AFOB MALAYSIA CHAPTER
Asian Federation of Biotechnology

AFOBMCIS 2018

AFOB-Malaysia Chapter International Symposium 2018

Pullman Hotels and Resorts Kuching, Sarawak, Malaysia
18-21 August 2018

UTM UNIVERSITI TEKNOLOGI MALAYSIA

UPM UNIVERSITI PUTRA MALAYSIA
BERILMU BERBAKTI

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Day 3	**20 August 2018**		
7.30 AM	Registration	**12.30 PM**	Lunch
9.00 AM	Plenary Speech 2 *Prof Dr Neil C. Bruce*	**2.30 PM**	Afternoon Sessions
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8.00 AM	Technical Visit		

WELCOME ADDRESS

Professor Dr Mohd Ali Hassan
President
AFOB-Malaysia Chapter

I would like to welcome you to the Asian Federation of Biotechnology Malaysia Chapter International Symposium (AFOBMCIS 2018) from 18th-21st August 2018 at Pullman Hotels and Resorts, Kuching Sarawak.

The AFOBMCIS 2018 is an inaugural event of Asian Federation of Biotechnology Malaysia Chapter (AFOB-MC). AFOB-MC is a non-profit organization and was established and registered to Registrar of Society in 2013.

The AFOBMCIS 2018 intends to create a platform for all scientists interested in biotechnology and related research fields to meet and discuss the relevant issues. The theme of the AFOBMCIS 2018, **"Roles of Biotechnology in Sustainable Growth and Development"** will emphasize the emerging scientific and technological developments in important areas related to Biotechnology.

I hope that this symposium will help establish collaborative research programs, hence strengthening research relations and networking between universities, industries and government. I would like to express appreciation to the AFOBMCIS 2018 Organizing Committees for their effort and hard work to ensure a successful and meaningful symposium for all of us.

Thank you.

WELCOMING REMARKS

Associate Professor Dr Madihah Md. Salleh
Chairman
AFOB-Malaysia Chapter International Symposium 2018

Dear Delegates,

It is a great pleasure to welcome you to our inaugural Asian Federation of Biotechnology Malaysia Chapter International Symposium (AFOBMCIS 2018).

AFOBMCIS 2018 is an International Symposium organized after Asian Congress of Biotechnology 2015 (ACB 2015) and AFOB Regional Symposium 2014 (ARS 2014) in Kuala Lumpur, Malaysia. The AFOBMCIS 2018 emphasizes the multidisciplinary focus, emerging scientific and technological developments in several areas related to biotechnology. This symposium can be a platform for local and international scientists, academia and industries to present current research findings, sharing ideas and opinions in various biotechnological fields. The symposium also invited prestigious speakers in the biotechnology field worldwide to share their knowledge and expertise. A special session for young scientist will also be organized with a special award to be presented.

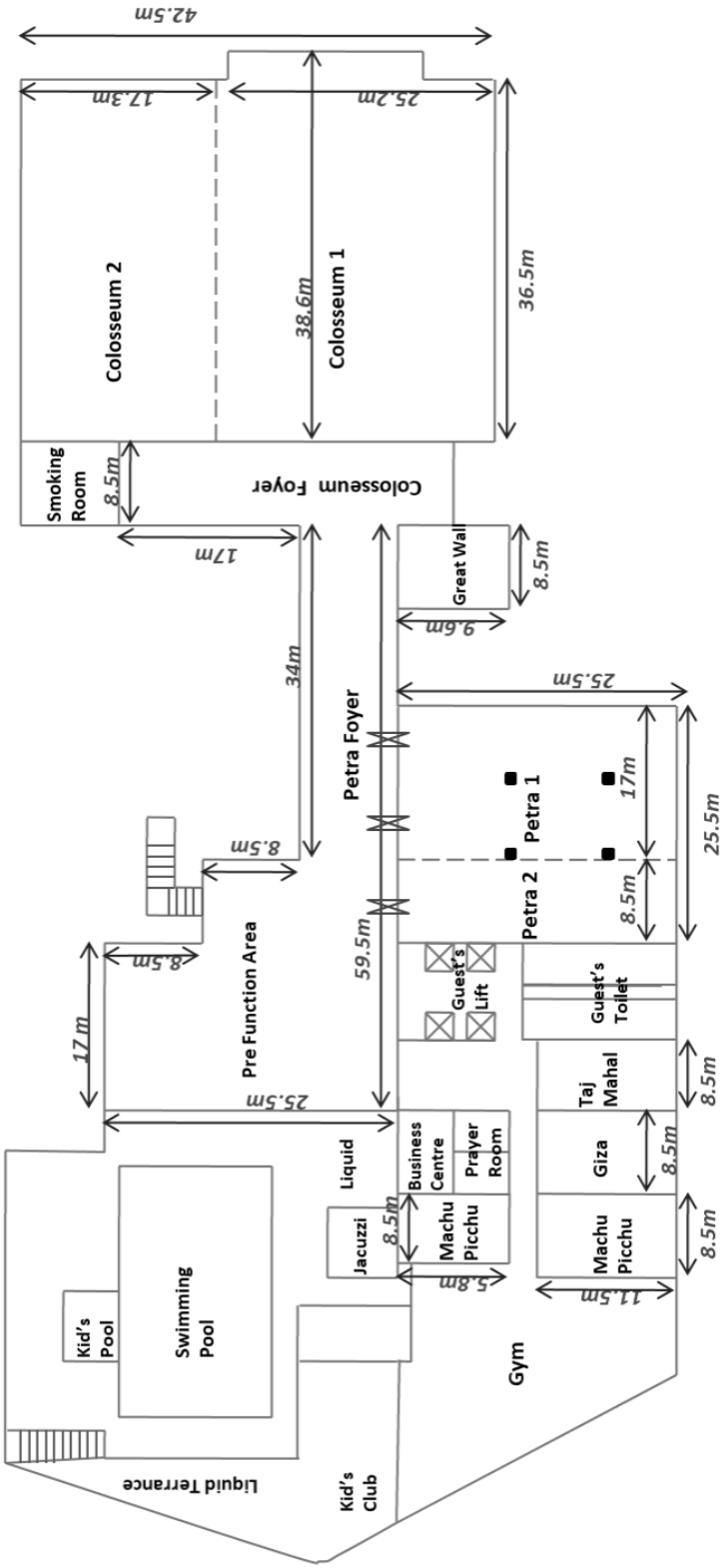
This symposium is mainly organised by Universiti Teknologi Malaysia and Universiti Putra Malaysia, supported by AFOB-MC, Sarawak Convention Bureau (SCB) and Department of Agriculture Sarawak (DAS). It is also a joint-collaboration with Universiti Malaysia Sarawak (UNIMAS), Universiti Teknologi Mara Sarawak (UiTM), Universiti Sains Malaysia (USM), Universiti Kebangsaan Malaysia (UKM), Universiti Malaya (UM), International Islamic University of Malaysia (IIUM), Universiti Malaysia Sabah (UMS), Universiti Malaysia Pahang (UMP) and Malaysian Agricultural Research and Development Institute (MARDI).

