights the potential of microbial derived chitinase as a promising biotechnological alternative to chemical termiticides for integrated pest management.

Keywords: Chitinase; *Bacillus licheniformis*; *Globitermes sulphureus*; termite; biocontrol.

Oral 2.1

Prof. Dr. Surendraraj Alagarsamy

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Novel Thermostable Alkaline Protease Isoenzymes from Sabkha Derived *Marinobacter*: Functional Characterization and Industrial Implications

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Abstract: Kuwait sabkhas, an extreme marine habitat with high salinity (up to 4.5 M NaCl), are declining due to urbanization. The halophilic microorganisms inhabiting these sabkhas have potential biotechnological applications, including the production of novel halotolerant enzymes. Seven protease-positive strains, capable of growth under extreme conditions, were selected from the pool of culturable bacteria isolated from Kuwait's sakhas. These strains were subjected to growth and protease production studies at different temperatures, pH values, and salt concentrations, to identify the best protease producer. *Marinobacter sediminum* (Isolate B12) from Bubiyan Sabkha was identified as the best protease producer, which demonstrated optimal protease production when grown at a pH of 9.0, temperature of 37 °C, and salt concentration of 15%, after 72 h of incubation. A novel thermophilic alkaline protease isoenzyme, B12 Pro1 and B12 Pro2 was purified from this bacterium using ultrafiltration, gel filtration, and anion exchange chromatography. The isolated isoenzymes, B12 Pro1 and B12 Pro2, exhibited specific activities of 657.5 and 2437.5 U/mg proteins, respectively. The optimal conditions for these enzymes were a temperature of 50 °C, pH of 9, and the absence of salt. The enzymes remained active up to a temperature of 80 °C and a pH of 12. Nonionic detergents, such as Tween and Triton X100, and oxidizing agents, such as H_2O_2 and Clorox, enhanced the activity of these isoenzymes. However, SDS, an anionic detergent, inhibited both B12 Pro 1 and Pro 2. DTT enhanced but EDTA inhibited Pro1, but the effect was reversed for Pro2, indicating the potential differences in their structures, catalytic mechanisms, or binding sites. These novel enzymes with the above unique property may find biotechnological applications in food processing, the detergent industry, and different biosynthetic processes.

Keywords: Hypersaline; Halophiles; Alkaline Protease; Isoenzyme;.

Oral 2.2

Mr. Syeqqal Ismail

Universiti Tun Hussein Onn Malaysia, Malaysia

Toxicological Characterization of Cresol Compounds from Food Industry Effluents with Aryl Hydrocarbon Receptor (AhR) Activation via Molecular Docking Analysis

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Abstract: Industrial effluents from the food industry may contain refractory organic pollutants that pose long-term environmental and health hazards due to their persistence and potential bioactivity. One group of concern is cresol compounds, which are suspected activators of the aryl hydrocarbon receptor (AhR), a key protein in xenobiotic metabolism and toxicological pathways. This study aims to assess the toxicological relevance of cresol group pollutants from industrial sludge on AhR activation using a multi-method approach involving environmental assessment, statistical analysis, and molecular docking. The first objective involved conducting the Toxicity Characteristic Leaching Procedure (TCLP) on sludge samples collected over three years to examine cresol leachability and general toxicity. TCLP results showed that all parameters, including cresol levels, were below the Maximum Contaminant Limits (MCLs) set by regulatory standards, suggesting minimal risk of leachate toxicity. Python programming was used to organize, reshape, and visualize the multi-year data through bar charts and line plots. The second objective evaluated the chemical oxygen demand (COD), a key indicator of refractory organics, using 30-day pre-treatment (equalization tank) and post-treatment (final discharge) datasets. Descriptive statistical tools, including central tendency, dispersion, histograms, box plots, and line plots, were applied. This was followed by correlation analysis using scatter plots, Pearson correlation coefficients, and paired t-tests. The third objective involved molecular docking simulations using AutoDock to assess the binding affinity of cresol isomers to the AhR protein. Docking results revealed that despite their low concentration, cresol compounds exhibited strong binding affinities to AhR, indicating potential biological activity. This study highlights the importance of integrating chemical monitoring and computational toxicology in environmental assessments. The findings contribute to a better understanding of the hidden toxicological risks of low-concentration refractory organics, supporting more informed risk assessments and regulatory considerations in food industry wastewater management.

Keywords: Cresol compounds; Aryl hydrocarbon receptor (AhR); Industrial effluent; Food industry sludge; Toxicity Characteristic Leaching Procedure (TCLP);

Oral 3.1

Assoc. Prof. Dr. Suriana Sabri

Universiti Putra Malaysia, Malaysia

A Genome-guided Approach to Uncover and Purify Potent Antimicrobials from *Bacillus velezensis* PD9 for Combating Multidrug-resistant Pathogens

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Abstract: The global rise of multidrug-resistant (MDR) bacteria presents a significant challenge to public health, underscoring the urgent need for novel antimicrobial strategies. Antimicrobial compounds (AMCs) derived from Bacillus spp. have emerged as promising alternatives due to their potent and diverse bioactivities. In our previous work, *Bacillus velezensis* PD9 (BvPD9), isolated from the propolis of the stingless bee *Heterotrigona itama*, demonstrated broad-spectrum antimicrobial potential. This study aimed to investigate the genomic and metabolomic profiles of BvPD9 and to purify and characterize its bioactive AMCs for potential industrial application. Whole genome sequencing using the PacBio Sequel II system revealed a genome size of 4,263,351 base pairs, comprising 4,101 protein-coding genes. Genome mining via antiSMASH and BAGEL4 identified 17 biosynthetic gene clusters (BGCs) encoding secondary metabolites. Metabolomic profiling using liquid chromatography–time-of-flight tandem mass spectrometry (LC-TOF-MS/MS) detected five AMCs: bacillibactin, bacilysin, and three lipopeptides - surfactin A, fengycin A, and bacillomycin D. The crude extract exhibited strong bactericidal activity against a broad range of Gram-positive and Gram-negative pathogens relevant to multiple industries. Subsequent purification using anion-exchange and size-exclusion chromatography yielded two bioactive peaks. LC-TOF-MS/MS analysis revealed that Peak 1 comprised bacillomycin D (C14), which showed potent activity against Staphylococcus spp., including methicillin-resistant *Staphylococcus aureus* (MRSA) and *Staphylococcus epidermidis*. Peak 2 contained C14 and C15 homologues of bacillomycin D and displayed strong activity against Gram-negative bacteria such as *Klebsiella pneumoniae* and *Shigella flexneri*. In conclusion, the integration of genome mining and metabolomic approaches highlights BvPD9 as a valuable source of AMCs. The selective antimicrobial properties and structural diversity of bacillomycin D homologues underscore their potential for development into targeted therapeutics against MDR pathogens.

Keywords: *Bacillus velezensis,* genomic, antimicrobial compounds, purification, bacillomycin D

Oral 3.2

Assoc. Prof. Dr. Hoang Anh Hoang

Ho Chi Minh City University of Technology, Vietnam

Phage Therapy - A Solution Against Antimicrobial Resistance in Fishery Industry in Vietnam

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Abstract: Antibiotics are commonly used as the main prevention and treatment of disease-causing bacteria in both human and animals. In agriculture, antibiotic occupies significant niche in food producing animals and plants. In contrast, the antimicrobial resistance (AMR) is a naturally occurring phenomena of microorganisms through which they become resistant to antimicrobial compounds. In Vietnam, a high antibiotic-resistant rate of pathogenic bacteria has been reported in fish farms. Phages are virus infecting bacteria. The use of lytic phages as a prevention and treatment for bacterial diseases in fishery industry has gained serious attention in the last 40 years, especially due to the widespread evolution of antibiotic-resistant bacteria. The current report will firstly show some important findings of phage therapy in agriculture on over the world. Next, we will present major achievements of our research group about phage therapy in striped catfish. The research works are in the terms of bacterial isolation, pathogenicity and genome analysis; phage isolation, infection activity, phage genome analysis; and *in vivo* phage trial at wet lab.

Keywords: phage therapy; AMR; genome; striped catfish; bacterial pathogens;.

Oral 4.1 (Online)

Assoc. Prof. Dr. Hazel Monica M. Peralta

Central Luzon State University, Philippines

Microsatellite-Based Characterization of *Paracalanus parvus* Populations across Coastal Ecosystems of the Straits of Malacca

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Abstract: Understanding genetic diversity and population structure is crucial for elucidating evolutionary processes and ecological dynamics in marine species. This study characterizes the population genetics of the calanoid copepod, *Paracalanus parvus*, a key zooplankton species widely distributed in coastal ecosystems along the Straits of Malacca. Traditionally, holoplanktonic organisms like *P. parvus* were assumed to exhibit high gene flow and low genetic structuring due to their dispersal potential. However, recent evidence suggests otherwise, motivating this investigation. Using microsatellite DNA markers originally developed for the intertidal copepod *Tigriopus californicus*, we screened 11 loci and identified six polymorphic markers suitable for population analysis. Samples were collected from four distinct coastal habitats: mangrove forest reserve, shrimp aquaculture farm, cage culture area, and seagrass bed. Genomic DNA was extracted via a modified CTAB method, and PCR amplification was optimized for these loci. Allele sizes were determined through gel electrophoresis and band pattern analyses. Our results reveal significant genetic variability within *P. parvus* populations across different coastal ecosystems, indicating restricted gene flow and genetic differentiation despite the species' presumed dispersal ability. These findings challenge the traditional paradigm of panmixia in pelagic copepods and highlight the influence of local environmental factors and habitat heterogeneity on population structure. This study contributes to the limited knowledge on copepod population genetics and underscores the importance of microsatellite markers in assessing genetic diversity in marine zooplankton. The insights gained have implications for biodiversity conservation, ecosystem management, and understanding evolutionary mechanisms in marine planktonic species.

Keywords: Microsattelite; *Paracalanus parvus*; Coastal ecosystems; Straits of Malacca;.

Oral 4.2 (Online)

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From Lab to Field: Designing RT-RPA based Isothermal Amplification Method for *Citrus Tristeza Virus* Detection

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Abstract: Robust and efficient diagnostic tools are the need of time to control the devastating effects of pathogenic diseases and move towards sustainable agriculture practices. Citrus tristeza virus is damaging the citrus orchards across the globe leading to the death and low quality fruit yield. Virus-free rootstocks and removal upon early detection is the only way to mitigate the CTV spread. In this study, development of RT-RPA- an isothermal amplification method was optimized to better cope with sensitive, specific, and on-site detection of CTV. TAS-ELISA and PCR-based techniques that include RT-PCR, RT-Nested PCR and Real time PCR are well investigated for detection and genetic analysis of coat protein (p25) gene. Nucleotide identity >93% and protein identity > 96% indicate high divergence among some strains of this study. This might lead to more severe strains also capable to escape the traditional diagnostic procedures in future. Specificity and sensitivity of TAS-ELISA and PCR techniques differed drastically as TAS-ELISA was least sensitive, RT-nPCR and qPCR proved to be 10 folds more sensitive than RT-PCR. Despite performing better both RT-nPCR and qPCR are laborious, time consuming and expensive. To overcome these limitations, RT-RPA was developed after well-curated primer designing process. RT-RPA operates at single temperature making it user friendly and an instrument free technique. Crude isolation procedure was optimized to simply the process further. Thus, the reaction time of RT-RPA from sample preparation till final target detection was optimized at 20 minutes with detection limit of 0.2 ng/ µL. Rapid, sensitive, specific and easy tool for detection is the absolute need of farmers making it applicable for field tests and rapid selection of virus free plant materials.

Keywords: Citrus tristeza Virus; Isothermal Amplification; Recombinase polymerase amplification; on-site detection; Amplification efficacy

Oral 4.3 (Online)

Prof. Dr. Danila S. Paragas

Central Luzon State University, Philippines

Eco-Friendly Biopesticides from Neem and Lagundi Extracts for Sustainable Management of Onion Armyworm (*Spodoptera exigua*)

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Abstract: The onion armyworm (*Spodoptera exigua* Hübner) is a destructive, polyphagous pest with a wide geographic distribution, posing significant threats to global agriculture through extensive crop damage. The recurrent outbreaks and heavy reliance on synthetic chemical pesticides have led to environmental degradation, pest resistance, and economic burdens, emphasizing the critical need for sustainable pest management strategies. This study explores the development of a biopesticide derived from neem (*Azadirachta indica*) and lagundi (*Vitex negundo*) leaves, employing environmentally friendly extraction methods and solvents. Using fermentation and hot infusion techniques with green solvents—rice wash and sugarcane vinegar—eight extract-solvent combinations were evaluated for their antifeedant and larvicidal activities. The most promising extracts, hot infusion with sugarcane vinegar for neem (HAN) and rice wash for lagundi (HRL), were further applied in the green synthesis of silver nanoparticles (AgNPs), which were characterized using UV-visible spectrophotometry, FTIR spectroscopy, and SEM-EDX. The AgNPs synthesized from HAN and HRL exhibited significant larvicidal activity against *S. exigua*, highlighting their potential as effective, sustainable pest control agents. This study demonstrates the viability of integrating green chemistry and nanotechnology to develop environmentally sound pest management solutions, aligning with the goals of reducing pesticide reliance and mitigating ecological impacts in agricultural systems.

Keywords: *Azadirachta indica; green solvents*; biopesticides; Spodoptera exigua; *Vitex negundo;*.

Oral 4.4 (Online)

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Cultivation of Microalgae Using Fruit Waste as a Nutrient Source

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Abstract: The search for sustainable and cost-effective methods in microalgae cultivation has led to increased interest in the utilization of agro-industrial and fruit wastes as alternative nutrient sources. Microalgae are recognized for their rapid growth, high lipid productivity, and potential applications in biofuel, nutraceuticals, cosmetics, and wastewater treatment. However, large-scale cultivation remains limited due to the high cost of conventional growth media such as BG-11 or AF-6. In response, researchers have explored the use of organic waste materials, particularly fruit waste, to provide essential macro- and micronutrients for microalgae growth. This review focuses on the potential of various fruit wastes—such as pineapple, banana peels, orange peels, watermelon rind, and mango waste—as low-cost, renewable substrates for microalgae cultivation. Pineapple waste, rich in carbohydrates, vitamins, and trace elements, has shown promising results in enhancing the growth of microalgae when used either fresh or fermented. Similarly, other fruit residues have demonstrated varying levels of support for biomass productivity and lipid accumulation depending on their nutrient profiles and preparation methods. The review further discusses the physicochemical properties of these waste substrates, including pH, carbon/nitrogen ratio, and biodegradability, and how they influence microalgae physiology. It also highlights the adaptability of certain microalgae strains to grow under nutrient-variable and stress-induced conditions derived from organic waste sources. Challenges such as microbial contamination, inconsistent nutrient content, and the need for pre-treatment of wastes are also addressed. By compiling and analysing the current findings, this paper aims to provide an integrated understanding of fruit waste as a feasible and eco-friendly nutrient alternative for microalgae biotechnology. The review concludes with future directions for optimizing cultivation conditions, waste formulation, and upscaling for industrial applications.

Keywords: Microalgae cultivation, fruit waste, pineapple waste, agro-industrial by-products, alternative nutrient source. biomass productivity, lipid accumulation, sustainable biotechnology, organic waste valorisation, eco-friendly cultivation, biofuel production, wastewater treatment

Oral 4.5 (Online)

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Enhancing Cold Storage Quality of Carambola via Vacuum Impregnation with Melatonin, GABA, and Oxalic Acid

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Abstract: Carambola (*Averrhoa carambola*), a tropical fruit rich in nutrients, is highly perishable and prone to rapid ripening and spoilage at ambient temperatures. While low-temperature storage is commonly employed to extend shelf life, carambola is susceptible to chilling injury under such conditions, resulting in quality deterioration. This study investigated the efficacy of vacuum impregnation with melatonin (MT), γ-aminobutyric acid (GABA), and oxalic acid (OA) in alleviating chilling injury and preserving postharvest quality during cold storage. Carambola fruits were treated with each compound and stored at 4 °C for 28 days. Assessments were conducted every 7 days, evaluating weight loss, firmness, physicochemical parameters, total phenolic content, flavonoid content, and proline accumulation. Among the treatments, melatonin proved most effective, resulting in the highest firmness (146.31 g) and lowest weight loss (1.53%) at the end of storage. Visual evaluation revealed that MT-treated fruits ripened uniformly and exhibited no visible chilling injury symptoms, with decay delayed until after the storage period. In contrast, GABA- and OA-treated fruits began to decay by day 28. Bioactive compound retention was significantly enhanced in MT-treated samples, with phenolic and flavonoid contents increasing by 6.10% and 12.67%, respectively, compared to initial values. GABA treatment also maintained both phenolic and flavonoid levels, whereas OA preserved only phenolic content. These findings suggest that melatonin, applied through vacuum impregnation, is a promising postharvest treatment for mitigating chilling injury and maintaining the physicochemical and nutritional quality of carambola during cold storage.

Keywords: Chilling tolerance, non-thermal processing, physicochemical, postharvest, quality

Oral 5.1

Dr. Meher Nahid

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Reduction of acrylamide precursors in potatoes through nutrient management: A mitigation strategy

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Abstract: Acrylamide (AA) a class 2A carcinogenic compound is a concerning issue prioritizing the mitigation technique in processed potato products. The management of nitrogen (N), potassium (K) and sulfur (S) nutrients during potato cultivation play an important role in minimizing AA precursors without compromising the processing quality. The research aims to create a balanced approach to N, K and S applications in potato variety, Courage, in response to their roles in AA precursor formation particularly, glucose, fructose sucrose and amino acid content. Utilizing a split-split plot design experiment, N minimization coupled with K and S supplementation resulted in a notable decrease in glucose and fructose, particularly at a specific rate, and led to reduced levels of amino acids, specifically asparagine. Among the 12 treatment combinations, the ratio of 120 kg N ha^{-1}, 152 kg K ha^{-1} and 20 kg S ha-1 exhibited the highest marketable yield (26.79 t ha-1), specific gravity (1.090 g cm-3), dry matter (22.41%) and the lowest glucose (0.181 mg g-1 FW), fructose (0.382 mg g-1 FW), asparagine (12.06 mg g-1 DW) and acrylamide (162 µg kg-1) content. Thus, the research findings provide a valuable insight for the potato variety Courage with low AA precursors utilizing the optimum management of N, K and S nutrient during cultivation.