I would like to extend my gratitude to the AFOBMCIS 2018 Organizing Committee and AFOBMC board members for their efforts and supports in developing such a stimulating and interesting symposium programme. On behalf of all organizers, I would like to express appreciation for the sponsorship given by the respective organization towards the success of AFOBMCIS 2018.

Along with our colleagues and partners, we are happy to welcome you to Kuching Sarawak, a lively multicultural city with great food, culture and art.

Best wishes.

CONFERENCE VENUE LAYOUT



EVENT PROGRAMME

Day 1	**18 August 2018**		
1400 – 1700	Registration		
1900 – 2300	Welcome Reception (Poolside)		
Day 2	**19 August 2018**		
0730 – 0830	Registration		
0900 – 1000	Plenary Speaker 1 **Prof Dr Wen-Chien Lee** **National Chung Cheng University, Taiwan** "Production of bio-based C3-C6 organic acids for building blocks and speciality chemicals" Chairman **Prof Dr Suraini Abd Aziz** **Universiti Putra Malaysia** (Colosseum 2)		
1000 – 1030	Morning Tea Break and Poster Presentation (Colosseum 2 Foyer / Exhibition Area)		
1030 – 1200	Opening Ceremony & MoU Signing Ceremony between AFOB-MC and BEST (Colosseum 2)		
1200 – 1400	2nd AFOB-MC Annual General Meeting (Colosseum 2) LUNCH (Puzzle)		
1430 – 1640 Afternoon Sessions	**Technical Session 1** *Agriculture and Food Biotechnology* *Applied Microbiology* Chairman **Prof Dr S Vikineswary Sabaratnam** **Universiti Malaya** (Taj Mahal)	**Technical Session 2** *Bioprocess and Bioseparation Engineering* *Bioenergy and Biorefinery* *Environmental Biotechnology* *Bioindustry Promotion and Bioeducation* Chairman **Prof Dr Mohd Ali Hassan** **Universiti Putra Malaysia** (Giza)	**Technical Session 3** *Biopharmaceutical and Medical Biotechnology* *Marine Biotechnology* *Systems and Synthetic Biotechnology* *Tissue Engineering and Biomaterials* Chairman **Prof Dr Charles S Vairappan** **Universiti Malaysia Sabah** (Machu Piccu)
1430 – 1500	Keynote Speaker 1.1 **Prof Dr Kenji Sakai** **Kyushu University, Japan** "Studies on bacterial community toward sustainable palm oil industry coexisting with environmental and biodiversity conservation"	Keynote Speaker 2.1 **Prof Dr Yoshihito Shirai** **Kyushu Institute of Technology, Japan** "Promotion of green economy with palm oil industry for biodiversity conservation in Malaysia -Creation of SDSG businesses using our results from JST/JICA SATREPS project"	Keynote Speaker 3.1 **Dr Yit Heng Chooi** **University of Western Australia** "Panning for gold in mould: Mining the fungal genomes for bioactive metabolites and small molecule-mediated host interactions"

1500 – 1520	Invited Speaker 1.1 **Dr Chong Chun Shiong** **Universiti Teknologi Malaysia** "Halophilic bacteria: Insights into industrial applications"	Invited Speaker 2.1 **Prof Dr Mohd Ali Hassan** **Universiti Putra Malaysia** "Case study on recycling of oil palm biomass waste and turning it into renewable energy"	Invited Speaker 3.1 **Dr Darman Nordin** **Universiti Kebangsaan Malaysia** "Adsorption of extracellular matrix protein fibronectin on the surface of nano-composite particle of graphene-hydroxyapatite"
1520 – 1540	Invited Speaker 1.2 **Dr Afsheen Aman** **University of Karachi, Pakistan** "Extraction of chitin from marine bio-waste and exploration of chitinolytic microbes for the production of chitinase"	Invited Speaker 2.2 **Dr Noratiqah Kamsani** **Biocon Sdn Bhd, Malaysia** "Degradation of sawdust based on solid state fermentation strategy for reducing sugar production"	Invited Speaker 3.2 **Dr Azman Kassan** **Universiti Malaysia Terengganu** "The advantages of biofloc technology application towards the growth performance of Pacific Whiteleg Shrimp, *Penaeus vannamei*"
1540 – 1600	Speaker 1.1 **Assoc Prof Dr Amir Husni Mohd Sahriff** **Universiti Malaysia Sabah** "Selected trace minerals concentrations found in two varieties of sweet potatoes (*Ipomea batatas*) grown on BRIS soils in the East Coast of Peninsular Malaysia"	Invited Speaker 2.3 **Dr Mohd Shamzi Mohamed** **Universiti Putra Malaysia** "Design of experiment modeling approach to improving the performance of triple-impeller configuration in stirred tank bioreactor"	Invited Speaker 3.3 **Prof Dr Rakesh Bhatnagar** **Banaras Hindu University, India** "Recombinant vaccine against anthrax: from clone to clinical trials"
1600 – 1620	Speaker 1.2 **Dr Mohd Zulkhairi Mohd Yusoff** **Universiti Putra Malaysia** "The importance of pseudogenes in hydrogen metabolism of *Escherichia coli*"	Invited Speaker 2.4 **Prof Datin Dr Zaharah Ibrahim** **Universiti Teknologi Malaysia** "Beneficial microbes for waste-water treatments"	Speaker 3.1 **Assoc Prof Dr Noorhisham Tan Kofli** **Universiti Kebangsaan Malaysia** "Amino acid and fatty acid profiling of local fermented rice grain (bedak sejuk) and its soaking water"
1620 – 1640	Speaker 1.3 **Dr Alina Wagiran** **Universiti Teknologi Malaysia** "Application of bar-high resolution melting analysis for detection of *Eurycoma longifolia* in selected herbal products in Malaysia"	Speaker 2.1 **Mr Shankar Ramanathan** **Universiti Teknologi Malaysia** "Production of biobutanol by *Clostridium beijerinckii* SR1 using sea water medium"	Speaker 3.2 **Dr Che Azurahanim Che Abdullah** **Universiti Putra Malaysia** "Preparation of hydroxyapatite from nacre layer as biomaterial for dental"
1640 – 1700			Speaker 3.3 **Dr Mohd Helmi Sani** **Universiti Teknologi Malaysia** "Selection of microcarriers for the mammalian cell in microwell attachment plate"
1630 – 1700	Afternoon Tea Break and Poster Presentation (Colosseum 2 Foyer / Exhibition Area)		
1900 – 2300	Gala Dinner (Colosseum 2)		

Day 3	20 August 2018		
0730 – 0830	Registration		
0900 – 1000	Plenary Speaker 2 **Prof Dr Neil C. Bruce** **University of York, United Kingdom** "Mining marine and terrestrial environments for lignocellulose degrading enzymes" Chairman **Prof Dr Suraini Abd Aziz** **Universiti Putra Malaysia** (Colosseum 2)		
1000 – 1030	Morning Tea Break and Poster Presentation (Colosseum 2 Foyer / Exhibition Area)		
1030 – 1240 (Morning Sessions)	**Technical Session 4** *Agriculture and Food Biotechnology* *Applied Microbiology* *Nanobiotechnology, Biosensors and Biochips* *Bioindustry Promotion and Bioeducation* Chairman **Prof Dr Mohd Nazalan bin Mohd Najimudin** **Universiti Sains Malaysia** (Taj Mahal)	**Young Researcher Session 1** Chairman **Dr Mohamad Faizal Ibrahim** **Universiti Putra Malaysia** (Giza)	**Young Researcher Session 2** Chairman **Assoc Prof Dr Phang Lai Yee** **Universiti Putra Malaysia** (Machu Piccu)
1030 – 1100	Keynote Speaker 4.1 **Prof Tzong-Jih Cheng** **National Taiwan University, Taiwan** "Reform an interdisciplinary academic department into a research-oriented university"	**10:30 – 10:45** Speaker YR 1.1 **Nur Fariza Abdul Rahman** **Universiti Putra Malaysia** "Extraction of ferulic acid from lemongrass leaves (*Cymbopogun Citratus*) using hydrothermal pretreatment"	**10:30 – 10:45** Speaker YR 2.1 **Muhammad Afiq Khir Anuar** **Universiti Teknologi Malaysia** "Potential use of chicken viscera for cat food production"
1100 – 1120	Invited Speaker 4.1 **Prof Dr Mohd Nazalan bin Mohd Najimudin** **Universiti Sains Malaysia** "Assembling nitrogen fixation genes for plants: Lessons from the Gram positive bacteria"	**10:45 – 11:00** Speaker YR 1.2 **Mohd Azwan Jenol** **Universiti Putra Malaysia** "Bioelectricity generation from sago hampas using direct biomass fuel cell"	**10:45 – 11:00** Speaker YR 2.2 **Nur Amira Syahirah Mazlan** **Universiti Teknologi Malaysia** "Optimisation of thermophilic *Bacillus licheniformis* strain mea-01's proteolytic activity towards casein based on temperature and incubation period"
1120 – 1140	Invited Speaker 4.2 **Dr Citartan Marimuthu** **Universiti Sains Malaysia** "Aptamers as the thriving molecular recognition elements"	**11:00 – 11:15** Speaker YR 1.3 **Norulsazyani Mohd Safri** **Universiti Teknologi Malaysia** "Purification and characterization of biovanillin from lemongrass hydrolysate in submerged fermentation using molecular imprinting polymers (MIPs)"	**11:00 – 11:15** Speaker YR 2.3 **Nurshafika Abd Khalid** **Universiti Teknologi Malaysia** "Microbial community analyses of palm oil mill effluent and oil palm empty fruit bunch compost"