Keywords: Acrylamide; Food quality; Food safety; Processing quality potato ; Process contaminant

Oral 5.2

Assoc. Prof. Dr. Suhaila Mohd. Omar

International Islamic University Malaysia, Malaysia

Electrospinning of Chitosan Nanofibers Derived from Insect Biomass

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Abstract: Insects have emerged as a sustainable and underutilised source of biopolymers. This study investigated the potential use of black soldier fly (Hermetia illucens) pupal exuviae as a source of chitosan for the fabrication of electrospun nanofibers. Chitosan extracted from BSF pupal exuviae, a waste by-product of an insect farm, was blended with polyethylene oxide (PEO) to form nanofibers using electrospinning. Three formulations containing 0.5%, 1.0%, and 2.0% chitosan with 12% PEO (300 kDa) were electrospun and evaluated. Fourier Transform Infrared Spectroscopy (FTIR) analysis confirmed the presence of both polymers in the nanofiber film. Scanning electron microscopy (SEM) revealed nanofiber diameters ranging from 0.475 to 0.695 nm, with relatively uniform morphology. Mechanical testing showed that the 2.0% chitosan formulation had the highest tensile strain (126.7%), tensile strength (0.072 MPa), and Young's modulus (0.127 MPa). These findings suggest that insect-derived chitosan, in combination with PEO, may be a viable material for producing nanofibers with properties suitable for further exploration in various applications.

Keywords: black soldier fly (BSF); chitosan, electrospinning, nanofibers, PEO

Oral 6.1

Dr. Kanokwan Pundee

King Mongkut's University of Technology Thonburi, Thailand

Optimization of Coir Pith Vermicompost Tea as a Potent Biocontrol Agent Against Plant Pathogens

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Abstract: Vermicompost tea (VCT), a liquid organic biofertilizer extracted from vermicompost, demonstrates dual capabilities in suppressing phytopathogens while delivering essential nutrients and hormones for plant growth. Due to the variability in raw materials used for VCT production, quality standardization remains challenging. This investigation focused on developing coir pith-based VCT specifically for plant pathogen suppression. The VCT was prepared by brewing mature coir pith vermicompost with tap water at a 1:10 ratio, supplemented with molasses under continuous aeration. Growth inhibition of three fungal phytopathogens e.g., *Colletotrichum gloeosporioides*, *Fusarium oxysporum* and *Curvularia lunata,* was evaluated. The coir pith VCT effectively inhibited mycelial growth of all tested fungi, with the highest efficacy against *C. gloeosporioides*. Response surface methodology (RSM), particularly Central composite design (CCD), was employed to optimize VCT production for *C. gloeosporioides* suppression. Aeration rate and molasses concentration were tested at five levels across three brewing durations (24, 48, and 72h). Maximum pathogen inhibition (88.48%) was achieved when brewing VCT at 0.5 L/min aeration and 3.6% molasses concentration for 72 hours. The optimized VCT exhibited high nutrient content (0.37 g N/L, 0.32 g P/L, and 1.38 g K/L) and significant indole acetic acid concentration (87.9 mg IAA/L). Phytotoxicity assessments confirmed the VCT's safety for plants application. These results contribute to sustainable agriculture by providing an effective organic approach for plant disease management that simultaneously offers nutritional benefits.

Keywords: Vermicompost tea; Coir pith; Response surface methodology; Suppressive ability; Mycelial growth inhibition

YR Speaker 1.1

Mr. Muhammad Kabir Hassan

King Mongkut's University Of Technology Thonburi, Thailand

Cellfectin Mediated Delivery of Exogenous dsRNA Enables Spray-Induced Gene Silencing in *Colletotrichum gloeosporioide*

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Abstract: Phytopathogenic Fungi, particularly *Colletotrichum gloeosporioides*, have a significant impact on agricultural productivity, prompting concerns about conventional chemical control methods. Spray-induced gene silencing (SIGS) offers a promising alternative, yet its efficacy is limited by the inability of certain fungi to internalize exogenous double-stranded RNA (dsRNA). This study employed Cellfectin, a cationic lipid-based transfection reagent, to overcome *C. gloeosporioides*'s resistance to dsRNA uptake. Target pathogenicity genes were identified and corresponding dsRNA synthesized, which demonstrated remarkable stability at 40°C for up to 4 hours, indicating potential field applicability. Cellfectin-mediated delivery significantly enhanced dsRNAs' internalization in *C. gloeosporioides*, effectively silencing target genes and substantially reducing fungal virulence. *In vivo* experiments on mango and apple fruits, previously considered resistant to SIGS approaches, showed marked reduction in disease progression following treatment with Cellfectin-dsRNA complexes. These findings highlighted carrier molecules' critical role in circumventing species-specific RNA interference (RNAi) barriers. The established delivery system expanded SIGS' applicability across fungal taxa previously deemed recalcitrant to RNAi techniques. This approach not only advances fundamental research into fungal gene functions and pathogenicity mechanisms but also contributes to sustainable agriculture by providing an environmentally compatible, targeted strategy for the management of resistant fungal pathogens.

Keywords: RNA Interference (RNAi), Spray-Induced Gene Silencing (SIGS), *Colletotrichum gloeosporioides*, Cellfectin.

YR Speaker 1.2

Ms. Enas Sakkaamini

Kyushu University, Japan

Osmolyte-Based Polymer Systems for Protein Stabilization

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Abstract: Proteins, vital in therapeutics, diagnostics, and laboratory applications, are highly susceptible to denaturation by factors such as temperature fluctuations, pH changes, lyophilization, high concentrations, and oxidative stress. Ensuring protein stability during production, storage, and use remains a key challenge. Traditional stabilizers such as low- molecular-weight compounds often require high concentrations that may interfere with protein function. This study explores a bioinspired approach to protein stabilization, drawing on the natural strategies used by organisms to endure extreme environments. Osmolytes, small organic molecules found in nature, play a crucial role in cellular protection. Among them, trimethylamine *N*-oxide (TMAO) is known to help deep-sea fish withstand high-pressure conditions. At physiological pH, TMAO adopts a zwitterionic form with both cationic and anionic groups, giving rise to a unique hydration shell structure governed by electrostatic forces. This shell offers superior stability compared to conventional hydration layers formed through hydrogen bonding. Inspired by TMAO's protective role, a novel TMAO-derived polymer was synthesized to test its efficacy in stabilizing proteins under thermal and cold stress. The polymer was prepared using controlled radical polymerization, and its protective capabilities were evaluated using model enzymes subjected to heat and freeze-thaw cycles. Enzymatic activity assays were conducted to assess functional integrity, and spectroscopic techniques were employed to examine structural preservation. The polymers improved the resilience of the model enzymes, maintaining their activity after stress exposure. This research presents a promising direction for enhancing protein stability in diverse applications. By mimicking the protective mechanisms of TMAO, this approach contributes a bioinspired strategy for the advancement of protein-based technologies.

Keywords: Protein stabilization; TMAO-inspired polymer; Zwitterionic polymers; Enzyme activity; Thermal and cold stress; Bioinspired materials.

YR Speaker 1.3

Ms. Siti Norishamizal Azfar Mohd Zamri

Universiti Teknologi MARA, Malaysia

Molecular Determination of Genetic Diversity by Enterobacterial Repetitive Intergenic Consensus PCR (ERIC-PCR) and Antibiotic Resistance Pattern of *Klebsiella pneumoniae* From Raw and Cooked Foods

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Abstract: *Klebsiella pneumoniae* is a significant cause of hospital and community acquired infections, with drug-resistant strains recognized by the World Health Organization (WHO) as a top global health concern. In recent years, *K. pneumoniae* has emerged as a notable foodborne pathogen due to its multidrug resistance (MDR) and presence in raw and cooked foods. This study examines the prevalence, antibiotic resistance patterns, and genetic diversity of *K. pneumoniae* isolates from raw vegetables, fruits, and cooked food samples collected from food stalls and supermarkets in Meru and Puncak Alam, Selangor. A total of 190 food samples were collected, and microbiological isolation was performed to identify *K. pneumoniae*, followed by biochemical confirmation. Consequently, 80 putative *K. pneumoniae* isolates were used for genetic diversity analysis by ERIC PCR and antibiotic resistance using the Kirby-Bauer disc diffusion method with 12 antibiotics. The highest resistance rate was observed for ampicillin 20% (16/80), cefoxitin 11.25% (9/80) and amoxicillin clavulanic acid 10% (8/80). The findings aim to elucidate the potential role of food in antimicrobial resistance transmission and highlight the genetic diversity among isolates. This research provides critical data for public health strategies to enhance food safety and mitigate the spread of MDR *K. pneumoniae* through the food chain.

Keywords: *K. pneumoniae,* genetic diversity, ERIC PCR, antibiotic resistance pattern.

YR Speaker 1.4

Mr. Muhammad Hezreef Arif Mohd Kamarul Arif Pang

Universiti Kebangsaan Malaysia, Malaysia

Development of Modular CRIPSR/dCas13a Platform for Programmable RNA Knockdown in Bioengineered Bacterial Chassis

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Abstract: Synthetic biology enables the engineering of microbial hosts to produce high value compounds, ranging from biofuels and pharmaceuticals to biodegradable plastics. Achieving optimal yields in these bioproduction systems depends on precise control over gene expression. While DNA-targeting CRISPR systems are widely used for gene regulation, RNA-targeting technologies like CRISPR/Cas13a remain underexplored, despite their potential to regulate gene expression at post-transcriptional level without genome alteration. This study introduces the design of a modular CRISPR/dCas13a system designed for programmable RNA knockdown, offering flexible and non-permanent control of microbial gene expression. The developed system employs catalytically inactive Cas13a (dCas13a), which binds but does not cleave RNA transcripts, thereby inhibiting translation. To enhance modularity and efficiency, the CRIPSR RNA (crRNA) array was designed with a Golden Gate assembly motif, enabling rapid and seamless insertion of new spacers without the need to re-clone the entire crRNA. Gene fragments encoding dCas13a, crRNA, and a red fluorescent protein (RFP) reporter were assembled into plasmids via Gibson assembly and propagated in *Escherichia coli*. This system was validated by measuring RFP fluorescence, with a decrease in fluorescence indicating effective post-transcriptional knockdown. This work establishes a programmable, modular approach to RNA-level regulation with potential broad applicability across microbial systems. The integration of Golden Gate cloning enhances scalability and adaptability, making this system a valuable toolkit for microbial synthetic biology and metabolic engineering strategies.

Keywords: CRISPR/dCas13a; RNA knockdown; Transcriptome editing; Synthetic biology; Bacterialchassis

YR Speaker 1.5

Mr. Oluwasola Michael Akinola

Universiti Putra Malaysia, Malaysia

AptamerGen: Deep Learning Framework for Designing Multi-Target Aptamers Against Digestive Enzymes

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Abstract: Traditional aptamer discovery through Systematic Evolution of Ligands by Exponential Enrichment (SELEX) is often time-consuming, labor-intensive, and limited by library diversity and manual iterations. The design of aptamers capable of simultaneously targeting multiple digestive enzymes presents an additional challenge, requiring computational methods that ensure both binding specificity and structural stability. This study introduces *AptamerGen*, a deep learning framework combining a multi-head attention variational autoencoder (VAE) with reinforcement learning to generate high-affinity aptamer sequences targeting alpha-amylase and alpha-glucosidase, key enzymes involved in metabolic disorders. The objective of this research is to automate and enhance aptamer design by capturing complex sequence–structure–function relationships through attention mechanisms and latent space modeling. The methodology integrates a multi-head attention variational autoencoder (VAE) to identify critical binding motifs and structural elements, with reinforcement learning guiding the model toward optimized sequences. Generated aptamers were evaluated using molecular docking and dynamics simulations to confirm target specificity and structural stability. Computational validation showed promising results, achieving an accuracy and F1-score of 0.873 and an R^2-score of 0.744. The predicted aptamers demonstrated strong binding affinities at the active sites of the target enzymes. These findings suggest that *AptamerGen* can serve as an efficient alternative to SELEX, accelerating aptamer discovery while reducing costs and manual effort. In conclusion, this work highlights the potential of artificial intelligence in revolutionizing aptamer-based drug discovery. By automating sequence generation and optimization, *AptamerGen* contributes to the development of precision therapeutics, particularly in managing metabolic diseases, and showcases the growing synergy between deep learning and molecular biotechnology.

Keywords: Aptamer design; Deep learning; Digestive enzymes; Variational autoencoder; Drug discovery

YR Speaker 1.6

Ms. Ponnhmalar Subramaniam

Universiti Kebangsaan Malaysia, Malaysia

Protein Analysis of Wharton's Jelly Mesenchymal Stem Cell Secretome Under Hypoxic and Normoxic Conditions: Potential for Cell-Free Therapy in Atopic Dermatitis

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Abstract: Atopic dermatitis is a chronic skin inflammation characterised by barrier disrup- tion and immune dysregulation. Current AD treatments mainly manage symptoms using topical corticosteroids and systemic immunosuppressants for severe cases. These can pro- vide temporary relief, however leading to side effects including skin thinning, immunosuppression, and poor long-term efficacy. Wharton's Jelly-derived mesenchymal stem cells (MSC) offer cell-free therapy by secreting bioactive factors that aid tissue re- pair and reduce inflammation. This study aims to analyze the WJ-MSC secretome under normoxic and hypoxic conditions and evaluate its protein content and therapeutic rele- vance. WJ-MSCs were isolated and cultured until passage 5 exhibiting typical fibroblast- like morphology. Cells were then cultured in phenol free F12: DMEM for secretome col- lection, and the secretome were concentrated using 3-kDa centrifugal filters. Protein quantification using the bicinchoninic acid (BCA) assay revealed that hypoxic-condi- tioned secretomes yielded higher protein concentrations compared to normoxic samples, however, there was no significant difference ($p = 0.7564$). Comparison of LC-MS protein expression profiles between normoxic and hypoxic conditions revealed distinct differ- ences. A total of 50 common proteins were identified, including albumin, fibronectin, al- pha-2-macroglobulin, and alpha-1-antitrypsin. These shared proteins suggest a core secre- tory profile of the cells that supports fundamental anti-inflammatory and wound healing. However, 30 proteins were expressed in normoxic conditions favoured the expression of extracellular matrix (ECM) related proteins such as collagen alpha-1(III) chain, fibulin-1, and laminin subunit alpha-4, which are crucial for structural tissue integrity and cellular adhesion during the early phases of wound repair. Contrastingly, 32 proteins were uniquely expressed under hypoxic conditions such as collagen alpha-1(I) chain, periostin, biglycan, and galectin-7, which are associated with enhanced tissue remodelling, fibrosis control, and keratinocyte migration. Both conditions share core anti-inflammatory and re- generative proteins, but normoxia supports ECM stability, while hypoxia enhances remodelling and stress adaptation, potentially making it more effective for AD therapy.

Keywords: Atopic dermatitis, WJMSCs, secretome, normoxic, hypoxic

YR Speaker 1.7 (Online)

Mr. Hassan Mohammed Sani

Universiti Putra Malaysia, Malaysia

Optimising *Tetragenococcus halophilus* Growth for Enhanced Probiotic Feed in Red Hybrid Tilapia: Impacts on Health and Growth Performance

Hassan Mohammed Sani[1], Suraini Abd-Aziz[1], Hanan Hasan[3], Wan Abd Al Qadr Imad Wan-Mohtar[4], Norhidayah Mohd Taufek[5] and Mohamad Faizal Ibrahim[1,2*]

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Abstract: Aquaculture plays a crucial role in global food production; however, the presence of antibiotic compounds in this sector raises concerns about environmental pollution and potential health risks. Feed additives play a crucial role in reducing antibiotic use and enhancing the productivity of aquaculture. This study aimed to optimise medium compositions for the growth of T. halophilus cells used in dietary feed formulation for Red Hybrid Tilapia (Oreochromis sp.) by employing statistical methods. A regular two-level factorial design was utilised to assess six critical factors impacting biomass, specifically sago hampas hydrolysate, yeast extract, and agitation speed. The response surface methodology-central composite design (RSM-CCD) determined the optimal medium composition to be 17.50 g/L SHH, 12.50 g/L yeast extract, and an agitation speed of 150 rpm, predicting a maximum biomass of 3.018 g/L. Under optimised conditions, the biomass achieved was 3.068 g/L, which is 1.54-fold higher than that of the unoptimised medium (1.526 g/L). Furthermore, diets were formulated using optimised T. halophilus cells with fermented oil palm decanter cake to evaluate their effects on body composition, organosomatic indices, and haematological parameters across five different diets. The diet containing 1 × 107 CFU/g significantly improved body composition and organosomatic indices, with condition factor (CF) values above 1.4, indicating good health and growth in fish. Blood analysis revealed significant increases in haemoglobin (HGB: 7.46 g/dl), haematocrit (HCT: 38%), and red blood cells (RBC: 2.73 10^6/mm3) at 1 × 107 CFU/g (p

YR Speaker 1.8 (Online)

Ms. Rathi Devi Nair Gunasegavan

Universiti Putra Malaysia, Malaysia

Biogenic Synthesis, Characterization and Biological Activity of Zinc Oxide Nanoparticles from Red Dragon Fruit Peels

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Abstract: Using red dragon fruit peel extract (RDPE) as a biogenic reducing and stabilizing agent, this work presents an inexpensive and eco-friendly biogenic synthesis of zinc oxide nanoparticles (ZnONPs). These biogenic materials are non-hazardous, environmentally friendly, and incur minimal cost compared to chemical approaches. The successful biosynthesis of the ZnONPs was confirmed using several characterization tests, including UV-Vis spectroscopy, particle size analysis, zeta potential analysis, Fourier transform infrared spectroscopy, thermogravimetric analysis, X-ray diffraction spectroscopy, Field emission scanning electron microscopy and Energy dispersive X-ray spectroscopy. In addition, a Taguchi experimental design was applied to optimize synthesis conditions, incorporating the effect of two zinc salt precursors (acetate and nitrate). Among these, acetate-derived ZnONPs produced the desired hydrodynamic size (203.97 ± 1.53 nm) and best colloidal stability (zeta potential: –29.4 ± 0.89 mV) with formulation AR7. The hexagonal wurtzite phase with a crystallite size of 18.00 ± 5.32 nm was verified by X-ray diffraction. FTIR spectra showed the presence of phytochemical functional groups in charge of capping and reduction. SEM revealed unique flower-like morphology, with an average particle size of 43.90 ± 5.13 nm, proving the efficacy of AR7 as the best formulation. The antimicrobial activity tests revealed minimum inhibitory concentration values of 2.50 – 5.00 µg/mL against *Escherichia coli, Staphylococcus aureus*, and *Candida albicans*; while an IC_{50} of 405 g/mL was obtained with cytotoxicity test on 3T3-L1 cells upon 24 hours of incubation. These results imply that the AR7 formulation presents excellent prospects of reducing environmental wastage for widespread biomedical applications.