1140 – 1200	Invited Speaker 4.3 **Dr Norlia Basherudin** **Forest Research Institute Malaysia** "De novo assembly and analysis of *Eurycoma longifolia* transcriptome to identify genes involved in the biosynthesis of active secondary metabolites"	**11:15 – 11:30** Speaker YR 1.4 **Rohaya Mohd Noor** **Universiti Teknologi Malaysia** Potential application of lignin from paddy husk for biovanillin production by *Phanerochaete chrysosporium* in submerged fermentation	**11:15 – 11:30** Speaker YR 2.4 **Lam Ming Quan** **Universiti Teknologi Malaysia** Isolation, identification and genomic analyses of halophilic bacteria with lignocellulolytic abilities
1200 - 1220	Speaker 4.1 **Dr Noor Liyana Yusof** **Universiti Putra Malaysia** "Vacuum impregnation of spinach tissue: Effect on metabolic activity and package gas composition"	**11:30 – 11:45** Speaker YR 1.5 **Norazela Nordin** **Universiti Pendidikan Sultan Idris, Malaysia** Optimisation of photo-autotrophic cultural conditions for high biomass and lipid production of *Chlorella vulgaris*	**11:30 – 11:45** Speaker YR 2.5 **Sye Jinn Chen** **Universiti Teknologi Malaysia** "Characterization of lignocellulolytic bacteria from oil palm residues"
1220 – 1240		**11:45 – 12:00** Speaker YR 1.6 **Kazuki Tani** **Universiti Malaysia Sabah-Japan** "Three new bioactive sesquiterpenoids from bornean soft coral genus *Lemnalia*"	**11:45 – 12:00** Speaker YR 2.6 **Mazlina Mohd Ariffin** **Universiti Teknologi Malaysia** "Optimisation of caseinolytic enzymes production from isolated *Bacillus cereus 13BN"*
		12:00 – 12:15 Speaker YR 1.7 **Christine Rika** **Universiti Teknologi Malaysia** "The effects of lightweight macrocomposite for palm oil mill effluent (POME) treatment"	**12:00 – 12:15** Speaker YR 2.7 **Fariha Ibrahim** **Universiti of Karachi, Pakistan** "Combinatorial strategy: A valuable approach for enhanced production of bacteriocin produced by *Lactobacillus plantarum* against food borne pathogens"
1230 – 1430		Lunch (Puzzle)	
1430 – 1600	**Young Researcher Session 3** Chairman **Assoc Prof Dr Madihah Md Salleh** **Universiti Teknologi Malaysia** (Taj Mahal)	**Young Researcher Session 4** Chairman **Assoc Prof Dr Shaza Eva Mohamed** **Malaysia-Japan International Institute of Technology** (Giza)	**Young Researcher Session 5** Chairman **Dr Juferi Idris** **Universiti Teknologi MARA, Sarawak, Malaysia** (Machu Piccu)
1430 – 1445	Speaker YR 3.1 **Mohamed Roslan Mohamad Ikubar** **Universiti Teknologi Malaysia** "Oil palm frond petiole for enzyme production: Deinking potential and environmental impact"	Speaker YR 4.1 **Siti Huzaimah Ribut** **Universiti Putra Malaysia** "Structural, optical and antibacterial activity of low cost and biogenic zinc oxide nanoparticles (ZnONPs)"	Speaker YR 5.1 **Nur Syafiqah Muhammed** **Universiti Teknologi Malaysia** "Molecular cloning, preliminary expression and bioinformatic analysis of an extracellular subtilisin-like serine protease from *Acinetobacter baumannii* TU04"

1445 – 1500	Speaker YR 3.2 **Jemilatu Audu** **Universiti Teknologi Malaysia** "Enrichment of biohydrogen-producing microflora from anaerobic digested sludge using palm oil mill effluent"	Speaker YR 4.2 **Khalida Rahayu Zainon** **Universiti Putra Malaysia** "Nanomaterials enhanced siRNA delivery system for treatment of human lung carcinoma"	Speaker YR 5.2 **Uchenna Ezeilo** **Universiti Teknologi Malaysia** "Moisture content and temperature optimization of cellulase and xylanase production by newly isolated *Trichoderma asperellumUC1* using raw oil palm frond leaves as substrate in solid state fermentation"
1500 – 1515	Speaker YR 3.3 **Ahmed Ibrahim Galadima** **Universiti Teknologi Malaysia** "Optimization of ferulic acid recovery from lemongrass leaves hydrolysate using central composite design"	Speaker YR 4.3 **Emmellie Laura Albert** **Universiti Putra Malaysia** "The studies of the effects of different ratio of magnetic nanoparticle to the conjugation with graphene oxide"	Speaker YR 5.3 **Nor Syafirah Zambry** **Universiti Sains Malaysia** "Bioprocessing influences lipopeptide biosurfactant production in *Streptomyces* sp. PBD-410L"
1515 – 1530	Speaker YR 3.4 **Vivian Sien Shi Ting** **Universiti Malaysia Sabah** "Bioactive sesquiterpenoids from bornean red algae and liverwort"	Speaker YR 4.4 **Natrah Shafiqah Rosli** **Universiti Putra Malaysia** "Nano-Titania obtained from natural Ilmenite for photocatalytic and antibacterial properties"	Speaker YR 5.4 **Nur Husna Haron Narashid** **Universiti Teknologi Malaysia** "Microbial profiling of chicken viscera for development of microbial cocktail for the production of flavor"
1530 – 1545	Speaker YR 3.5 **Monaliza Mohd Din** **Universiti Teknologi Malaysia** "Potential risks of harmful algal blooms in response to eutrophication in the aquaculture area west johor straits"	Speaker YR 4.5 **Muhammad Amir Faiz Mohd Shaifuddin** **Universiti Putra Malaysia** "Metal free catalyst carbon nanotubes (CNTs) from tea waste doped with ZnO nanoparticles (ZnONPs)"	Speaker YR 5.5 **Izzah Afifah** **Universiti Teknologi MARA, Sarawak, Malaysia** "Antioxidant properties of crude extract and compounds from the stem bark of *Calophyllum ferrugineum* and *Calophyllum andersonii*"
1545 – 1600	Speaker YR 3.6 **Chin-Soon Phan** **Universiti Malaysia Sabah** "Soft coral-derived secondary metabolites against adult T-cell leukemia"	Speaker YR 4.6 **Chin-Wei Chang** **National Tsing Hua University, Taiwan** "Development and application of a new Cre/loxP-based long-term gene expression system in single recombinant baculovirus"	Speaker YR 5.6 **Rafiqqah Mohamad Sabri** **Universiti Kebangsaan Malaysia** "Two stage study of mesophilic methane production from sago mill effluent using mixed microbial consortia in an ASBR"
1600 – 1615			Speaker YR 5.7 **Urooj Javed** **University of Karachi, Pakistan** "Saccharification of plant biomass waste: an economical approach to produce xylanase and xylose"
1630 – 1730	Closing and Awards Reception Ceremony (Colosseum 2)		
Day 4	**20 August 2018**		
0800	Technical Visit		