Keywords: biogenic synthesis, zinc oxide, nanoparticles, dragon fruit peel, biomedical

YR Speaker 2.1

Mr. Aris Fafon

Kasetsart University, Thailand

Development of Cassava Flour-Modified Bacterial Cellulose Scaffolds Coated with BSA for Tissue Engineering

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Abstract: Tissue injuries from road traffic accidents, falls, and physical assaults are major causes of morbidity and long-term disabilities globally. Despite available treatments, current wound healing methods are limited in promoting effective tissue regeneration, especially in soft tissues. These challenges arise from issues such as poor cellular infiltration and inadequate scaffold biocompatibility. Bacterial cellulose (BC) has gained attention as a potential scaffold material due to its mechanical strength and biocompatibility. However, its dense fiber structure and low porosity limit tissue integration. To address these challenges, this study explores the modification of BC scaffolds by incorporating cassava flour as a structural disruptor during the biosynthesis process. This in-situ modification enhances scaffold porosity and reduces fiber density. Additionally, the scaffolds were coated with bovine serum albumin (BSA) to promote cell attachment and proliferation. Scaffold characterization was carried out using scanning electron microscopy (SEM), Fourier transform infrared (FTIR) spectroscopy, porosity analysis, swelling behavior, and biodegradability testing. Biological assessments, including cytotoxicity and cell proliferation assays with the L929 fibroblast cell line, demonstrated improved biocompatibility and cellular growth. The results suggest that the cassava flour-modified BC scaffold, with BSA coating, holds significant potential for applications in soft tissue engineering.

Keywords: Bacterial Cellulose; In-situ modification; Natural Polymer; Scaffold; Tissue Engineering

YR Speaker 2.2

Mrs. Afifah Husna Mat Saad

Universiti Putra Malaysia, Malaysia

Solvent-Free Biodiesel Synthesis Using Immobilized Reconstructed Ancestral Lipase LUCA

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Abstract: Biodiesel is a promising renewable alternative to petroleum-based diesel, offering both environmental and energy security benefits. One sustainable approach involves converting waste cooking oil (WCO) into biodiesel, addressing waste management and energy recovery simultaneously. This study explores a solvent-free, one-step enzymatic transesterification process using WCO as substrate. We evaluated the catalytic potential of last universal common ancestor (LUCA), a reconstructed ancestral lipase from family I.3 and the first ancient lipase reported to be immobilized, for biodiesel synthesis. LUCA was immobilized via adsorption onto Seplite LX120, a commercial styrene-divinylbenzene resin, enhancing its operational stability and reusability. The immobilized enzyme retained over 80% of its activity across a broad temperature range (20–100 °C) and pH spectrum (pH 4–9), with optimal activity at 70 °C and pH 9. It also showed excellent stability toward various 25% (v/v) organic solvents. The highest biodiesel yield recorded was 103.8%, based on washed crude biodiesel weight after wet washing, using 1% (w/w) immobilized LUCA under optimized conditions within 2 hours. The immobilized enzyme retained >85% activity after 6 weeks of storage at 4 °C and showed excellent reusability, producing 99.13% biodiesel yield after 10 cycles. These findings highlight immobilized LUCA as a novel, robust, and recyclable biocatalyst for sustainable, rapid biodiesel production from waste substrates under mild, solvent-free conditions.

YR Speaker 2.3

Mrs. Yang Zhimei

Universiti Malaya, Malaysia

Effects of Co-application of Chemical and Organic Fertilizers on SOC Sequestration in Tobacco-planting Soils

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Abstract: Fertilization strategies in agricultural ecosystems significantly influence soil organic carbon (SOC) sequestration, with integrated chemical and organic fertilization showing potential for enhancing SOC sequestration. However, the mechanisms, particularly the contribution of microbial residues, in SOC stabilization remain unclear. This study investigated the effects of different fertilization treatments on SOC accumulation and microbial residue dynamics in tobacco-planting soils. Four treatments were applied: (1) no fertilizer (CK), (2) chemical fertilizer (CF), (3) chemical fertilizer with corn straw amendment (CFS), and (4) chemical fertilizer with pig manure amendment (CFM). Soil samples of tobacco cultivation were collected at different growth stages to determine SOC content, total nitrogen (TN), total phosphorus (TP), Ammonium nitrogen (NH_4^+), Nitrate nitrogen (NO_3^-), and quantified via amino sugar biomarkers (MurA、GalN、GluN、F-GluN). Results showed that (1) the exogenous organic amendments (CF, CFS, CFM) significantly enhanced SOC content compared to the CK, with CFM showing the most pronounced effects.(2) The organic amendments reveled significantly enhanced soil amino sugar pools compared to CK, with treatment efficacy following: CFM > CFS > CF ($p < 0.05$). (3) The CFM treatment significantly promoted microbial residue carbon (MRC) accumulation. Native soils exhibited FRC as the primary SOC contributor. However, exogenous treatments (CFS and CFM) substantially increased the contribution of bacterial residues to SOC formation. (4) Correlation analysis revealed that bacterial residue carbon (BRC) was the primary contributor to SOC accumulation, with CFM treament significantly promoting BRC accumulation. BRC was strongly correlated with SOC ($r = 0.58$, $p < 0.05$), whereas FRC showed no significant correlation. This study highlights that BRC exhibits a stronger and more persistent capacity for SOC sequestration in tobacco-planting soils, whereas FRC contributes minimally. These findings emphasize the importance of microbial residue-driven mechanisms of carbon stabilization, and provide insights for optimizing fertilization strategies to improve carbon sequestration in agricultural soils.

Keywords: soil organic carbon; microbial residues; amino sugars; fertilization strategies; soil carbon sequestration

YR Speaker 2.4

Ms. Syazayasmin Sabparie

Universiti Malaysia Sarawak, Malaysia

Endophytic Trichoderma Spp. as Biocontrol Agents against *Phytophthora capsici*, *Pyricularia oryzae*, and *Fusarium verticillioides*

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Abstract: *Trichoderma* spp. are ubiquitous soil fungi with strong biocontrol potential due to their ability to suppress phytopathogens. This study assessed the antifungal activity of *Trichoderma harzianum*, *Trichoderma asperellum*, *Trichoderma virens*, and *Trichoderma lixii* against *Phytophthora capsici*, *Pyricularia oryzae*, and *Fusarium verticillioides* using dual culture and double plate assays on Potato Dextrose Agar (PDA). Percentage inhibition of radial growth (PIRG) was calculated, and mycoparasitism mechanisms were confirmed via Scanning Electron Microscopy (SEM), showing hyphal coiling, penetration, and sporulation. In dual culture assays, *T. asperellum* exhibited the highest inhibition against *P. capsici* (85.19 ± 1.57%) and *P. oryzae* (79.63 ± 0.94%), while *T. virens* showed the greatest inhibition against *F. verticillioides* (72.22 ± 2.70%). In double plate assays, *T. asperellum* again showed strong inhibition, particularly against *P. capsici* (76.30 ± 1.57%) and *P. oryzae* (71.11 ± 0.94%), whereas *T. virens* remained most effective against *F. verticillioides* (68.52 ± 2.70%). *T. lixii* displayed comparatively lower inhibition across all pathogens and assays. These findings reinforce the potential of *Trichoderma* spp. as effective biocontrol agents and support their broader application in sustainable agriculture to reduce reliance on chemical fungicides.

Keywords: *Trichoderma*; phytopathogens; antagonism; antifungal; mycoparasitism

YR Speaker 2.5

Mr. Muhammad Syahmi Bin Mohd Zaid

Atta-Ur-Rahman Institute For Natural Product Discovery, Malaysia

Epigenetic Modifications in Soil Fungi for Anti-biofilm Activity against Oral Pathogen, *Streptococcus mutans*

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Abstract: The increasing virulence and antibiotic resistance of microorganisms within oral biofilm pose a significant global challenge. Despite advancements in antimicrobial treatments, the rise of multidrug-resistant pathogens has rendered many conventional therapies ineffective. Soil fungi serves as an untapped reservoir of unique bioactive compounds with potential therapeutic applications. Epigenetic modifications offer a promising strategy to activate cryptic genes in soil fungi, potentially leading to the discovery of novel anti-biofilm agents. In this study, fungal extracts from two Arctic soil fungi (*Penicillium fimorum* and *Penicillium* sp.) and one tropical fungus from Malaysian rainforest (*Aspergillus longivesica*) were evaluated for their anti-biofilm activity. Each fungus was fermented in three conical flasks containing potato dextrose broth (PDB) with epigenetic modifiers namely 5-azacytidine and valproic acid, along with a control (PDB without epigenetic modifier). Then, the fungal cultures were extracted using liquid-liquid extraction with ethyl acetate. The anti-biofilm activity of the fungal extracts was evaluated against *Streptococcus mutans* (NCTC 10449) using a crystal violet assay. Chlorhexidine served as the positive control while 5% DMSO was used as the negative control. Biofilm formation was quantified by measuring optical density at 570 nm using a UV spectrophotometer. All three extracts of *P. fimorum* showed similar inhibitory activity with a minimum inhibitory concentration (MIC) of 1250 µg/mL. Extracts from *Penicillium* sp. exhibited MIC value ranging from 1250 to 2500 µg/mL. The extract of *A. longivesica* treated with 5-azacytidine showed the most potent activity, with MIC value of 625 µg/mL. This study demonstrates the potential of epigenetic modifications in activating bioactive secondary metabolites from soil fungi with anti-biofilm activity. These findings highlight the value of combining fungal biodiversity with epigenetic approaches as a promising strategy for the discovery of novel agents to combat oral biofilm-related infections.

Keywords: Arctic fungi; tropical fungi; epigenetics modifiers; oral biofilm; *Streptococcus mutans*.

YR Speaker 2.6

Ms. Koonsirin Buraphan

King Mongkut's University of Technology Thonburi, Thailand

Characterization of Plant Growth-Promoting Bacteria from Mungbean Root Nodules in Thailand and Their Biofertilizer Potential

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Abstract: Mungbean (*Vigna radiata* L.) has significant economic importance in Thailand, but intensive chemical fertilizer use has led to insoluble nutrient accumulation in soils, limiting plant nutrient uptake. This study aimed to isolate plant growth-promoting bacterial strains (PGPB) from mungbean root nodules and evaluate their biofertilizer potential. Twenty-four bacterial isolates were obtained from root nodules collected in Chachoengsao province of Thailand using yeast mannitol agar (YMA). Six isolates were identification through 16S rRNA gene sequencing as *Bacillus pumilus* (G-N-8), *Bacillus amyloliquefaciens* (P-N-1), *Bacillus* sp. (P-N-2), *Pantoea* sp. (R-S-3), *Acinetobacter calcoaceticus* (R-S-6), and *Acinetobacter* sp. (R-S-8). These isolates were characterized for multiple growth-promoting traits, including nitrogen fixation, phosphate solubilization, potassium solubilization, and siderophore production. In laboratory assessment, six isolates exhibited beneficial characteristics, with *Pantoea* sp. (R-S-3) showing the most promising results. In greenhouse experiments, mungbean plants inoculated with *Bacillus amyloliquefaciens* (P-N-1) and *Bacillus* sp. (P-N-2) demonstrated superior growth parameters. The results suggest these native PGPB isolates have significant potential as biofertilizers that could enhance nutrition availability in mungbean cultivation while reducing chemical fertilizers dependence. This microbial approach offers a sustainable solution to soil fertility and crop productivity in Thai agriculture.

Keyword: Biofertilizer, Nodule endophytic bacteria, PGPB, Sustainable agriculture, *Vigna radiata*

YR Speaker 2.7

Mr. Yusuf Ibrahim Sadisu

King Mongkut's University of Technology Thonburi, Thailand

Potential of *Bacillus subtilis* 55-7 from Thailand as a Dual Function Biofertilizer and Biocontrol Agent

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Abstract: The need to reduce synthetic agrochemical use has prompted interest in sustainable agricultural alternatives. Endophytic bacteria show promise by promoting plant growth and suppressing pathogens, enhancing both food safety and ecological sustainability. This study examined *Bacillus subtilis* strain 55-7, isolated from a saline-hot spring in Krabi Province, Thailand, for its plant growth promotion and pathogen control capability. Whole-genome sequencing characterized the strain's genetic makeup and identified genes for plant growth promotion and biocontrol. Analysis using antiSMASH and BAGEL4 revealed ten biosynthetic clusters, including non-ribosomal peptide synthetases (NRPSs), polyketide synthases (PKSs), siderophores, and ribosomally synthesized and post-translationally modified peptides (RiPPs), indicating antimicrobial potential. BAGEL4 detected cluster encoding subtiilosin A, sactipeptides, and competence factor (pheromone). Laboratory testing confirmed the strain's ability to inhibit various plant pathogens through antimicrobial metabolites, volatile organic compounds (VOCs), and hydrolytic enzymes. The bacteria also demonstrated nitrogen fixation and phosphate solubilization capability. Greenhouse experiment with Chinese kale (*Brassica alboglabra*) compared four treatments: strain 55-7 alone, NPK alone, and 55-7 combined with either 40% or 60% NPK. Results showed enhanced plant growth and improved soil nutrient levels, particularly in pots treated with strain 55-7 plus 40% NPK fertilizer. This research suggests that *B. subtilis* 55-7 has significant potential as a biofertilizer and biocontrol agent, potentially reducing dependence on chemical inputs in agriculture while maintaining crop productivity.

Keywords: Biocontrol; Plant growth promotion; *Bacillus subtilis*; Genome analysis; Secondary metabolites;.

YR Speaker 2.8

Mr. Mohammad Ali Zaber

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Modulating acrylamide precursors through nutrient based strategies to control acrylamide formation in potato chips

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Abstract: Process contaminant, Acrylamide (AA), is a concerning issue prioritizing the mitigation technique at potato processing industry. The management of nitrogen (N) and potassium (K) nutrient during potato cultivation plays an important role to minimize AA precursors without compromising the processing quality. The research aims a balanced approach to N and K application in two potato cultivars, Asterix and Courage, in response to their roles in AA precursor formation particularly, glucose, fructose sucrose and amino acid content. Utilizing a split-split plot design experiment, N minimization (160, 140 and 120 kg N ha^{-1}) coupled with K supplementation (132, 152 and 172 kg K ha^{-1}) was studied for glucose, fructose, sucrose and amino acid using High Performance Liquid Chromatography (HPLC) and Amino Acid analyzer. N minimization (140 N ha^{-1}) coupled with K supplementation (152 kg K ha^{-1}) resulted in a notable decrease in glucose and fructose, particularly at a specific rate, and led to reduced levels of amino acids, specifically asparagine. Among the 18 treatment combinations, the ratio of 140 kg N ha^{-1} and 152 kg K ha^{-1} demonstrated the lowest glucose (0.165 and 0.135 mg g^{-1} FW) and fructose (0.665 and 0.635 mg g^{-1} FW) and highest sucrose (1.512 and 1.525 mg g^{-1} FW) content in the cultivar Asterix and Courage. Among the amino acid concentration, the lowest asparagine (21.17 and 21.04 mg g^{-1} DW), glutamine (14.27 and 13.54 mg g^{-1} DW), proline (1.60 and 1.72 mg g^{-1} DW), glycine (2.16 and 1.90 mg g^{-1} DW), alanine (2.12 and 1.79 mg g^{-1} DW) and valine (2.02 and 1.57 mg g^{-1} DW) content were found in the Asterix and Courage. Thus, the research findings provide a valuable insight for the cultivar Asterix and Courage with low AA precursors utilizing the optimum management of N and K nutrient during cultivation.

Keywords: Acrylamide, Potato, Processing quality, Food safety

YR Speaker 2.9

Ms. Iwana Zainudin

Universiti Putra Malaysia, Malaysia

Surface Charge Engineering of Microbial Esterase for Enhanced Performance in Acidic Conditions

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Abstract: An esterase from metagenomic library gives a vegetarian option used for dairy fermentation. It exhibits favorable specificity for short-chain fatty acids but affected from reduced activity under acidic conditions typical of soft cheese production. This study applied surface charge engineering to enhance the enzyme's functionality at lower pH. A homology model was constructed using SWISS-MODEL and validated with quality metrics confirming its reliability. Targeted mutation was introduced via Rosetta Supercharge to increase the net negative surface charge. Docking simulations with tributyrin revealed that substrate binding was preserved across the mutant variant T36D. Molecular dynamics simulations at pH 5 and 7 demonstrated improved structural stability and hydrogen bonding in the mutant variant which maintained consistent compactness and solvent accessibility. Binding free energy analyses supported enhanced interaction strength under acidic conditions. These results indicate that surface charge optimization can effectively improve acid tolerance while maintaining catalytic integrity, supporting the use of engineered microbial esterases in animal-free cheese production systems. Future studies could focus on scaling up the production of the T36D mutant variant for industrial applications in cheese production.

Keywords: Esterase; surface-charge engineering; Rosetta Supercharge; acidic pH; cheese

YR Speaker 3.1

Mr. Hu Jintao

Universiti Putra Malaysia, Malaysia

Process Optimization and Structural Insight into RTX LUCA Lipase Catalyzing Long-Chain Fatty Acid Production from Waste Cooking Oil

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Abstract: Long-chain (>C10) fatty acids are typically used in various industries, but the price remains high among the conventional products. Waste cooking oil (WCO), a renewable and inexpensive triglyceride-rich feedstock, is now becoming a promote alternative for sustainable fatty acids, especially for the long-chain fatty acids. In this study, LUCA (Last Universal Common Ancestor) lipase, which is a type I - secreted bacterial enzyme from the I.3 family, was employed to catalyse WCO hydrolysis. Systematically, the optimisation of temperature, agitation speed, pH and reaction time yielded a maximum conversion of 59.5 % at 50 °C, pH 8.0, 150 rpm and 1.5–2 h, whereas enzyme activity declined significantly when the pH shifted from 8.0 or agitation exceeded 210 rpm. In order to deeply explore the structural basis of this reaction, two AlphaFold3-based models of LUCA lipase were constructed: a Ca^{2+}-bound (holo) form, with one Ca^{2+} near the catalytic site and eight in the RTX β-roll domain, and a Ca^{2+}-free (apo) form. Accordingly, tripalmitin was docked into the catalytic triad using AutoDock Vina, and both complexes were subjected to 100 ns molecular dynamics (MD) simulations in explicit solvent at 50 °C and pH 8.0 using YASARA. Through the simulation, the apo model—characterized by a Ca-RMSD plateau of 2.0 Å and loop/lid RMSF values exceeding 1.5 Å—showed increased flexibility in these regions, transient narrowing of the substrate access channel, and reduced stability of substrate binding, whereas the holo model, with a Ca-RMSD of ~2.6 Å and loop/lid RMSF suppressed by ~25 %, maintained an open conformation of the lid domain, preserved the geometry of the active site, and supported consistent tail-first substrate accommodation. These findings indicate that Ca^{2+} contribute to conformational stability and active-site pre-organisation, enabling efficient long-chain triglyceride hydrolysis under high-temperature and alkaline conditions.

Keywords: LUCA Lipase; Calcium Ion; RTX β-roll, Molecular Dynamics Simulation; Triglyceride Hydrolysis

YR Speaker 3.2

Ms. Nurul Bari'ah Hamzah

Universiti Teknologi Malaysia, Malaysia

Composting Potential of Pineapple Waste for Circular Agricultural Applications

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Abstract: Over 48% of pineapple fruit parts are discarded as waste during harvesting and processing activities. Through elemental analysis conducted, this biomass highlights the potential to be transformed into value-added agricultural products. Composting is applied as a strategy to manage this biomass, aligning with sustainable agriculture and zero-waste goals by converting waste into nutrient-rich fertiliser. This study investigates the feasibility of utilising pineapple waste as a compost substrate, aiming to produce high nutrient and odour-reduced compost. To overcome limitations of traditional composting such as prolonged processing, unpleasant odour, and low nutrient recovery—co-composting materials including chicken manure and a seaweed-based booster were incorporated. Laboratory-scale experiments were conducted to evaluate the progression of pH, moisture, temperature, electrical conductivity (EC), and macronutrient content (nitrogen, phosphorus, potassium) under different moisture conditions. The optimisation of moisture content, in particular, has shown that higher moisture levels improve salinity and nutrient concentrations, likely due to higher ion mobility. However, the increasing moisture levels were also associated with intensified odour emissions because of the anaerobic condition of the wet compost. Subsequent experiments were conducted to eliminate this issue while maintaining higher NPK concentration. The findings indicate an increase in EC and notable improvements in nitrogen, phosphorus, and potassium levels with increasing moisture. To evaluate the effect of chicken manure on compost nutrient content, a control experiment was conducted comparing NPK concentrations between a control group and pineapple waste co-composted with chicken manure. This ongoing study highlights the promise of pineapple waste composting in advancing sustainable farming practices and promoting localised circular bioeconomy. Results from this work contribute toward the development of composting systems with lower odour, higher efficiency, and improved soil-enhancing properties.

Keywords: Pineapple waste; Chicken Manure; Seaweed-based booster; Moisture; Optimisation.

YR Speaker 3.3

Mrs. Wan Nur Syakilla Wan Ahmad Nasri

Universiti Teknologi MARA, Malaysia

Neurotoxicity Effects of Antarctic Soil Fungi on Differentiated SH-SY5Y Human Neuroblastoma Cells

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Abstract: Neurodegenerative diseases pose a significant global health challenge, particularly among ageing populations, with current treatments often being ineffective, costly, or associated with severe side effects. Antarctic fungi produce diverse secondary metabolites with potential neuroprotective and neurotrophic effects, but their neurotoxicity remains unclear, requiring rigorous studies to evaluate their safety and therapeutic potential. This study aims to screen the metabolite profile of ten Antarctic fungi crude extracts, assess their neurotoxicity, and identify the selected fungi with the lowest cell cytotoxic effect. Antarctic fungi isolates were cultured on PDA at 10°C, and their crude extracts were obtained using liquid-liquid extraction with ethyl acetate, followed by HPLC profiling to analyse their metabolite profile. The neurotoxicity of these extracts was assessed on differentiated SH-SY5Y neuroblastoma cells using the MTT assay, while ITS gene sequencing was performed to identify the selected non-toxic fungal species. Statistical analysis, including one-way ANOVA, was conducted to evaluate the significance of the findings. In this study, three fungal extracts known as R3-2 sp17, R3-3 sp30, and R5-1 demonstrated promising candidates for neuronal cell proliferation, with cell viability exceeding 100% at various concentrations. R3-3 sp30 isolate was the most non-toxic, consistently maintaining high cell viability across all concentrations, with the highest at 133.01%, followed by R5-1 (114.74%) and R3-2 sp17 (107.05%). The molecular identification by the ITS gene sequence confirmed that R3-2 sp17 is Pseudogymnoascus sp. CCMGE59 with 100% similarity, R3-3 sp30 as *Geomyces* sp. FMCC-3 (99.29%), and R5-1 as *Oidiodendron truncatum* (99.46%). This study identifies Antarctic fungal extracts with low neurotoxicity, highlighting their potential as safe candidates for neurological applications and neurodegenerative therapy. These findings provide a strong foundation for future research to advance the development of innovative neuroprotective therapies.

Keywords: Antarctic soil fungi; secondary metabolite; neurotoxicity; differentiated SH SY5Y cells

YR Speaker 3.4

Ms. Nur Afiqah Ali

Universiti Malaysia Sarawak, Malaysia

Utilization Of Chicken Eggshell-Derived Catalyst as Eco-Friendly Alternative for Biodiesel Production

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Abstract: The need for alternative fuels has arisen in the previous few decades due to the awareness on fossil fuel resources and growing environmental concerns. One of the potential renewable fuels that may be produced from both edible and inedible biomass is biodiesel, which has the potential to replace diesel made from petroleum. The study aims to synthesise calcium oxide (CaO) from eggshells as a catalyst, enhancing its performance by impregnating it with zinc (Zn) in two distinct ratios: CaO/Zn (80/20%) and CaO/Zn (60/40%) as a catalyst for efficiently converting WCO to biodiesel by evaluating and optimizing lab-scale production using methanol. The powder eggshell then undergoes a calcination process at 900oC for three hours. Afterwards, the Zn was impregnated with CaO followed by drying and a subsequent calcination at 900°C for an additional three hours to stabilize the Zn modified catalyst. Box-Behnken design was used to determine the optimum conditions for producing biodiesel with a constant methanol to oil ratio of 6:1 and a catalyst weight of 0.5g. Effects of main variables, including methanol: oil ratio, temperature of the reaction and reaction time, were evaluated and optimized to achieve the maximum purity of the biodiesel. Using Fourier-Transform Infrared Spectroscopy (FTIR), Thermogravimetric Analysis (TGA), Field Emission Scanning Electron Microscope (FESEM), X-ray diffraction Analysis (XRD), and Brunauer-Emmett-Teller (BET), the catalyst was characterised both qualitatively and quantitatively. Gas Chromatography-Mass Spectrometry (GCMS) studies were used to confirm the formation of Fatty Acid Methyl Esters (FAME) from WCO. Altogether, these tests indicate that CaO/Zn (80/20)% is a highly effective and stable catalyst, suitable for use in biodiesel production. The results indicated that the optimal yield was achieved utilizing a CaO/Zn (80/20)% catalyst at 85 °C for 60 minutes. In summary, the CaO/Zn (80/20)% catalyst yields 76% more than CaO and (60/40)%, with a reusability of up to five cycles.

Keywords: Biodiesel; Box Behnken Design; Calcium Oxide; Eggshell; Zinc Metal

YR Speaker 3.5

Mr. Hazlam Shamin Ahmad Shaberi

Universiti Kebangsaan Malaysia, Malaysia

Engineering *Synechocystis* sp. PCC 6803 for Phototrophic Production of Psychrophilic Polyethylene Terephthalate Hydrolase

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Abstract: Plastic pollution, notably from polyethylene terephthalate (PET), poses escalating threats to aquatic biodiversity and human health due to its persistence and microplastic formation. Conventional recycling methods are energy intensive and often downcycle materials. Phototrophic bioremediation harnesses light-driven microbial platforms to directly convert PET into value-added products, reducing carbon footprint and enabling circular bioeconomy strategies. In this study, we engineered *Synechocystis* sp. PCC 6803 to secrete the psychrophilic hydrolase Mors1 for extracellular PET depolymerisation. Bioinformatics tools ensured heterologous protein expression and extracellular enzyme secretion. The Mors1 gene from Moraxella sp. TA144 was codon-optimized, fused to a secretion signal peptide, and chromosomally integrated via homologous recombination at a neutral locus. Transformants were selected on antibiotic medium and verified by colony PCR and Sanger sequencing. High-density cultivation in a 2 L photobioreactor under continuous illumination facilitated recovery of secreted Mors1 from culture supernatants, which were purified for in vitro screening against PET film substrates. Genome integration confers stable inheritance without antibiotic pressure, and the modular cassette design allows facile swapping of PET-degrading enzyme genes for rapid prototyping. This work establishes a pipeline for heterologous protein secretion in *Synechocystis* sp. PCC 6803 and lays the groundwork for scalable, light-driven photobioremediation applications to mitigate plastic pollution.

Keywords: *Synechocystis*; PET hydrolase; Synthetic biology; Genome engineering; Photobioremediation;.

YR Speaker 3.6

Mr. Aisamuddin Ardi Zainal Abidin

Sunway University, Malaysia

Could SmTCL-1 Long Terminal Repeats (LTR) Retrotransposons in Symbiont Algae *Symbiodinium* be the Key to Saving Corals from Global Warming?

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Abstract: Coral reefs face severe threats from human activities and rising ocean temperatures, endangering marine ecosystems and coastal communities that depend on them for food and protection. As the sea temperature rises, corals undergo bleaching where it expels their essential endosymbiont algae that live inside corals and provide them with food through photosynthesis. This partnership breakdown occurs when both corals and their algae partners cannot tolerate the heat stress. To address this crisis, we focused on improving the heat tolerance of zooxanthellae, specifically *Symbiodinium microadriaticum*, which forms crucial partnerships with many coral species. Previous research showed that mobile genetic elements called retrotransposons can help organisms survive heat stress, but this had never been tested in coral symbionts. This study aims to create heat-tolerant strains of *S. microadriaticum* by enhancing the activity of a specific retrotransposon called SmTCL-1. To develop heat-tolerant cultures, *S. microadriaticum* underwent 3 different types of heat treatments namely 1) control (maintained at 26°C), 2) temperature ramp up and 3) heat shock with temperature ramp up. Cultures were analysed using pulse amplitude modulation (PAM) and cell counts to determine the photosynthetic efficiency and cell growth of the experimentally evolved cultures against parental control cultures. To elucidate the role of the retrotransposons in providing protection for the zooxanthellae against elevated temperatures real-time PCR was carried out through to determine the copy number of the gene in heat-tolerant strain compared to the wild-type strain. This study managed to improve heat-tolerant strains up to 33.7°C which is 2.7°C higher than the bleaching threshold. Furthermore, the copy number of the SmTCL-1 LTR retrotransposon in heat shock with temperature ram up cultures showed significantly higher up to 6±1.63 fold compared to control cultures. It is hoped that this study will pave the way for a strategy for promoting coral reef preservation and protection.

Keywords: coral bleaching, global warming, *Symbiodinium microadiratium*, SmTCL-1 LTR retrotransposon, zooxanthellae

YR Speaker 3.7

Mr. Faisal Amir

National Yunlin University of Science and Technology, Taiwan

Hydrothermal Liquefaction of Agricultural Waste and Aquatic Biomass: A Sustainable Approach to Biochar and Biofuel Production

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Abstract: Biochar derived from water hyacinth using the hydrothermal liquefaction (HTL) process has recently gained attention due to its abundance, low cost, and use of non- valuable raw materials. However, its commercial applications remain limited. This study aims to develop water hyacinth-based biochar as both a biocatalyst and a bio-adsorbent. A Box-Behnken design was utilized to optimize production efficiency, exploring variables such as feedstock type, biomass ratio, and solvent content to achieve maximum yield. The findings revealed that water hyacinth feedstock produced the highest biochar yield, and lower solvent content improved biochar output but reduced bio-oil production. The optimal yields 41.92 wt.% for biochar and 42.13 wt.% for bio-oil were obtained using the lowest solvent-to-biomass ratio at 260 °C and 54 bar for 90 minutes. Interestingly, applying the Box-Behnken design increased bio-oil yield to 57.4 wt.%, emphasizing the significant impact of temperature and reaction time. The resulting products met ASTM standards. Additionally, the biochar was successfully used as a biocatalyst in biofuel production with a 56.13 wt.% liquid fuel yield and served as a bio-adsorbent with an efficiency of 7.23–10.21 wt.%. Utilizing water hyacinth for biochar production supports sustainable development, circular economy practices, and the goal of net-zero emissions.

Keyword: Biochar; Biocatalyst and bio-adsorbent; Box-Behnken Design; Hydrothermal liquefaction technology; Water hyacinth.

YR Speaker 3.8

Ms. Siti Farah Hanim Alhafiz

Universiti Putra Malaysia, Malaysia

Evaluating *Nannochloropsis* sp. as a Functional Feed Additive for *Lates calcarifer* Asian Sea Bass: Growth Performance and Immunomodulatory Effects

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Abstract: Microalgae, particularly *Nannochloropsis* sp., have gained attention as functional feed additives in aquaculture due to their nutritional and immunomodulatory properties. This study evaluated the effects of *Nannochloropsis* sp. supplementation on the physiological and immune responses of *Lates calcarifer* (Asian seabass) juveniles. Fish with an initial weight of 9.04 ± 0.5 g were reared in 100 L fiberglass tanks with a recirculating water system and fed commercial feed supplemented with 5% wild-type *Nannochloropsis* sp. for five consecutive days during weeks 0 and 2. A control group received only commercial feed. Immune responses were assessed via whole-blood profiling and qPCR analysis targeting *IgM* and *MHC class I* gene expression. A pathogen challenge was conducted at week 4 using *Vibrio harveyi* via intraperitoneal injection to validate the feed's immunostimulatory effect. No significant differences were observed in specific growth rate (SGR) or haematological parameters, including haemoglobin (HGB), white blood cells (WBC), plasma protein, and platelet count (PLT), indicating no adverse physiological effects. However, qPCR revealed significant upregulation of immune genes in the treated group: *IgM* expression was highest in the head kidney (5.9-fold), and *MHC-I* in the hindgut (3.8-fold). Post-challenge, the relative percent survival (RPS) of the treated group was 17% higher than the control group. These findings demonstrate that *Nannochloropsis* sp. is a safe bio-functional feed additive that enhances immune gene expression and disease resistance in *L. calcarifer*. The results support its potential use in oral immunoprophylaxis strategies, including transgenic *Nannochloropsis*-based vaccination against vibriosis in Asian seabass.

Keywords: Fish feed; *Nannochloropsis* sp.; oral vaccine; transgenic microalgae; vibriosis disease.