PLENARY SPEECH 1

Professor Dr Wen-Chien Lee
National Chung Cheng University, Taiwan
President of Asian Federation of Biotechnology

Production of Bio-based C3-C6 Organic Acids for Building Blocks and Specialty Chemicals

Shu-Ya Wana[a], Syuan-Ping Liou[a], Hua-Ju Hsu[a], Zheng-Xiong Lin[a], Hsin-Yi Teng[a], Jhih-Sing Lee[a], Jiumn-Yih Wu[b] and Wen-Chien Lee[a*]

[a]*Department of Chemical Engineering, Systems Biology and Tissue Engineering Research Centre, National Chung Chen g University, Chiayi, Taiwan*
[b]*Department of Chemical Engineering, I- Shou University, Kaohsiung, Taiwan*

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Bio-based C3-C6 organic acids has recently attracted global interest for their use as chemical building blocks and specialty chemicals. Those organic acids include lactic acid (in D- or L-form), succinic acid, itaconic acid and cis,cis-muconic acid that can be produced by microbial fermentation from plant-derived sugars. The utilization of sugars from cellulosic parts of plant biomass as the raw material is *particularly* interesting. We have isolated an *Escherichia coli* strain CCU-8 from bovine rumen that can produce D-lactic acid in high concentration. Genetic engineering on this rumen *E. coli* by deleting the D-*ldhA* gene encoding D-lactate dehydrogenase A resulted in a recombinant *E. coli* CCU-8 (ΔD-*ldhA*), which could produce optically pure L-lactic acid. Both D- and L-lactic acids are required for the synthesis of poly (lactic acid) stereocomplex. The organic acid fermentation could be significantly influenced by the supply of either carbon dioxide or oxygen. For the production of succinic acid by *Actinobacillus succinogens*, an increase in mass transfer rate could increase the dissolved carbon dioxide concentration, and then enhance the succinic acid yield. But for cis,cis-muconic acid production using *Pseudomonas sp*., the oxygen transfer of the fermenter had a strong impact on the productivity. For the recovery of organic acid such as succinic acid and itaconic acid from the fermentation broth, an outside-in module of ultrafiltration membrane was employed for the removal of cells. The *clarified* broth was *then* subjected to electrodialysis using a patented design of electrodialysis equipment to yield purified organic acid.

Keywords: Lactic acid, succinic acid, itaconic acid, cis,cis-muconic acid, bio-based chemicals

PLENARY SPEECH 2

Professor Dr Neil C. Bruce
University of York, United Kingdom
Chair, Centre for Novel Agriculture Product (CNAP)

Mining Marine and Terrestrial Environments for Lignocellulose Degrading Enzymes

Neil C. Bruce*

Centre for Novel Agricultural Products, Department of Biology, University of York, York, United Kingdom

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As concerns about the environmental impact resulting from the use of fossil fuels increases, industrial biotechnologists are exploring ways to use plant based feedstocks in *biorefineries* to generate biofuels and manufacture polymers, pharmaceuticals and commodity chemicals. The long-term success of biorefining is dependent on the development of economical methods for processing plant biomass to exploit the energy rich polysaccharides in cellulose for fermentation. The complex phenolic polymers present in lignin create a major bottleneck in the deconstruction of plant cell walls, as they are recalcitrant to degradation. Currently biorefineries require the use of acid or alkali and steam explosion to treat lignocellulose, which is inefficient and energy dependent, the released cellulose is then digested with a cocktail of cellulases. The costs involved in converting biomass into fermentable sugars currently make cellulosic fermentation too expensive. While the saccharification of lignocellulose remains a problem for industry, it is carried out effectively in the natural environment by microbial communities and animals. The major challenge in identifying the range of enzymes and other proteins during lignocellulose digestion lies in the complexity of the process itself. To date lignocellulose degradation has largely been studied in a few well characterised and culturable microorganisms. We have focused our efforts on discovering new enzymes and associated proteins using a multi 'omics approach, combining the power of extracellular proteomics and transcriptomics, to identify proteins critical for lignocellulose deconstruction from microbial communities and animals obtained from marine and terrestrial environments. This approach is allowing us to identify new types of lignocellulose active proteins, both broadening our fundamental understanding of this process, as well as providing novel activities for research and industrial applications.

Keywords: Enzymes; lignocellulose; microorganisms; marine woodborers

KEYNOTE SPEECH 1

Professor Dr Kenji Sakai
Kyushu University, Japan
Department of Bioscience and Biotechnology
Faculty of Agriculture

Studies on Bacterial Community toward Sustainable Palm Oil Industry Coexisting with Environmental and Biodiversity Conservation

Kenji Sakai*

Department of Bioscience and Biotechnology, Faculty of Agriculture, Kyushu University, 6-10-1 Hakozaki, Higashi-ku, Fukuoka 812-8581, Japan

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Complex microbial communities exists in environment such as natural forest, plantation forest, river and wastewater drainage, intestinal tracts of animals and palm rhizosphere. Also, microbial transforming processes of organic waste are generally operated with specific mixed culture system. Recent development of next generation DNA sequencing gave us a strong tool for analysing these complex structures. After knowing structure and functions of microorganisms in these biotransformation system, we could estimate functions of the communities and improve them. Tracing specific bacteria in waste materials, animals and plant rhizosphere, with general structures in soil and river water, would provide us useful information to know impact of palm oil industry and to understand biodiversity of microorganism, fauna and flora. The author joined SATREPS Project aiming Promotion of Green Economy with Palm Oil Industry for Biodiversity Conservation and has been collaborated with members in UPM and UMS, Malaysia. Within ecosystems in Borneo island, a dynamic assemblage of soil, water, plants and animals which are delicately inter-connected. In this lecture, I would like to introduce three research topics our team involved: (1) Accelerating recycle of biomass waste through enhanced mixed microbial conversion process. (2) Monitoring of bacterial community in river water as an indicator for waste water discharge. (3) Investigation of biodiversity of animals and insects, with bacterial diversity in animal faeces, forest soil and river water.