Poster 1.1

Ms. Nur Raihan Aqilah Binti Mohammad Azmin

Universiti Teknologi MARA, Malaysia

Exploring Phytochemicals of Endophytic Actinomycete Extracts Using Liquid Chromatography Tandem Mass Spectrometry Data Analysis

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Abstract: The increasing prevalence of dental caries among the world's population has propelled the search for novel antimicrobial agents, with particular emphasis on combating biofilm-associated infections. Endophytic actinomycetes, residing within plant tissues, are renowned for their prolific production of bioactive secondary metabolites. This study focuses on the identification of secondary metabolites derived from endophytic actinomycetes inhabiting the stem bark of *Hopea ferrea*, a medicinal plant with remarkable therapeutic potential such as anti-tooth cavity. Crude extracts from three endophytes have been prepared using four different types of media (tryptic soy, ISP1, starch casein and King's B) and the extracts were tested for their capabilities to inhibit biofilm production using crystal violet assay against a biofilm-producing bacteria, *Streptococcus mutans*. The extracts were then analysed using high-performance liquid chromatography (HPLC) and liquid chromatography-mass spectrometry (LCMS) to identify the bioactive compounds, then the results were analysed using MZmine and SIRIUS software. Preliminary results indicated the presence of diverse secondary metabolites with potential antibiofilm activity within the endophytic actinomycetes of *Hopea ferrea*, such as 4-(2-Amino-1-hydroxyethyl)phenol and Beta-phenylethylamine (PEA). Among all extracts, the endophytes grown in tryptic soy media exhibited the lowest *S. mutans* biofilm production, at 67.63%. The identified compound groups detected with HPLC and LCMS has been previously studied for their antibacterial and antibiofilm activities. This study highlights the endophytic actinomycetes from medicinal plants as a promising source of antibiofilm agents and showcases mass spectrometry-based dereplication as a valuable tool for discovering and characterising bioactive compounds to develop new treatments for biofilm-related infections.

Keywords: antibiofilm, endophytic actinomycetes, liquid mass-spectrometry (LCMS), secondary metabolites

Poster 1.2

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Influence of Alginate Concentration on Enumeration and Characterization of Probiotic Microbeads for Poultry Feed Additives

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Abstract: Probiotics are increasingly recognised for their beneficial effects on poultry health and productivity. Microencapsulation in biopolymers such as sodium alginate is a promising approach to enhance the stability and delivery of probiotics in poultry feed. This study examines the impact of varying sodium alginate concentrations on the enumeration and characterisation of probiotic microbeads intended for use as poultry feed additives. *Lactobacillus plantarum* was encapsulated in sodium alginate at concentrations of 1.0%, 1.25%, and 1.5% (w/v), using extrusion into a calcium chloride solution to form gel beads through ionic gelation. The microbeads were analysed for probiotic enumeration via plate count techniques. Beads' characterisation included size distribution, morphology via scanning electron microscopy (SEM), and viability tests under simulated gastrointestinal conditions. Results showed that sodium alginate concentration significantly influenced microbeads characteristics. Higher alginate concentrations produced larger, more uniform beads with better sphericity. Enumeration results indicated that encapsulation efficiency and probiotic viability were optimal at a 1.25% sodium alginate concentration. SEM revealed rough surfaces on all beads, a result of freeze-dried polysaccharides. Viability tests demonstrated that beads with 1.25% alginate offered the best protection against poultry gastric and intestinal conditions, with minimal log reductions to 6.57, 5.61, and 5.04 from 7.13 in simulated salivary (pH 6.5), gastric (pH 2.0), and intestinal (pH 7.2) fluids, respectively. A concentration of 1.25% of alginate provided the best balance between bead integrity and probiotic viability, making it the most suitable for effective probiotic delivery in poultry. Sodium alginate concentration is a key factor in the successful encapsulation of probiotics for poultry feed additives. This study provides valuable insights into optimizing probiotic formulations to enhance their stability and functionality, thereby improving poultry health and productivity.

Keywords: Probiotics; Sodium Alginate; Microencapsulation; Poultry Feed; Enumeration; Characterisation; Viability

Poster 1.3

Prof. Dr. Su-Der Chen

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Effect of Soaking and Radio Frequency Roasting Processing on Germinated Buckwheat Tea

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Abstract: Buckwheat was soaked in various solutions at 25℃ for 6 h, including distilled water (RO), 0.1% glucose (Glu), 0.1% phenylalanine (Phe), and 0.1% calcium chloride ($CaCl_2$) to enhance the bioactive compounds. After soaking, one group was subjected to ultrasonic (U) treatment for 20 min, then the seeds were germinated at 25℃ for 24 h, reaching a moisture content of 40% at 24 h, with 3 mm sprout length. Germination significantly enhanced total polyphenols, flavonoids, rutin, and DPPH radical scavenging activity compared to non-germinated samples. Among the treatments, 0.1% $CaCl_2$ combined with ultrasonic treatment (Ca+U) resulted in the highest total polyphenol content (6.42 μg GAE/g), elevated rutin levels (3.65 mg/g), and strong antioxidant capacity (81.64 %). Germinated buckwheat tea (2 kg) was roasted using a conventional cyclone oven at 140℃ for 100 min, and hot air-assisted radio frequency (RF) heating at 100℃ with 10 kW, 40.68 MHz power for 22 min, achieving final roasting temperatures of 140℃ and 120℃, respectively. Therefore, soaking in 1% $CaCl_2$ with ultrasonics to obtain higher bioactive components, using RF roasting can effectively obtain germinated buckwheat tea.

Keywords: Buckwheat; Germination; Radio frequency; Roasting

Poster 1.4

Mr. Kim Haram

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D-Lactate Assessment for Ensuring the Safe Use of Microorganisms as Food Ingredients

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Abstract: D-lactate is a stereoisomer of L-lactate and is primarily produced as a metabolic byproduct of microbial activity. While only trace amounts are present in human and animal tissues, excessive accumulation through microbiota or fermented foods can pose significant health risks. High levels of D-lactate may lead to D-lactic acidosis and encephalopathy, which can cause symptoms such as neurological dysfunction, gastrointestinal discomfort, and metabolic acidosis. With the increasing consumption of probiotics and fermented foods, evaluating the D-lactate production potential of microbial strains has become essential for ensuring food safety. Although regulatory guidelines for D-lactate exist, clear evaluation criteria have not been established. Therefore, this study proposes a standardized and reliable protocol to assess D-lactate production in microorganisms used in food biotechnology. In this study, the culture supernatants of *Lactiplantibacillus plantarum* and *Limosilactobacillus fermentum* type strains were used as positive and negative controls, and D-lactate concentrations were measured using the D-Lactate Assay Kit (Abcam, ab83429). Test samples were prepared according to the manufacturer's instructions, including deproteinization when necessary. After generating a standard curve with known concentrations of D-lactate, assay buffer, enzyme mix, and substrate mix were added to the samples. Following a 2-minute incubation at room temperature, absorbance was measured at 450 nm, and D-lactate concentrations were quantified based on the standard curve. Our results showed that *L. plantarum* exhibited a D-lactate production of 15.514 mM/µL, while *L. fermentum* showed a production of 10.108 mM/µL. Other tested bacteria showed variable amounts of D-lactate production. In summary, the proposed protocol for assessing D-lactate production in microorganisms would support the safe selection of microbial strains intended for use as food ingredients.

Keywords: Probiotics, D-lactate, Lactic acid bacteria, Safety assessment, Food safety

Poster 1.5

Mr. Chae Yeongjae

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Genome Sequence Analysis of *Enterococcus faecalis* and Its Functional Probiotic Potential

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Abstract: *Enterococcus faecalis* (*E. faecalis*), which has been certified for safe use by the Ministry of Food and Drug Safety of Korea, is increasingly utilized due to its various probiotic functions, including gut health promotion and immune modulation. In this study, the complete genome of *E. faecalis* BK_B_06 isolated from commercial cream cheese was sequenced using the Oxford Nanopore Technologies MinION platform. *De novo* assembly was performed using Flye and Canu, followed by contig polishing with Homopolish. BUSCO was used to assess genome quality, and annotation was performed using RAST and eggNOG. The genome consists of a circular chromosome of 2,822,943 base pairs with a GC content of 37.6%. The genome annotation revealed 2,711 protein-coding sequences, 147 tRNAs and 31 rRNAs. The genome of BK_B_06 contains the *RAN1* gene (EC 3.6.3.4), which encodes a copper-translocating P-type ATPase that contributes to maintaining copper homeostasis and protecting the cell against oxidative stress. It also encodes the *SOD2* gene (EC 1.15.1.1), which produces a manganese-dependent superoxide dismutase that detoxifies reactive oxygen species, further enhancing the strain's antioxidant defense. Additionally, the genome harbors *BEWA_032300* (EC 3.6.3.32), encoding the ATP-binding component of the glycine betaine ABC transport system, which enhances resistance to osmotic stress. The genetic functionality of BK_B_06 in coping with oxidative and osmotic stress suggests its potential applications beyond the dairy industry, extending to health supplements and the functional food industry.

Keywords: Complete genome sequencing; Probiotics; *Enterococcus faecalis*

Poster 1.6

Mr. Jun Won Oh

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Green Bioprocess for Uroporphyrin I Production: Red Algae Saccharification and Microbial Transformation by *Corynebacterium glutamicum*

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Abstract: Among various biomass sources, red algae, which are abundant in marine environments, hold great potential as a sustainable feedstock. Notably, uroporphyrin I (UP I), a porphyrin derivative known for its strong antimicrobial activity, has emerged as a promising bioactive molecule. However, microbial production of UP I remain challenging due to its long biosynthetic pathway and complex regulatory mechanisms. To achieve UP I production from galactose derived from red algae, the study was divided into two major experimental tracks. First, to utilize red algae as a carbon source, enzymatic hydrolysis of κ-carrageenan, a sulfated polysaccharide, was carried out. To improve κ-carrageenan hydrolysis and obtain fermentable galactose, κ-carrageenase (CgkA) and iduronate-2-sulfatase (IdsA3) were used simultaneously, resulting in a two-fold increase in relative activity compared to the use of a single CgkA. Second, as wild-type *C. glutamicum* lacks the ability to utilize galactose, a heterologous galactose metabolism pathway was introduced. Complete galactose consumption was observed after 39 h of cultivation in a 5 L fermentation using the engineered strain, confirming successful pathway implementation. Third, to establish UP I biosynthesis, the strain was first tested using glucose as a carbon source. UP I biosynthesis requires the condensation of eight molecules of 5-aminolevulinic acid (5-ALA), which is known to be a rate-limiting precursor. To overcome this bottleneck, we constructed an expression cassette carrying *hemA*^{fbr} from *Salmonella enterica* and *hemL* from *Escherichia coli*, which were cloned into vector and overexpressed in *C. glutamicum*. This strain produced approximately 161.3 mg/L of UP I in 250 mL flask cultures. By introducing this UP I production module into the galactose-utilizing *C. glutamicum* strain, successful conversion of red algae-derived galactose to UP I becomes feasible, providing a novel perspective on the sustainable biosynthesis of porphyrin-related compounds using galactose.

Keywords: *Corynebacterium glutamicum*; Uroporphyrin I; Red Algae; Biomass Utilization;.

Poster 1.7

Mr. Wu-Young Jeong

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Biosynthesis of Designer Metalloporphyrin through Programmable Porphyrin Production using Modular Cell Factory

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Abstract: Chemical synthesis of metalloporphyrin typically involves harsh reagents and energy-intensive conditions, raising environmental concerns. In this study, sustainable biological metalloporphyrin production was developed. First, microbial strain was engineered to produce 5-aminolevulinic acid via Beale pathway and Shemin pathway. Then, porphyrin pathways were employed with dual induction system for selective porphyrin production. Engineered strain produced uroporphyrin I (UP I), coproporphyrin III (CP III) and protoporphyrin IX (PP IX) selectively under appropriate inducer. Second, metal-chelatase was used for metalloporphyrin biosynthesis. Purified chelatase was tested *in vitro* for metal specificity and resulted high specificity with Fe^{2+}, Zn^{2+}, Cu^{2+}, Ni^{2+} and Mn^{2+} which has similar ionic radius between 0.70-0.80Å. However, other metals with similar ionic radius were not able to form metalloporphyrin, thus, chelatase was engineered. Third, metal binding site of chelatase H182, S221, and E263 were targeted for rational design and S221H variant have successfully attached cobalt with CP III resulting Co-CP III, which are used as catalyst in photoelectrochemical reactions. These results demonstrate the feasibility of converting porphyrin into metalloporphyrin biologically with engineered strain and enzymes. This platform offers an alternative for the scalable production of versatile metalloporphyrin, advancing sustainable biosynthetic strategies and contributing to reduced environmental impact in the production of functional porphyrin-based materials.

Keywords: Porphyrin production; Metalloporphyrin; Biosynthesis; Metabolic engineering; Protein engineering

Poster 1.8

Mr. Dong-Hyeok Hwang

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Modular Oligo-Transport Integration for Promoting Algal Sugar Assimilation and Porphyrin Production

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Abstract: Red algal biomass yields a complex mixture of fermentable sugars with diverse chain lengths upon depolymerization, presenting a challenge for microbial uptake. o address this, *C. glutamicum* was engineered with a heterologous oligosaccharide transporter system, enabling efficient assimilation of red algae-derived sugars. Expression of the transporter was confirmed through S-layer protein analysis, showing a molecular weight of 174.68 kDa. Additionally, key genes involved in galactose metabolism, such as galactose mutarotase, galactose-1-phosphate uridylyltransferase, and galactokinase, were introduced to enhance downstream sugar utilization. After 72 hours of cultivation, the modified strain consumed approximately 60 % of the supplied sugars and showed a 1.5-fold improvement in growth relative to the wild-type strain. Furthermore, modular optimization of the porphyrin biosynthetic pathway was achieved by overexpressing key genes including *hemA*, *hemL*, *hemQ*, and *hmuO*. Using a 5 L bioreactor system, the engineered *C. glutamicum* successfully produced biliverdin at a titer of 68.74 ± 4.97 mg/L. These findings highlight the potential of this microbial platform for scalable and sustainable production of high-value porphyrin derivatives from red algae-derived feedstocks, supporting its future application in industrial biotechnology.

Keywords: Oligo-Transporter; Algal oligosaccharide; Galactose uptake; Bioproduction; Porphyrins

Poster 1.9

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Development of Quantitative Metabolic Analysis Methods Using Kinetic Model in A Complex Microbial System

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Abstract: Organic acids have been widely used in industry and their demand is increasing recently. Particularly, organic acid production using complex microbial systems has the advantages of costs and flexibility. However, a method to analyze the dynamics at species level has not been established to date. This study aimed developing a new metabolic analysis method to measure the species-specific productivity (SSP) of each microbial species through a kinetic model, which can estimate the metabolic kinetics of microbial species. To construct a kinetic model, we used results of chemical parameters and predominant bacterial species including *Caldibacillus hisashii*, *Clostridium cochlearium*, and *Heyndrickxia coagulans* in continuous fermentations at dilution rates (D) of 0.05 h^{-1} and 0.4 h^{-1}. Metabolic modelling and simulation were carried out using a simulator of WinBEST-KIT. Reaction rate equations were constructed by multiplying the Michaelis-Menten reaction rate equation by the concentrations of each microbial species. To improve the accuracy of glucose prediction, a term of glucose inhibition was introduced at D=0.05 h^{-1} and terms of glucose and lactic acid inhibitions at D=0.4 h^{-1}. As the results, the coefficients of determination between the measured and estimated values at D=0.05 and D=0.4 h^{-1} were 0.972 and 0.996, respectively. These were much higher than 0.653 and 0.0363 with the model without of the inhibition equation, respectively, which suggested lactic acid inhibition and glucose inhibition in the continuous fermentation systems. Furthermore, 0.333 g/L/h and 2.15 g/L/h of the SSP with the predominant microbial species *C. hisashii* was calculated at D=0.05 h^{-1} and D=0.4 h^{-1}, respectively, by the kinetic model. At D=0.05 h^{-1}, SSP values indicated the possibility of lactic acid-mediated cross-feeding between lactic acid-consuming *C. cochlearium* and -producing *C. hisashii*. These results suggest that this is a novel metabolic analysis method that can quantitatively calculate species-level productivity and consumption in complex microbial systems.

Keywords: complex microbial system; dynamic model, species-specific productivity; organic acid production; continuous fermentation;.

Poster 1.10

Assoc. Prof. Dr Yukihiro Tashiro

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Establishment of Two-Stage Meso- and Thermophilic Anaerobic Digestion of Food Waste for Methane Production

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Abstract: Among the United Nations' Sustainable Development Goals (SDGs), waste and wastewater treatment (SDG6) poses a particular challenge. A lot of food waste is created worldwide. The key issue of waste is its unhygienic disposal, leading to disease. A solution would require frequent waste collection and treatment to maintain a clean living environment. However, waste also holds nutritional value for microorganisms. Many countries have already recognized this unique attribute of waste and have put it to use through the on-site microbial treatment of food waste via both aerobic and anaerobic digestion. In this study, a two-stage meso- and thermophilic anaerobic digestion (TSMTAD) of food waste was examined and its microbiological structure was investigated. The first stage was designed for the primary storage of perishable food waste and the second stage for central biogas production. Mesophilic storage with initial neutralization and inoculation of lactic acid bacteria (LAB) resulted in an accumulation of lactic acid (21-23 g/L) with a decreased pH, in which bacterial members in facultative hetero-fermentation type LAB dominated. Repeated fed-batch storage showed stable accumulation of lactic acid with retaining 89.3% (av.) carbon, prevented the growth of exogenous food pathogens. When the second stage of TSMTAD was compared with direct single stage anaerobic digestion (SSAD) at 55°C, the amount of methane accumulated was 1.48-fold higher (896 Nml/g-vs). The methane yield of the original food refuse was 6.9% higher in case of TSMTAD. The microbial community structures of the both cases were similar, consisting of a sole thermophilic hydrogen-assimilating methanogen, *Methanothermobacter thermautotrophicus*. However, the abundance of bacteria belonging to two functional groups, H_2 CO_2 and acetic acid producer, and syntrophic acetate oxidizing bacteria increased in TSMTAD. This may change the metabolic pathway, contributing to the stimulation of methane productivity.

Keywords: food waste; anaerobic digestion; biogas production; two-stage meso- and thermophilic anaero-bic digestion (TSAD); microbial community structure;.

Poster 1.11

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A Self-Assembled Peptide Nanofibers for Enhanced Intratumoral Penetration

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Abstract: Rapid growth of cancer cells leads to the formation of compact structure and sparse vasculature in solid tumor. This provides significant challenges for effective drug delivery, as penetration of macromolecules are restricted. To develop drug delivery system for tumor penetration, cancer cell spheroids have been used as a model as they closely mimic the main features of human solid tumors. This study aims to characterize the cancer cell spheroid penetration of a peptide amphiphile (PA) system and explore its potential as a platform for deep tumor drug delivery. The PA system consists of cyanuric acid-modified PA (Cya-PA) and melamine- nitrobenzofurazan (Mel-NBD)[1]. In aqueous conditions, complementary hydrogen bonding and amphiphilicity of the PAs direct the formation of Cya-PA/Mel-NBD co- assembled nanofibers. By increasing the number of C6 alkyl linker in Cya-PA, the nanofibers can be lengthened. These nanofibers exhibit rapid, non-endocytic internalization by HeLa cells. Upon incubation with HeLa cell spheroids, rapid and deep penetration of the nanofibers into spheroids was confirmed. These nanofibers can then be modified for antisense oligonucleotide (ASO) delivery by introducing complexation motifs. When HeLa cells and their spheroids were treated with the complex, enhanced cellular uptake of both the nanofibers and ASO was observed. The findings suggest the potential use of PA-based system for deep tumor drug delivery.

Keywords: Peptide amphiphiles; Self-assembly; Cancer cell spheroid; Drug delivery

Poster 1.12

Prof. Dr. Chia-Hung Kuo

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Efficient Extraction and Physicochemical Characteristics of Soy Protein from Soybean Meal

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Abstract: Soybean meal, a soybean oil-industrial waste, is a promising source for the extraction of soy protein for its application as an alternative to animal protein. In this study, a green strategy was applied for the value-added valorization of soybean meal for human health benefits. Soy protein was extracted from soybean meal using high shear homogenization technique. A maximum protein recovery (70%) was achieved when high shear homogenization was given for 10 min, at 55 °C, pH 12, extraction time 2 h, and solid-liquid ratio 1:20. Fourier-transform infrared spectroscopy analysis confirmed the presence of amide I, II and III regions in the soy protein. The extracted protein exhibited enhanced oil holding capacity (5.52 g/g) compared to commercial soy protein isolate. Additionally, the soy protein showed excellent foaming and emulsifying properties and maximum solubility (~80%) at pH 10. The poor solubility and the net charge of zero at pH 4.5 indicated the isoelectric point of soy protein. Moreover, the extracted soy protein was supplemented with biscuits to make protein-rich biscuits. The supplementation of 20% soy protein concentrate in biscuits increased the protein content (12.61%). Although the addition of 20% protein resulted in reduced hardness and brightness of biscuits, it was similar to control biscuits (without protein addition) in terms of sweetness, bean flavor, crispness, and overall acceptability besides decreasing the glycemic index of the biscuits. The study's findings indicated that the value-added component can be extracted from soybean meal waste and used to form functional food with high nutritional value.

Keywords: Soybean meal; Soy protein extraction; High-shear homogenization; Surface charge; Solubility; Glycemic index;.

Poster 1.13

Assoc. Prof. Dr. Jung-Chin Tsai

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Immobilization of Carbonic Anhydrase on Functionalized Regenerated Cellulose Nanofiber Membranes for Carbon Dioxide Capture and Mineralization

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Abstract: Cellulose acetate (CA) nanofibers were prepared using electrospinning technology, and modified into regenerated cellulose (RC) with -OH groups. These RC membranes were coupled with bromoacetic acid (BrA) to produce weak ion exchange membranes with acidic groups (RC-BrA). Further chemical bonding with chitosan (CS) formed RC-BrA-CS membranes with -NH2 groups. Carbonic anhydrase (CA) was covalently bonded to these membranes, creating RC-BrA-CS-CA and RC-BrA-CA membranes. The activity of free CA was analyzed using the p-nitrophenyl acetate (p-NPA) colorimetric method under varying conditions (temperature, pH, and salinity), while immobilization activity on the modified membranes was determined by the Walbur-Anderson (WAU) method. Results showed superior immobilized expression activity for RC-BrA-CS-CA compared to RC-BrA-CA. Repeatability tests indicated that RC-BrA-CS-CA retained high activity. Immobilized CA converted saturated CO2 solution into bicarbonate (HCO3-). During CO2 conversion tests, adjusting the bicarbonate solution pH to 9 or 11 and adding 0.2 M calcium chloride (5 mL) led to calcium carbonate (CaCO3) precipitation. SEM, FTIR, and XRD analyses confirmed CaCO3 formation. The results demonstrated that CA immobilized on both membranes effectively facilitated CO2 mineralization into CaCO3.

Keywords: Carbon dioxide Capture; Cellulose acetate nanofiber membrane; Modification, Conversion; Mineralization;.

Poster 1.14

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Optimization of Enzymatic Parameters for Enhanced Soluble Protein Content in Moringa Leaves

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Abstract: Moringa oleifera leaves are rich in protein, but their low solubility limits their functional use in food systems. This study aimed to optimize enzymatic hydrolysis using Alcalase to improve the soluble protein yield. A Central Composite Design (CCD) under Response Surface Methodology (RSM) was used to evaluate the effects of enzyme concentration (1–4%) and hydrolysis time (30–180 minutes) at pH 8. Soluble protein was measured using the Bradford assay and expressed in µg/mL. The quadratic model generated showed an R^2 value of 0.6084 and a desirability of 0.828. Hydrolysis time was found to be the most significant factor ($p < 0.05$), while enzyme concentration had a limited effect. The model predicted an optimum yield of 247.13 µg/mL at 1% enzyme concentration and 180 minutes, which was experimentally validated with a comparable yield of 260.02 µg/mL. These findings demonstrate the potential of enzyme-assisted hydrolysis as a practical approach for improving protein solubility in moringa leaves, supporting its development into functional plant-based ingredients.

Keywords: Moringa oleifera; Alcalase; soluble protein; enzymatic hydrolysis; Response Surface Methodology;.

Poster 1.15

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Modified Na13X Spherical Particles with PEI and BSA for Enhanced CO_2 Capture: Dynamic Adsorption Performance

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Abstract: Capturing carbon dioxide (CO_2) from the atmosphere is a crucial strategy for mitigating harmful emissions and combating climate change. While CO_2 capture using amine-based aqueous solutions or zeolite particles is well established, the development of new adsorbents remains an important research focus. In this study, modified Na13X spherical particles were investigated as potential CO_2 capture materials. The modification involved the physical attachment of polyethyleneimine (PEI) and bovine serum albumin (BSA) at varying concentrations, resulting in four distinct adsorbents: NaX-PEI, NaX-BSA, NaX-PEI-BSA, and NaX-BSA-PEI. The study evaluated the impact of key process variables—including flow rate, CO_2 concentration, PEI and BSA concentrations, and column bed height—on breakthrough curves in a packed bed reactor. Adsorption performance was assessed through dynamic breakthrough characteristics such as dynamic binding capacity, equilibrium binding capacity, and column bed utilization. The findings provide insights into the effectiveness of modified Na13X adsorbents and their potential for CO_2 capture from ambient air.

Keywords: CO_2 capture; Na13X; Bovine serum albumin; Polyethyleneimine (PEI);.

Poster 1.16

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Comparative Study of Photosynthetically Improved Microalgae for Further Strain Enhancement

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Abstract: Microalgae have been gaining attention as a promising solution for CO_2 reduction and as an alternative energy source. Microalgal lipids are synthesized from photosynthetic products, but achieving a yield and productivity suitable for industrial production of biofuel requires highly efficient photosynthesis. This necessitates strains with significantly superior photosynthetic efficiency compared to natural strains, and various bioengineering approaches have been explored to overcome the limitations of photosynthetic efficiency. To achieve truly efficient strain development, selecting appropriate parental strains is essential.

In this study, we aim to identify suitable parent strains through comparative analysis of the growth patterns and photosynthetic efficiency of various photosynthetic mutant strains. We employed improved microalgal strains through CRISPR-based genetic modifications to regulate light-harvesting antenna pigments and carbon metabolism in microalgae. We then compared their growth, photosynthetic efficiency, and biomass accumulation under photoautotrophic and mixotrophic conditions.

Through this analysis, we gained insights into the photosynthetic and carbon metabolic changes associated with each mutation. These findings will allow us to select optimal parent strains for further improvement and establish strategies for additional strain enhancements.

Keywords (3개 이상): Photosynthetic microalgae, CRISPR-derived mutants, photosynthetic efficiency

Poster 1.17

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Discovery of novel transcription factors as targets to control the virulence of *Vibrio vulnificus*

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Abstract: *Vibrio vulnificus*, a highly lethal food-borne pathogen, produces exotoxins to disrupt the host immune system during infection. For successful infection, multiple transcription factors (TFs) elaboratively regulate the expression of the *V. vulnificus* exotoxin genes in response to host environments. However, present studies are limited to only a few TFs involved in the regulation of the exotoxin gene expression. Here, we selected putative TF genes of *V. vulnificus* based on the presence of DNA-binding domains and constructed 285 TF mutants. To discover novel TF(s) regulating the virulence of *V. vulnificus*, the cytotoxicity for human epithelial cells and hemolytic activity for human red blood cells of each mutant were compared with those of the wild type. These results revealed that a TF-deleted mutant exhibited less cytotoxicity and hemolytic activity than the wild type, without any growth defects. Moreover, compared with the wild type, the TF-deleted mutant showed reduced mortality in mice and brine shrimp, indicating that the TF is essential for the pathogenesis of *V. vulnificus*. Transcriptome analysis revealed that the TF regulates the expression of major exotoxin genes of *V. vulnificus*, including *rtxA* encoding the multifunctional autoprocessing repeats-in-toxin (MARTX) toxin, *vvhA* encoding hemolysin VvhA, and *plpA* encoding phospholipase A_2. Altogether, this study discovered the novel TF that contributes to the overall pathogenesis of *V. vulnificus* by regulating the expression of critical exotoxin genes. Thereby, the development of drugs targeting the TF would contribute to the reduction of *V. vulnificus* infectivity with low selective pressure for the emergence of resistant strains by specifically inhibiting its virulence without impeding bacterial viability.

Keywords: *Vibrio vulnificus*; Transcription factor; Virulence; Exotoxin; Control target.

Poster 1.18

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Research and Activity Evaluation of Enzyme Applicable to Astaxanthin Extraction from *Xanthophyllomyces dendrorhous*

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Abstract: In the food industry, interest in and consumption of health functional foods for antioxidant and immunity enhancement is increasing significantly due to the effects of aging and the novel coronavirus (COVID-19). Therefore, research related to functional substances is also being actively conducted. Astaxanthin is a ketocarotenoid-type red pigment and has been investigated as an antioxidant that is about 10 times more powerful than other types of carotenoids. The chemical compound form of astaxanthin has problems with lower bioavailability and lower stability than natural extracts. In this study, an enzyme used for *Xanthophyllomyces dendrorhous* was developed through a transformed microorganism and the enzyme ability was evaluated through halo assay and DNS method. In addition, astaxanthin extracted from *X. dendrorhous* were analyzed for astaxanthin using HPLC. As a result, enzyme production was successfully performed from the transformed microorganism, and the enzymatic activity of the prepared enzyme was confirmed qualitatively and quantitatively. By extension the *Corynebacterium glutamicum* strain, which is easily cultured and genetically manipulated, will be utilized to increase the efficiency of the enzyme. Through these studies, it is expected that it can be directly applied to the functional food market containing astaxanthin extracted from *X. dendrorhous*.

Keywords: *Xanthophyllomyces dendrorhous*, Astaxanthin, Enzyme development, Enzyme activity analysis, Halo assay, DNS method, HPLC

Poster 1.19

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Disease severity analysis of Banana Blood Disease pathogen in local banana varieties in Malaysia

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Abstract: Musa spp. is one of the key fruits under Malaysia's National Agriculture Policy, accounting for nearly 17% (28,000 hectares) of total fruit cultivation. However, Banana Blood Disease (BBD) has significantly impacted Malaysia banana production since 2007 and still available until now, despite attempts at control through various chemical and biological approaches. Understanding the pathogenesis of BDB in common local banana cultivars lays a strong foundation for developing targeted disease management strategies to mitigate banana blood disease. To meet this objective, our study was conducted to characterize BDB isolates from locally grown banana plants and to compare the bacterium's pathogenesis across the five most common local banana cultivars which include Cavendish, Nangka, Raja, Berangan and Tanduk variety. The results of this study revealed that all tested banana cultivars were susceptible to Banana Blood Disease, although the degree of susceptibility varied among the cultivars. Based on disease severity test on last day of infection which is day 18, banana cultivar Tanduk, Cavendish, Berangan were severely affected with demonstrated disease severity index (DSI) more than 95% (98.75% for cv. Tanduk, 96.25% for Berangan, 95% for Cavendish) followed by Raja (87.5%) and Nangka (77.5%). In conclusion, the assessment of plant diseases has become an important factor in maintaining the sustainability of plant protection systems. This due to understanding the pathogenicity of Banana Blood Disease (BBD) on local banana cultivars can help provide a strong foundation for developing a disease management plan to reduce the spread of this disease

Keywords: Banana Blood Disease; banana cultivar; disease severity analysis

Poster 1.20

Dr. Lau Han Yih

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Field testing of newly developed diagnostic method for the detection of *Pyricularia oryzae* paddy

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Abstract: Rapid and sensitive crop diseases detection is in high demand in agricultural industry. Loop-mediated isothermal amplification (LAMP) is an isothermal amplification method that allows the rapid, highly specific amplification of target DNA sequences at constant temperature. Therefore, it has high potential for field-level diagnosis of plant diseases. Here we describe a a newly developed diagnostic method for detection of *Pyricularia oryzae*, fungi causing Blast disease in rice using LAMP incorporated with magnetic beads flocculation. Primers of *P. oryzae* were developed for use in reliable LAMP. The specificity test was performed using three other types of fungi species (*Rhizoctonia solani, Helminthosporium oryzae* and *Sarocladium oryzae*) and the result shows that the primers are highly specific toward *P.oryzae*. Limit of detection for the assay was consistently 0.5pg of genomic DNA. The field testing conducted at Seberang Perai, Penang was revealed that the LAMP followed by flocculation assays were successful in detecting *P. oryzae* on non-symptomatic samples at early infection stages. The combination of these techniques is highly specific, sensitive and robust for the early detection of Blast disease to adopt precautionary control measures.

Keywords: *LAMP; flocculation assay; Blast, Pyricularia oryzae*

Poster 2.1

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Population Assessment and Microplastic Degradation Screening of Actinomycetes Isolated from Rice Field and Beach Soils, Sekinchan, Selangor

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Abstract: Earth's ecology and the creatures inhabiting it have been severely damaged by plastic waste. Microplastics, in particular, contribute significantly to the problem of plastic pollution. Due to its various advantages such as low cost, easy production, and lightweight, hence lead to the increasing demand of plastics in numerous applications in our daily lives. Over time, plastics degrade through weathering and thus microplastics are formed. In response to this issue, some research studies are exploring the use of microorganisms from natural habitats such as soil to degrade microplastics. Therefore, this study aims to isolate and determine the population of Actinomycetes from rice fields and beach soils followed by a determination of their potential microplastics degrading capability. Actinomycetes isolates are subjected to macroscopic and microscopic characterization before the first level screening on Mineral Salt Medium with LDPE, HDPE, PP and PET powder. The isolation process has yielded Actinomycetes populations of 1.07×10^6 CFU/g and 3.67×10^5 CFU/g for beach and rice field soils respectively showing no significant difference between the soils ($p > 0.05$). Nine isolates were obtained and subjected to plastic degrading screening. Two isolates (D1 and B2) have shown growing potential during preliminary screening using MSM+Microplastics (MPs) powder and were selected for further analysis. In conclusion, the isolated Actinomycetes has the prospects of enhancing the microplastics degradation process, providing a sustainable solution for handling plastic waste.

Keywords: Microplastics; Actinomycetes; Rice Field Soil; Beach Soil

Poster 2.2

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Malaysian Palm Oil Board, Malaysia

Sex-Specific Transcriptomic Insights Into The Key Oil Palm Pollinator, *Elaeidobius kamerunicus*

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Abstract: The introduction of the oil palm pollinating weevil, *Elaeidobius kamerunicus* (Ek), from Africa in the 1980s significantly improved palm oil yields. However, limited molecular data on this species highlights the need for transcriptome analysis to complement existing biological knowledge. This study aimed to characterize the transcriptomic features of male and female *E. kamerunicus* using RNA sequencing data. Clean mRNA reads from three biological replicates of each sex were assembled using the Trinity program. Gene prediction was performed with TransDecoder, and functional annotation was carried out using Blast2GO within the OmicsBox platform (v3.4.5). Putative genes were further annotated via Diamond Blastp against the NCBI non-redundant protein database. BUSCO analysis assessed the completeness of the assemblies using the insecta_odb10 reference set. The assembled transcriptomes yielded sizes of 145.8 Mb (male) and 123.2 Mb (female), with N50 values of 2481 kb and 2565 kb, and contig counts of 116,165 and 91,096, respectively. A total of 62,142 and 51,282 protein-coding genes were predicted for males and females respectively. Approximately 11–14% of these genes had no matches in the NCBI database, suggesting potential novel or uncharacterized sequences. BUSCO completeness scores were high, at 99.56% for males and 99.05% for females, indicating high-quality assemblies. This transcriptome dataset provides a valuable molecular resource for the Coleoptera order, particularly the Curculionidae family. It serves as a foundation for future functional genomic studies, especially those related to the biology, adaptation, and management of oil palm pollinators.