Keywords: Palm oil industry; waste biomass recycle; biodiversity conservation; bacterial community structure

KEYNOTE SPEECH 2

Professor Dr Yoshihito Shirai
Kyushu Institute of Technology, Japan
Director, KyuTech-UPM Malaysia Super Satellite Campus

Promotion of Green Economy with Palm Oil Industry for Biodiversity Conservation in Malaysia -Creation of SDSG Businesses Using Our Results from JST/JICA SATREPS Project

Yoshihito Shirai[a*] and Mohd Ali Hassan[b]

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Promotion of Green Economy with Palm Oil Industry for Biodiversity Conservation in Malaysia" is the project title of our Science and Technology Research Partnership for Sustainable Development (SATREPS) sponsored by JST, JICA and The Ministry of Higher Education Malaysia. This is a matching grant project between Japanese and Malaysian Governments. A part of the project sponsored by the Japanese Government has commenced in November 2013 and finished in November 2017. Another part of project sponsored by the Malaysia Government has commenced from August 2014 and would be ended in August 2018. We have clarified and confirmed that the water quality of the final discharge water from our pilot plant in Keningau Palm Oil Mill was less than the level of the regulation by the Sabah DOE (20ppm) when we use an aerobic treatment system with aeration. Least of 1 MW of the green electric power by bio gas power generation supplementary recovering more than 1500 tons-methane equivalent to more than 30000 tons-CO2. Recently JST has called a supporting project named "SDGs Commercialization Program Based on the Results from SATREPS". Here we shall report our current progress for several SDGs businesses based on our concept and results from our SATREPS projects.

Keywords: Palm biomass; POME treatment; green power; SATREPS; SDGs

KEYNOTE SPEECH 3

Dr Yit Heng Chooi
University of Western Australia, Australia

Panning for Gold in Mould: Mining The Fungal Genomes for Bioactive Metabolites and Small Molecule-mediated Host Interactions

Yit-Heng Chooi*

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A paradigm that has emerged for microbial natural product discovery in the genomics era is that we are far from exhausting the chemical diversity encoded in the genomes of the microorganisms that we have isolated and cultured in the laboratory. Advances in microbial genomics and synthetic biology and the expanding knowledge on secondary metabolite biosynthesis have opened up new avenues to access the hidden chemical diversity in microorganisms, enabling the translation genomic information to bioactive molecules. To prioritise the discovery in the era of genomic data explosion, we harness fungal biotic interactions and functional genomics to guide our genome mining effort for bioactive molecule discovery. Our lab is especially interested in molecules from pathogenic fungi involved in interactions with higher eukaryotic hosts, mainly plants and mammals, as these molecules could have potential agricultural and pharmaceutical applications. By prioritizing biosynthetic gene clusters that are expressed during fungal host infection and couple that with synthetic biology tools that enabled specific pathway activation and/or pathway reconstruction in heterologous expression system, we have discovered a number of phytotoxic metabolites previously not known to be produced by the fungi, some of which we have demonstrated to be important for virulence. Using a modular *Aspergillus* pathway expression system, we were able to elucidate the biosynthetic pathways of these metabolites and unveiled novel biosynthetic enzymes in these pathways.

Keywords: Genome mining, fungi, secondary metabolites, bioactive molecules, synthetic biology

KEYNOTE SPEECH 4

Professor Dr Tzong-Jih Cheng
National Taiwan University, Taiwan
Chair, Department of Bio-Industrial Mechatronics Engineering

Reform an Interdisciplinary Academic Department into a Research-Oriented University

Richie L. C. Chen and Tzong-Jih Cheng*

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Engineering disciplinary with excellent traditions at the agricultural college of university are facing new era of higher education changes and trends over the economic demands. The challenge for higher education is to market the education and reforming high self-positioning academic unit. Important issues of the academic organization's transformation are addresses here by reviewing the positioning of the organization based on the academic environment, social needs and education marketing challenge. This article will provide a case report of organizational transformation, reposition construction, vision and mission development within the organization and redefining the process of scope and research domains. In addition, we will provide an organizational administration model into an effective academic activities management to ensure effective transitional transformation, especially in the interdisciplinary academic department. An academic unit require an attractive, fancy and unique name in reflecting the reformation process of the organization for a long-term achievement. Here, we introduce our experiences in reshaping the role of emerging bio-sensing research team into the agricultural fields by internal and external collaboration within the organization.

Keywords: Interdisciplinary; agriculture; reformation; bio-sensing research team

INVITED SPEAKER 1

Dr Chong Chun Shiong
School of Biosciences
Faculty of Science
Universiti Teknologi Malaysia

Halophilic bacteria: Insights into industrial applications

Chun Shiong Chong[a*], Ming Quan Lam[a], Suganthi Thevarajoo[a], Seng Chong Teo[a]
Chitra Selvaratnam[a], Kian Mau Goh[a] and Neil C. Bruce[b]