Keywords: Assembly; Transcriptome; oil palm pollinator; sexes;.

Poster 2.3

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Evaluation of Flood Tolerance of Malaysian Indica Rice Cultivars for Sustainable Food Security

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Abstract: Flooding, intensified by climate change, presents a critical threat to rice production in Malaysia, where rice is a key staple and economic crop. Prolonged submergence during essential growth stages can lead to substantial yield losses, threatening national food security and farmer livelihoods. This study aimed to identify flood-tolerant and flood-sensitive of Malaysian Indica rice cultivars using selected biochemical markers. Ten cultivars; MR220 CL-1, MR232, MR269, MR220, MR315, SEMPADAN 303, MR220 CL-2, MR263, MARDI SIRAJ 297, and MARDI 284 were grown for 14-day under flood stress, followed by a 14-day recovery phase. The experiment was conducted using a Randomized Complete Block Design (RCBD), and biochemical responses were assessed after recovery phase through measurements of electrolyte leakage, total proline content, malondialdehyde (MDA), and hydrogen peroxide (H_2O_2). Results showed significant variation among cultivars in their biochemical responses to flooding. MR220 exhibited the highest tolerance, followed by MARDI SIRAJ 297, while MR220 CL-2 was the most sensitive. Six cultivars were classified as moderately tolerant, and MR269 showed low tolerance. Cluster analysis revealed grouping patterns with similarities ranging from 0% to 79.04%, supporting classification based on flood tolerance. These findings have potential to be used for breeding program of flood-tolerant rice cultivars.

Keywords: Flooding; Malaysian indica rice; flood-tolerant; flood-sensitive; biochemical markers

Poster 2.4

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Kaempferol Sensitizes Colon Cancer Cells to Cisplatin via Synergistic Induction of Apoptosis and Cell Cycle Dysregulation

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Abstract: Colon cancer continues to pose a major global health challenge, driving the need for innovative treatment approaches. Cisplatin, a widely used chemotherapeutic agent, is effective against various cancers, including colon cancer, but its therapeutic potential is often limited by drug resistance. This study explores the combinatorial effects of kaempferol, a bioactive flavonoid with demonstrated anti-tumor activity, and cisplatin in colon cancer models. Using colon cancer cell lines, we assessed the cytotoxic impact of kaempferol and cisplatin, both alone and in combination. The dual treatment significantly amplified cancer cell death compared to monotherapy, with the synergy further confirmed through apoptotic hallmarks, including cellular morphology and molecular indicators of programmed cell death and cell cycle disruption. Mechanistically, the combination therapy altered critical apoptosis-related pathways, increasing pro-apoptotic signals while suppressing survival factors. Moreover, the treatment suppressed proliferation and triggered cell cycle arrest. These results highlight the potential of kaempferol as an adjuvant to cisplatin chemotherapy, possibly improving treatment outcomes while reducing side effects. Future research, including preclinical models, is needed to further evaluate this combination's clinical applicability.

Keywords: Colon cancer, cisplatin, kaempferol, combination therapy, synergistic effect

Poster 2.5

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Engineered Cell-Derived Nanovesicles with Chimeric Antigen Receptor and Hyaluronidase for Enhanced PDT and TME Modulation

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Abstract: Photodynamic therapy (PDT) is a promising cancer treatment, but its clinical use is limited by nontargeted photosensitizers (PS) that accumulate in normal tissues, causing adverse effects, and poor penetration in tumor tissues due to the dense extracellular matrix (ECM). Here an innovative approach is presented using cell-derived nanovesicles (CNVs) engineered with chimeric antigen receptor (CAR) and hyaluronidase PH20 to enhance targeted PDT. The CAR–PH20 CNVs, loaded with the photosensitizer pheophorbide a (PheoA), specifically target HER2-expressing tumor cells and degrade hyaluronic acid in the tumor microenvironment (TME), improving tumor penetration and drug distribution. In vitro and in vivo experiments demonstrate increased reactive oxygen species (ROS) generation, improved tumor retention, and enhanced therapeutic efficacy compared to conventional methods. When combined with laser irradiation, these CNVs induce significant tumor cell apoptosis and inhibit tumor growth in mouse models, while minimizing toxicity to normal tissues. This platform offers a promising strategy for targeted, TME-modulating PDT with improved efficacy, and reduced side effects, marking a significant advance in nanodrug-based cancer therapies.

Keywords: cell-derived nanovesicles (CNVs); chimeric antigen receptor (CAR); hyaluronidase PH20; targeted photodynamic therapy; tumor microenvironment; modulation;.

Poster 2.6

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Nanohybrid Technology for Cosmeceutical Applications: Development of a Bacterial Nanocellulose-Enriched Gel Loaded with Nanostructured Lipid Carrier

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Abstract: Cosmeceutical consumers have shown a growing trend for choosing sustainable and science-backed products. In response to that, there is a growing demand for cosmeceutical formulations that use bio-based nanomaterials and advanced drug delivery systems. In this research, we are proposing to integrate bacterial nanocellulose with carboxymethyl cellulose (CMC) gel to enhance its rheological properties, thus forming a robust, biocompatible and biodegradable gel matrix. In parallel, to improve the delivery and stability of lipophilic active ingredients, nanostructured lipid carriers (NLCs) will be formulated to encapsulate a-tocopherol (vitamin E), a model antioxidant active compound. The resulting BNC-CMC hybrid gel will serve as a sustainable platform to incorporate the vitamin E-loaded NLCs, aiming to provide improved dermal penetration, antioxidant protection, and skin hydration. To do so, CMC gel (2% w/w) will be enriched with BNC at 1,3,and 5% (from total CMC content) and be evaluated for its properties such as water loss, viscosity and shear stress profile. For a-tocopherol-NLC, it will be formulated using Compritol ATO 888 (solid lipid), oleic acid (liquid lipid), and tween 80 (surfactant). Factors including lipid ratio, surfactant concentration and sonication time will be optimised using Response Surface Methodology to achieve small particle size, low polydispersity index (PDI), and great encapsulation efficiency. The optimised NLC will then be incorporated into the BNCCMC gel to assess compatibility and formulation stability. The fabricated BNC-NLC gel is expected to have good spreadability, high stability, shear thinning and thixotropic properties. Meanwhile, a-tocopherol encapsulation in NLC should provide better permeability and controlled release. This formulation approach leverages the biocompatibility and sustainability of BNC with the targeted delivery potential of NLCs, offering a promising strategy for advanced cosmeceutical applications with enhanced functionality and reduced environmental impact.

Poster 2.7

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Living Bioreactors: A Plant-Based System for Recombinant Proinsulin Production in *Centella asiatic*

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Abstract: The global demand for insulin continues to rise, yet current commercial production systems using *Escherichia coli* and *Saccharomyces cerevisiae* face key limitations, including the need for complex protein refolding steps and the exclusion of the C-peptide, which may hold therapeutic value in addressing long-term diabetic complications. This study addresses the need for an alternative, plant-based system capable of producing proinsulin, the precursor molecule that retains the biologically active C-peptide. The objective of this research was to optimize a laboratory-scale setup for transformed cell suspension cultures (CSCs) of *Centella asiatica* toward the production of recombinant proinsulin. *Centella asiatica*, a medicinal herb known for its therapeutic properties and biochemical diversity, was selected for its potential as a novel biofactory. Three main objectives were successfully achieved: (1) establishment of a viable cell suspension culture system, where optimal growth was observed between days 7 and 21; (2) successful transformation of CSCs with a recombinant proinsulin gene construct, confirmed by the presence of a 642 bp insert; and (3) preliminary detection of recombinant proinsulin in total soluble protein extracts using biochemical assays. Specifically, enzyme-linked immunosorbent assay (ELISA) was employed, confirming minimal expression levels in the transformed cultures. The methodology involved initiating callus cultures from sterile explants, transferring friable callus to liquid media to establish CSCs, transforming the cultures via *Agrobacterium*-mediated gene transfer, and subsequently analyzing protein extracts for proinsulin expression. Although expression levels were low, these findings provide a strong foundation for further optimization, including refining protein extraction protocols and determining the ideal harvest period for maximum yield. This research demonstrates the feasibility of using *C. asiatica* as a plant-based platform for recombinant protein production and offers promising potential for the development of cost-effective, bioactive insulin therapies in the future.

Keywords: *Centella asiatica*; recombinant proinsulin; plant-based bioreactor; genetic transformation; cell suspension cultures;.

Poster 2.8

Ms. Nor Faizah Jalani

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Removal of Colour and Phenolic Compounds from Palm Oil Mill Effluent through Chemical Treatment Method

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Abstract: The colour of palm oil mill effluent (POME) is primarily due to the presence of several organic and inorganic substances such as phenolic compounds, tannin, lignin and carotenoid. This study aimed to investigate the effectiveness of chemical treatment methods in removing coloured compounds by using a combination of aluminium sulphate ($Al_2(SO_4)_3$) and hydroxyethyl cellulose (HEC) as coagulant and flocculant, respectively. Central composite design (CCD) and response surface method (RSM) were applied to optimize the operating variables such as pH (5-9), coagulant (1000 – 4000 ppm) and flocculant dosages (6-20 ppm) in removing colour and phenolic compounds in POME. Quadratic models developed for the two responses (colour and total phenolic compound, TPC) indicated that the optimum conditions were at pH 7, an $Al_2(SO_4)_3$ dosage of 2500 ppm, and an HEC dosage of 13 ppm. The results demonstrated that the adjustment of pH as well as the appropriate dosages of coagulant and flocculant significantly enhanced the removal rates of colour and phenolic compounds from POME at 94.53% and 88.61% respectively. This study contributes to the development of more methods for managing POME.

Keywords: Chemical treatment, palm oil mill effluent, colour, phenolic, response surface methodology

Poster 2.9

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Functional Aquafeed Development Using Oil Palm By-products for Sustainable Fish Farming

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Abstract: Global fish consumption is expected to rise significantly and reach 183 million tonnes by 2031, driven by the increasing human population and dietary demand. This escalation requires a stable and sustainable fish feed supply chain to ensure long-term food security. However, the availability of key feed ingredients, such as soybean meal (SBM), remains constrained due to heavy reliance on imports, making the aquaculture sector vulnerable to price fluctuations and supply disruptions. In order to reduce this dependency and encourage sustainable feed alternatives, exploring locally available and cost-effective ingredients such as oil palm decanter cake (OPDC) is essential. OPDC, an abundant by-product of palm oil milling, presents a promising alternative due to its rich nutrient composition and availability. However, its direct use in aquaculture feed is limited by high crude fat content and incomplete nutrients. This study aims to significantly reduce crude fat content and improve its nutritional value by subjecting OPDC to solid-state fermentation (SSF) by *Ganoderma lucidum*. Factors such as the effect of initial moisture content, substrate loading, and inoculum loading have been investigated. Subsequently, the fermented OPDC with optimal characteristics was then formulated into several diets by partially replacing the conventional SBM. A 56-day feeding trial was conducted to evaluate the effect of experimental diets on growth performance, survivability, and organosomatic indices of juvenile red hybrid tilapia (*Oreochromis* spp.). The formulated diets and tilapia commercial feed were fed to triplicate groups of fish twice a day to apparent satiation. Findings showed an initial moisture content of 80%, 125 g of OPDC, and 15 mycelia discs of *Ganoderma lucidum* were found as optimal conditions. A crude fat reduction from 13.64% to 7.14% after 25 days of fermentation at 30°C was determined. The results also revealed that up to 15% of SBM could be replaced by fermented OPDC without significantly affecting growth. All experimental diets showed high survival rates, with no significant differences among the groups. The condition factor was significantly affected by the replacement of SBM by fermented OPDC. No significant differences were detected in the hepatosomatic index and viscerosomatic index between all treatments. These findings suggest that fermented OPDC can effectively replace SBM in practical diets for juvenile red hybrid tilapia, potentially addressing the food crisis while mitigating environmental challenges associated with the oil palm industry.

Keywords: Food Security; Fish Feed; Oil Palm Decanter Cake; Ganoderma lucidum; Solid-State Fermentation;.

Poster 2.10

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Valorisation of Chicken Feather Wastes via Keratinase Production by *Bacillus* sp. and *Pseudomonas* sp. for Stain Removal

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Abstract: The increasing demand for poultry meat around the world has led to a significant rise in feather waste, as feather constitutes approximately 5–7% of the total chicken body weight. Due to its high keratin content, feather waste is highly recalcitrant and decomposes slowly in the environment, contributing to environmental pollution. Microbial bioconversion offers a sustainable approach to valorise feather waste by producing keratinase—an industrially valuable enzyme used in animal feed formulation, leather processing, and detergent industry. This study aimed to compare the keratinase production and feather degradation efficiency of Bacillus sp. and Pseudomonas sp., as a basis for potential development of a mixed culture system. Bacillus sp. showed a maximum keratinase activity of 20.07 U/mL at 48 hours, accompanied by efficient substrate degradation up to 84%, and a maximum cell density of 1.4×109 CFU/mL. In contrast, Pseudomonas sp. achieved a lower maximum keratinase activity of 16.17 U/mL at 96 hours, with less effective feather degradation of 79% and a maximum cell density of 3.2×107 CFU/mL. This observation is likely due to the unique proteolytic system and fermentation adaptability of each species. In addition to enzymatic profiling, a preliminary washing test was conducted using keratinase-containing detergent. White cotton fabrics stained with protein-based substances (e.g., raw egg, curry, blood, Milo drink) were treated under various conditions. Detergents supplemented with keratinase successfully removed protein-based stains compared to control. This highlights keratinase's potential as a bioadditive in enhancing detergent performance. Overall, this study supports keratinase application in waste valorisation and eco-friendly bio-additive development, contributing to sustainable industrial practices.

Keywords: Keratinase, Chicken Feather Wastes, Optimization, Submerged Fermentation and Stain Removal

Poster 2.11

Ms. Mariam Jamilah Mohd Fairus

Universiti Putra Malaysia, Malaysia

Phenol adsorption performance of bamboo activated carbon produced using double insulated two-in-one carbonization activation reactor system

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Abstract: Phenol contamination from untreated industrial discharge poses a significant threat to ecosystems and human health. The Malaysia Environmental Quality Act of 1974 mandates phenol levels in industrial effluents be below 1 mg/L. This study produced bamboo-activated carbon (BAC) using a two-in-one carbonization activation reactor at a pilot scale. BAC was carbonized at 500°C for 2 hr, then activated at 800°C for another 2 hr, resulting in a high specific surface area of 1018 m^2/g and pore volume of 0.46 cm^3/g which was further employed for phenol removal. Phenol removal was 33.2% at a lower BAC dosage (0.1 g) and 97.4% at a higher dosage (0.5 g) which was achieved within 15 min, reaching equilibrium at 30 min. At pH 7, phenol removal was optimized at 99%, with a complete removal at lower phenol initial concentrations of 50 mg/L and around 92% removal at higher phenol initial concentration of 300 mg/L. The adsorption process closely followed pseudo-first-order and pseudo-second-order kinetics, with R^2 values of 0.9995 and 0.9945, respectively. The Freundlich isotherm model also fit well with an R^2 value of 0.9588. These results indicate that BAC has high potential for phenol removal and possibly various pollutants in the future.

Keyword: Continuous carbonization and activation system, Bamboo-based activated carbon, Effective pollutant removal, Kinetic and isotherm study

Poster 2.12

Mr. Mohd Afendy Abdul Talib

Malaysian Agricultural Research and Development Institute, Malaysia

LAMP-LFIA as a Promising Alternative to qPCR for Sensitive and Specific Porcine DNA Detection in Meat-Based Products

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Abstract: The accurate detection of animal species in food products is essential to prevent misleading labelling, particularly in the context of halal certification, which requires strict avoidance of porcine-derived ingredients. While qPCR is highly specific, it requires costly equipment, reagents, and skilled personnel. To address these limitations, we have developed a simple, portable, rapid, specific, and sensitive molecular diagnostic method for the detection of porcine DNA in food. This method integrates loop-mediated isothermal amplification (LAMP) with lateral flow immunoassay (LFIA), forming a DNA-based detection platform (LAMP-LFIA). Six species-specific LAMP primers were designed based on conserved regions of the porcine mitochondrial genome, two of which were labelled with biotin and digoxigenin. The LAMP reaction was conducted at 65 °C using a portable mini-incubator powered by a power bank. LFIA strips were developed with nitrocellulose membranes using capture reagents targeting the biotin- and digoxigenin-labelled amplicons. Five microliters of LAMP amplicons were mixed with 100 µL of LFIA running buffer and dropped onto the LFIA's sample pad. Visual results were observed within 2-15 minutes. The assay demonstrated high sensitivity, detecting porcine DNA down to 0.5 pg and as little as 0.001% (w/w) of pork content in chicken meat. The LAMP-LFIA assays detected porcine DNA from various raw meat samples, with no cross-reactivity observed with chicken, beef, or lamb. Known processed meat products containing porcine DNA including pork sausage, Siew Mai dumplings, and pork meatballs, yielded positive results. Conversely, products not containing porcine DNA (Halal-certified products), including chicken nuggets and chicken hotdogs, tested negative. The LAMP-LFIA strip presents a promising solution for rapid, sensitive, and cost-effective detection of porcine contamination in food products. It eliminates the need for expensive equipment and complex procedures, supporting regulatory compliance and consumer confidence, especially in settings where portability and on-site testing are required.

Keywords: LAMP; LFIA; Pig; Halal; Diagnostics;.