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Halophilic environments inhabit of countless unexplored bacteria that are potential source for biotechnological applications. Characterizations of newly discovered bacteria provide insights into their enzymes with unique properties, which are ideal for industrial applications. The main objective of this work was to genomically and functionally characterize novel bacteria isolated from halophilic environments. The 16S rRNA gene sequence analysis of the bacteria revealed that they belong to *Vitellibacter*, *Virgibacillus, Roseivirga, Nesterenkonia* and *Rhodothermaceae*. Qualitative screening of these bacteria confirmed their ability to produce extracellular protease and/or xylanase. The crude protease from *Vitellibacter* sp. exhibited optimum activity at 5% (w/v) NaCl, 60 °C, pH 7 and 10. Meanwhile, crude protease from *Virgibacillus* sp. showed optimum activity at 10% (w/v) NaCl, 60 °C, pH 7 and 10. Proteases from both bacterial sources were found to be detergent compatible. Proteinaceous stain removal efficacy demonstrated that the crude protease could enhance the performance of commercial detergent. To further characterize the bacteria from the genomic aspect, genomes of *Vitellibacter* and *Rhodothermaceae* were sequenced and analysed. Genome analysis of *Vitellibacter* showed the presence of cysteine protease, zinc metalloprotease and serine protease. Meanwhile, genes encode for xylan degrading enzymes were found in genome of *Rhodothermaceae*. Cloning, expression, purification and functional characterization of the xylan degrading enzymes are in progress. The protease and xylanase from bacteria in this study could serve as a promising source for industrial application, especially in detergent and lignocellulosic biofuel industries.

Keywords: Halophilic bacteria; protease; xylanase; genomics

INVITED SPEAKER 2

Prof Dr Mohd Ali Hassan
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Case study on recycling of oil palm biomass waste and turning it into renewable energy

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There is a big potential for biomass energy from various palm oil residues, wastes and effluent. Currently, biomass is widely used for heat and power generation through combustion process in the palm oil mills for their electricity and steam. The excess power from the plant can be connected to the national grid, as part of the national renewable energy requirement. This paper will address some of the issues in developing palm biomass and biogas energy. The government can provide support for the development of palm biomass utilization as renewable energy by legislative and fiscal incentives. This paper will specifically discuss the commercialization of biogas energy from palm oil mill effluent into green electricity for grid connection in Malaysia.

Keywords: Oil palm biomass; renewable energy; biogas

INVITED SPEAKER 3

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Adsorption of Extracellular Matrix Protein Fibronectin on the Surface of Nano-Composite Particle of Graphene-Hydroxyapatite

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The study of biomaterials for use as implants has been growing rapidly over recent decades in order to address issues of tissue and bone diseases. Since 1985, hydroxyapatite (HA) synthetic materials has gained attentions as an important material for bone replacement in orthopedic and dental fields due to its similarities in biological properties of human bone composition. In this paper, a graphene (GN) was produced by using modified Hummer's method whereas the nano graphene-hydroxyapatite (GN-HA) composite was synthesized via wet chemical precipitation method. An adsorption of fibronectin (FN) was performed on the surface of the composites to see the interaction of protein and hydroxyapatite with and without the present of graphene. The addition of GN as a coating material of HA is expecting to improve mechanical strength of HA and promote protein adsorption. The GN-HA composites was characterized by using X-ray diffraction (XRD), Field Emission Scanning Electron Microscope (FESEM) and Raman spectroscopy. A needle-like nanoparticle of GN-HA was formed with a particle size range between 150-200 nm in length. The surface roughness of HA is increasing while the porosity of HA is decreasing with the addition of GN which these can help in promoting cell attachment and spreading of cells. These exceptional criteria suggest composites have a great potential for biomedical applications.

Keywords: Biomaterial; Hydroxyapatite; Graphene; Fibronectin; Adsorption

INVITED SPEAKER 4

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Extraction of Chitin Form Marine Bio-Waste and Exploration of Chitinolytic Microbes for the Production of Chitinase

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Marine environment is a huge segment of the biodiversity which serves as a pool for novel biological macromolecules. Amongst different marine origin materials, fishery and crustacean's sources are major foundation for dietary supply. However, improper waste management of bio-waste from seafood industry causes some serious environmental concerns. Commercialization of bio-products derived from marine bio-waste has been an alternative trail for its utilization. Crustacean shells encompass a commercially important homopolysaccharide i.e. chitin. Current study was designed to utilize the local marine crustacean bio-waste for the extraction of chitin and exploit the microbial flora in it by screening them for chitinolytic potential. For this purpose, crustacean bio-waste of *Portunus sanguinolentus* (three-spot swimming crab), which is widely distributed throughout the Indo-Pacific region, was collected from local seafood processing industry in Pakistan. Chitin was extracted after demineralization, deproteinization and decolorization processing and subjected to the various analytical analysis. Colloidal chitin was prepared using the extracted chitin and was used as a substrate to produce chitinase. At the same time, different microbial species were screened and identified for chitinase production. Chitinolytic microbes are presently explored as an attractive alternative against synthetic chemicals because of their minor environmental impression. *Glutamicibacter uratoxydans* was indigenously isolated and identified. *G. uratoxydans* is a novel bacterial species which has not been previously explored to produce glycoside hydrolases. Fermentation parameters were optimized for improved production of chitinase. Antimicrobial potential of both the extracted chitin and chitinase against a variety of microbial species is underway, which will further demonstrate their applications.

Keywords: Bio-waste; Chitin; Chitinase; Antimicrobial potential; Marine Biodiversity

INVITED SPEAKER 5

Dr Noratiqah Kamsani
Biocon Sdn Bhd, Malaysia

Degradation of Sawdust Based on Solid State Fermentation Strategy for Reducing Sugar Production

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Sawdust is a common lignocellulosic biomass produced during the process of planning mills and moulding plants. In practice, sawdust is discarded in landfill areas, causing dust and dirt pollution in nearby localities. Therefore, an efficient and practical approach to manage and revalorize sawdust into useful products is crucial. This study reports on solid state fermentation (SSF)-based pre-treatment strategy to convert sawdust into reducing sugars. Single and co-culture of *Aspergillus* sp. A1 (A1) and *Bacillus* sp. B1 (B1) were inoculated on sawdust for production of lignocellulolytic enzymes. Further, the sawdust was degraded by the enzymes solution into reducing sugars. It was found that lignocellulolytic enzymes activities from A1B1 as co-culture were 1.7–25.6 fold higher than produced using single cultures. The fermented sawdust contained significantly lower lignin constitution, whereas its cellulose and hemicellulose content were higher than that observed in non-fermented sawdust. This indicates selective lignin degrading capability by A1 and B1. In addition, the reducing sugar produced from degradation of sawdust using co-culture crude enzyme extract was 1.9–11.8 fold higher than those obtained from single cultures. Total reducing sugar released using degradation hydrolysate with A1B1 co-culture crude enzyme was also higher (3.6–85.4%) compared to the use of commercial Celluclast solution. Overall, the SSF–based process showed to be an effective strategy for on-site enzymes production and delignification of substrate for the subsequent enzymatic degradation step. This is also the first study that presents the potential of sawdust-based biorefinery process for the purpose of reducing sugar production.