Poster 2.13

Mrs. Norhazniza Aziz

Malaysian Agricultural Research and Development Institute, Malaysia

Bromelain-Mediated Enzymatic Hydrolysis Enhances the Functional Properties of Stingless Bee Bread (*Heterotrigona itama)*

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Abstract: Stingless bee bread is a nutrient-rich, naturally fermented product composed of pollen, honey, nectar, and bee secretions, consumed primarily by worker bees and larvae. This study investigated the impact of bromelain-assisted enzymatic hydrolysis on the biochemical properties of bee bread from *Heterotrigona itama*. Enzymatic treatment led to a significant increase in total phenolic and flavonoid content, alongside enhanced antioxidant activity, with DPPH and ABTS radical scavenging capacities improving by 26.5–32.2%. HPLC analysis revealed several predominant phenolic compounds, with gallic acid being the most abundant (62.57–68.16 µg/g), followed by protocatechuic acid, 4-hydroxybenzoic acid, caffeic acid, and rutin. A marked increase in soluble protein content was observed, rising from 195.8 to 456.7 µg/mL post-treatment. Free amino acid profiling identified proline as the dominant amino acid (619.7–719.6 mg/100 g), in addition to the presence of all nine essential amino acids and non-proteinogenic compounds such as gamma-aminobutyric acid (GABA), known for its health-promoting properties. These findings demonstrate that enzyme-assisted extraction significantly enhances the nutritional and functional attributes of stingless bee bread.

Keywords: bee bread, enzyme hydrolysis, antioxidant, phenolics, amino acid

Poster 2.14

Assoc. Prof. Dr. Alina Wagiran

Universiti Teknologi Malaysia, Malaysia

Species Identification of *Phaleria macrocarpa* and Its Herbal Medicinal Products Using ITS2 for Authentication

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Abstract: *Phaleria macrocarpa*, commonly known as God's Crown or Mahkota Dewa in Malay, is a plant that originated from Malaysia and Indonesia. The prevalence of acute toxicity of these herbal products may occur due to fraudulence activities, either intentionally or accidentally, in any process of manufacturing. Hence, robust identification of species is critical. Raw materials are often identified by morphology, but dried/fragmented or dried materials pose a challenging identification. Furthermore, fraudulence activities may include substituting the true plant species with inferior species, cheaper remedies, contaminants, and fillers, posing public health risks and thus jeopardizing the safety and efficacy of herbal products. The DNA barcoding approach relies on gDNA quality for a successful polymerase chain reaction (PCR) of ITS2 primer; hence, the effectiveness of lysis buffer and incubation times was studied to produce high gDNA quality from different plant organs and herbal products. To determine the effectiveness of the gDNA quality produced, PCR was conducted followed by sequences analysis using BLASTn and phylogenetic tree. The results showed good gDNA quality was obtained using both PL2 (SDS-based) lysis buffer and PL1 lysis buffer for fresh *P. macrocarpa* (young leaves and fruits); but various quality in herbal products tested. The PCR amplification of *P. macrocarpa* of herbal products produced a high intensity of DNA fragments and was successful in several products with a length of 500 bp regardless of gDNA quality. Analysis from the BLASTn showed that fresh plant samples were 100% similar to *P. macrocarpa* (Accession number: KT779126.1 and MH134153.1), while all the herbal products had 100% similarities with the GenBank reference *P. macrocarpa* (Accession number: KT779126.1). However, the phylogenetic analysis using NJ tree revealed that only one herbal product (P4) was clustered in the same group with the reference *P. macrocarpa* from GenBank, while P5 product located away from the group and clustered in the same group with other species of the same family. Thus, ITS2 showed potential DNA barcodes that could identify the HMPs up to species level that this product was authentic. Therefore, the ITS2 DNA barcode could be used for species identification using the molecular approach in future.

Keywords: Acute myeloid leukaemia; cytogenetically-normal AML; RNA sequencing

Poster 2.15

Dr. Munirah Tharek

Malaysian Agricultural Research and Development Institute, Malaysia

Unveiling Plant Growth Promoting Traits of Diazotrophs Isolated from Legume Root Nodules

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Abstract: The increasing demand for sustainable agricultural solutions has accelerated research into plant growth-promoting diazotrophs. This study aimed to characterize the plant growth-promoting (PGP) potential of diazotrophic bacteria isolated from root nodules of three leguminous plants: *Arachis pintoi*, *Vigna radiata*, and *Vigna sesquipedalis*. Fourteen isolates were recovered and subjected to comprehensive characterization for key PGP traits. Nitrogen-fixing ability was initially assessed by growth on nitrogen-free media and subsequently quantified using the acetylene reduction assay, confirming active nitrogenase enzyme activity in selected isolates. Phytohormone production, specifically indole-3-acetic acid (IAA), was detected in several isolates, indicating potential roles in root development enhancement. Furthermore, isolates were evaluated for their ability to solubilize insoluble phosphate and potassium, essential for improving nutrient availability in soil. Additional screening revealed that certain isolates exhibited enzymatic activities for cellulose, lignin, and pectin degradation, suggesting their involvement in organic matter decomposition and nutrient cycling. Molecular identification through 16S rRNA gene sequencing revealed that the isolates belonged to diverse genera, including *Rhizobium, Bradyrhizobium, Sinorhizobium, Paenibacillus, Bacillus, and Arthrobacter*. Notably, some non-rhizobial diazotrophs, such as *Bacillus* and *Paenibacillus,* also exhibited nitrogen fixation alongside multiple PGP traits. These findings highlight the diverse functional capabilities of nodule-associated diazotrophs, encompassing nitrogen fixation, phytohormone production, nutrient solubilization, and enzymatic degradation. The results emphasize the potential application of these multifunctional diazotrophs as biofertilizers for sustainable agriculture, particularly in legume-based cropping systems.

Keywords: diazotrophs; plant growth-promoting traits; legume; root nodules.

Poster 2.16

Mrs. Nor Suzaida Mohd Nor

Malaysian Agricultural Research and Development Institute, Malaysia

Encapsulation of Antagonistic *Bacillus* spp. in Alginate Beads for Enhanced Viability and Biocontrol Against *Burkholderia glumae*

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Abstract: Bacterial Panicle Blight (BPB), primarily caused by *Bukhloderia glumae*, is a highly destructive disease that can lead to yield losses up to 75% in severely infested fields. Effective management of BPB is critical to minimize crop lose and ensure optimal production returns. However, current control options remain limited, highlighting the urgent need for development of sustainable and innovative disease management strategies. In response to this challenge, our research group has isolated and identified nearly 30 bacterial isolates form paddy field soils that shows antagonistic activities against *B. glumae*. Among the isolates, a *Bacillus* spp. was selected for encapsulation in alginate beads with the aim of enhancing bacterial viability and maintaining biocontrol efficacy over time. The isolate was encapsulated at different alginate concentration and the highest encapsulation efficiency of 88.5% was achieved with alginate concentration of 1.5%. The alginate-microencapsulated *Bacillus* spp. was then stored at 4 °C and -20 °C in two forms, which are wet beads and the freeze-dried beads. It was found that wet beads stored at -20 °C retained viability more effectively than freeze-dried forms, maintaining over 80% viability after three months. Furthermore, the released bacteria sustained their antagonistic activity against *B. glumae* following storage. These findings support the potential of alginate beads as a viable method to preserve bacterial viability and biocontrol efficacy.

Keywords: *Bukhloderia glumae*, biocontrol, bacterial encapsulation technique

Poster 2.17

Dr. Tengku Athirrah Tengku Mazuki

Malaysian Agricultural Research and Development Institute, Malaysia

Cloning and Expression of AHL Lactonases from *Bacillus* spp. for Biocontrol of Plant Pathogens

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Abstract: Quorum sensing via N-acyl homoserine lactones (AHLs) regulates virulence in many Gram-negative plant pathogens, presenting a target for sustainable disease control. In this study, AHL lactonase genes, abbreviated as *aiiA*$_{SP17}$ and *aiiA*$_{CHB18}$, were isolated from *Bacillus thuringiensis* and *Bacillus weihenstephanensis* strains derived from rice and tomato rhizosphere soils in northern Peninsular Malaysia. These genes, which share 94% nucleotide sequence identity, were cloned and expressed in the methylotrophic yeast *Pichia pastoris* X-33, producing recombinant proteins (~33 kDa) with optimal activity at pH 7 and 30 °C. The lactonases were capable of degrading AHL signals and significantly reduced infection by *Erwinia mallotivora*, the causative agent of papaya dieback disease, *in vivo*. These findings demonstrate the potential of AHL lactonases as biocontrol agents targeting quorum sensing to manage bacterial plant diseases, offering a promising alternative to chemical pesticides in agriculture.

Keywords: Quorum sensing; AHL lactonanase; Bacillus; recombinant protein; *Erwinia mallotivora*

Poster 2.18

Mr. Hsu Cheng Hsuan

National Yunlin University of Science and Technology, Taiwan

Intelligent Modular Insect Farming System: Big Data–Driven Multi-Parameter Monitoring and Management

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Abstract: This study develops a modular insect farming system integrating IoTbased environmental monitoring and image recognition to enable precision management and efficient production. Real-time tracking of temperature, humidity, and ammonia ensures optimal growth conditions. Image analysis monitors insect health and development stages. Collected data are analyzed through machine learning for predictive insights, improving farming outcomes and supporting scalable, sustainable insect production.

Poster 3.1 (Online)

Prof. Dr. Su-Der Chen

National Ilan University, Taiwan

Study on Infrared Freeze-Drying of Turmeric

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Abstract: Turmeric (*Curcuma longa*), rich in curcumin, is a plant known for its biological activities, including antioxidant, anti-inflammatory, and antimicrobial properties. It is widely used in the food, pharmaceutical, and health supplement industries. Plate freeze-drying (FD) produces high-quality dried turmeric, but the drying time typically exceeds 24 h. In contrast, conventional hot air drying (AD) can lead to the loss of bioactive compounds and a decline in turmeric quality. In this study, infrared radiation heating was applied to supply sublimation heat to frozen turmeric slices, aiming to shorten the drying time. The optimal conditions for infrared freeze-drying (IRFD), and their effects on curcumin content and color were investigated. Using an L9 Taguchi design, experiments were conducted with different sample weights (1000, 750, and 500 g), power intensities (1.2, 1.0, and 0.8 kW), and heating times (11, 5, and 3 s) followed by a 1-s pause. The "larger-the-better" analysis for curcumin content indicated that a sample weight of 500 g, a power of 1.0 kW, and a heating time of 3 s with a 1-s pause yielded the highest curcumin retention. The order of factor influence on curcumin content was found to be: power > heating time (with 1 s pause) > sample weight. Furthermore, turmeric processed under optimal conditions was subjected to a 28-day storage test, with curcumin content analyzed every 7 days. Results showed that curcumin content at 37°C decreased significantly, while degradation was slower at 4°C. Curcumin content declined over storage time due to degradation. In terms of color changes, higher temperatures caused a more pronounced increase in the *a** value, indicating accelerated browning reactions. Lower storage temperatures were effective in slowing down the browning of turmeric.

Keywords: Turmeric; Curcumin; Freeze-drying; Infrared; Storage;.

Poster 3.2 (Online)

Ms. Syazwani Izzati Siswanto

International Islamic University Malaysia, Malaysia

Uncovering The Role of R34 in H5N1 NS1 Through *in silico* and Site-Directed Analysis Targeting PIK3R2 Interaction

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Abstract: The non-structural protein 1 (NS1) of H5N1 influenza A virus acts as a key modulator of host-virus interactions, allowing the virus to evade the host immune system. NS1 hijacks host cellular machinery by binding to proteins such as phosphoinositide 3- kinase regulatory subunit 2 (PIK3R2), a component of the PI3K/Akt signaling pathway, which plays a critical role in immune regulation and cell survival. Through this interaction, NS1 suppresses host defense, including the type I interferon response, thereby promoting viral replication. Yet, characterizing interactions of the biomolecules at the amino acid residue level is challenging, as the conventional protein-protein interaction (PPI) assays such as pull-down, tandem affinity purification or yeast two-hybrid often lack the resolution and specificity for detailed analysis. Furthermore, advanced site-directed approaches, such as amber suppression technology, have not been applied to characterising interactions between NS1 and its counterparts, leaving a gap in understanding the viral-host PPI and its impacts precisely. To address this, a comprehensive bioinformatics analysis was conducted, starting with sequence conservation and secondary structure prediction of NS1 to identify the ideal functional sites for amber suppression technology. The analysis revealed that arginine-34 (R34) positioned within the RNA-binding domain (RBD) was crucial for preserving the protein's functionality. PPI networks were constructed using curated databases, revealing several candidate host interactors. Among these, PIK3R2 was chosen for further confirmation due to its promising interactions with binding partners in previous studies. Molecular docking simulations confirmed a strong binding between NS1 and PIK3R2 at conserved regions. Based on these insights, primers for site-directed mutagenesis (SDM) were designed to introduce an amber codon (TAG) at the R34 of NS1, enabling site-specific incorporation of an unnatural amino acid at R34 via amber suppression technology. Collectively, this study provides a refined strategy to probe NS1 host protein interactions with higher specificity, offering new inputs for drug discovery and targeted antiviral interventions.

Keywords: Site-directed mutagenesis; bioinformatics; viral-host interactome; protein-protein interaction assays, PIK3R2, NS1

Poster 3.3 (Online)

Mr. Lam Kah Yuen

Institute For Medical Research, Malaysia

Genetic Analysis of 70 Malaysian Patients with Haemophilia B

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Abstract: Haemophilia B (HB) is a hereditary bleeding disorder caused by deficiency or dysfunction in blood coagulation factor IX (FIX). The identification of mutation in HB patients can lead to more accurate diagnosis and contribute to the genetic counselling/ prenatal diagnosis. The aim of this study was to identify mutations in *F9* gene in Malaysian HB patients. We studied 70 unrelated HB patients from 2014 to 2024 using polymerase chain reaction and Sanger sequencing. *F9* gene mutations were identified in 57%, 29% and 14% HB patients with severe, moderate and mild respectively. The most common mutation subtype was substitution mutation (86%), followed by frameshift mutation (14%). In substitution mutation, 78% HB patients were missense effect, 15% were nonsense effect and 7% were splicing effect. For frameshift mutation, 70% HB patients show one or more deleted nucleotides, while 30% were inserted at least one nucleotide in *F9* gene. Small deletion or insertion altered the structure and function of the FIX protein, subsequently leading to a severe bleeding disorder. The most frequent mutations found across various exons in the *F9* gene were exon 8 (39%), exon 6 (20%), exon 5 (13%) and exon 2 (9%). This study database provides a resource describing *F9* gene mutations in Malaysia HB patients that could be applied in the future for genetic counselling and medical care of HB families.

Keywords: Haemophilia B; *F9* Gene; Factor IX; Mutation; Malaysian.

Poster 3.4 (Online)

Dr. Musliana Mustaffa

International Islamic University Malaysia, Malaysia

Interdisciplinary approach of a compromised maxillary central incisor with favourable treatment outcomes: A case report

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Abstract: Endodontically treated tooth could have a higher risk of root resorption during orthodontic treatment due to a persistent intraradicular infection, complicated by a high orthodontic force. Despite responding similarly to orthodontic treatment as vital teeth, endodontically treated teeth might be more susceptible to external inflammatory apical root resorption if the intraradicular infection is not controlled. The aim of this case report is to highlight the effectiveness of endodontic and orthodontic management in preventing the progression of external inflammatory apical root resorption associated with an endodontically treated maxillary central incisor. An 18-year-old male patient was referred to the endodontic specialist regarding the endodontic treatment of a maxillary central incisor with evidence of external inflammatory apical root resorption prior to orthodontic treatment. On presentation, patient did not report of any pain or discomfort related to the tooth. Patient is medically fit and healthy. Patient had a history of dental trauma five years ago, sustained a complicated crown fracture of maxillary central incisor and did not seek any dental treatment following the dental trauma. An endodontic treatment utilising a bioceramic material was performed followed by orthodontic treatment a few days after the completion of endodontic treatment. The orthodontic treatment lasted for 19 months, during which the tooth movement was monitored including the presence of any signs and symptoms associated with the endodontically treated maxillary central incisor. At two years six months follow-up, the endodontically treated maxillary central incisor was asymptomatic, clinical findings were insignificant, and absence of further progression of external inflammatory apical root resorption observed from the radiograph. Effective interdisciplinary management involving the endodontic and orthodontic disciplines, performed under standard protocols, supported by the use of bioceramic material could prevent the progression of external inflammatory apical root resorption, thus improving the oral health status and possibly patient's quality of life.

Keywords: Endodontically treated tooth; root resorption; endodontic; orthodontic; maxillary central incisor;.

Poster 3.5 (Online)

Mr. Rakyeom Kim

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Integration of Plano-Convex Lenses for Enhanced Fluorescent Signal in Centrifugal Microfluidic Systems

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Abstract: We present a method for enhancing fluorescence signals in centrifugal microfluidic systems by integrating a plano-convex lens into the optical path of a fluorescence detector, effectively focusing emitted light onto a single point. Two-dimensional computational simulations were first conducted to optimize the lens design and positioning, resulting in a 1.7-fold increase in fluorescence signal compared to configurations without the lens. When the optimally designed plano-convex lens was incorporated into the sample detection chamber of a centrifugal microfluidic system, fluorescence signal intensity was enhanced by approximately 323-fold. This fluorescence sensitivity enhancement strategy holds significant potential for application across a wide range of fluorescence-based biosensors, offering a versatile and powerful approach for improving detection capabilities in various analytical and diagnostic platforms.

Keywords: Plano-convex lens; fluorescence signal enhancement; optical focusing; fluorescent biosensors; centrifugal microfluidic systems

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Thank you!

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