Keywords: Sawdust; Solid State Fermentation; Co-culture; Lignocellulolytic Enzymes; Reducing Sugar

INVITED SPEAKER 6

Dr Nor Azman Kasan
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The advantages of biofloc technology application towards the growth performance of Pacific Whiteleg Shrimp, *Penaeus vannamei*

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Low survival rate of shrimp affected global shrimp production. Traditional farming method was unable to meet seafood demand while maximize the overall production. In more environmentally friendly condition, biofloc technology (BFT) offers an optimum water quality, low feeding conversion ratio (FCR) and operating cost. For the purpose of this study, BFT was implemented in industrial scale with the addition of bioflocculant-producing bacteria and controlled C/N ratio of 15. Water quality parameters, biofloc volume and growth performance of Pacific Whiteleg Shrimp, *Penaeus vannamei* were recorded in every 10 days interval. Overall, the growth performance of *P. vannamei* with more than 80% of survival rate and optimum water quality condition were achieved throughout the production periods, up to 100 days. It was expected that aggregation of beneficial microbes in biofloc assimilated the excess nutrient, thus providing optimum water quality condition and enhanced the growth performance of the shrimp culture. In conclusion, application of BFT had reduced environmental damage caused by aquaculture activity, minimize water exchange, decreased FCR and supporting efficient energy uses.

Keywords: Biofloc; *Penaeus vannamei;* C/N ratio; growth rate; water quality

INVITED SPEAKER 7

Dr Mohd Shamzi Mohamed
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Design of Experiment Modelling Approach to Improve the Performance of Triple-Impeller Configuration in Stirred Tank Bioreactor

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Stirred tank bioreactors (STBs) are the most generic of microbial cultivation system by which mixing is provided by impellers of various shapes and sizes. The system can offer high sophistication in process control, extensive variations of scales, and capable to accommodate customization. Culturing shear-sensitive microorganism of interest, however, restricts the intensity of impeller agitation that promotes turbulence intended for homogenization, cell suspension, and bubble dispersion. The prospect of reassessing and improving traditional Rushton turbine (RT) triple setup in 10 L STB was studied preliminarily by analysing the non-biological, STB-specific mixing performance criteria of volumetric power input, P_g/V, and volumetric mass transfer coefficient, k_La in order to derive comprehensive mathematical design models for triple-impeller configuration. The optimized setup was then tested for up-scaled cultivation of oleaginous *Tetraselmis striata* based on the microalga hydrodynamic preference from 2 L STB. A unique RSM modelling approach utilized the ability of Design Expert to integrate both numerical and categorical-type parameters influencing mixing in STB for interpreting correlation amongst variables and developing regression model. Numeric factors comprised of power input, mass transfer, mixing speed, superficial gas velocity while categoric factors referred to the geometrical variations of RT, Bakker turbine (BT), A315 Hydrofoil (HYD), and Narcissus (NT). Resulting regression indicate NS-BT-NS as potential configuration imposing moderate shear effect without risking the oxygen transfer rate to the medium. Scale-up criterion of constant k_La fared better over strategy based on equal tip speed on *Tetraselmis* growth whereby the highest biomass was obtained at 18.07 g/L with 22.6% of lipid bodies.

Keywords: volumetric mass transfer coefficient; triple impeller; mathematical model; stirred tank bioreactor; volumetric power input

INVITED SPEAKER 8

Prof. Dr Rakesh Bhatnagar
School of Biotechnology, JNU, New Delhi

Recombinant vaccine against anthrax: From Clone to clinical trials

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The nature of bio-terrorism resulting from an anthrax attack is such that an aggressor is likely to strike at a time and place calculated to induce maximum terror through mass casualties. In the absence of any specific intelligence, in terms of medical surveillance and integrated real-time detection systems, the unpredictable nature of such events compels the development of medical countermeasures, which will enable the authorities to treat the exposed individuals. Early treatment is essential before the disease reaches a point at which antibiotics are no longer effective owing to the accumulation of a lethal level of toxins, even though the organism is sensitive to the agent. The currently recommended post exposure treatment is a combination of an antibiotic (ciprofloxacin) and a licensed human vaccine AVA (highly toxic with side effects). We have PCR-cloned and over expressed the anthrax protective antigen gene. Bioprocess optimization was done to improve the yields of the genetically engineered protective antigen. The total yield of genetically engineered vaccine obtained was 25 g from a 5-liter bioreactor, which is equivalent to 1 million shots. The genetically engineered protein was found to be functionally and biologically identical to its *Bacillus anthracis* antigen. Toxicity studies conducted on this protein indicated that the protein is devoid of any toxicity and can be safely used for the development of a safe and effective genetically engineered vaccine against anthrax. Phase II clinical trials are being done as per guidelines of Drug Controller of India and US FDA. Technology for making genetically engineered vaccine against anthrax has already been transferred to Panacea Biotech Ltd., New Delhi, a pharmaceutical company already in the business of making polio and Hepatitis B vaccine.

Keywords: anthrax; genetically engineered vaccine; toxicity; clinical trials

INVITED SPEAKER 9

Prof. Datin Dr Zaharah Ibrahim
Universiti Teknologi Malaysia

Beneficial Microbes for the Treatment of Wastewater

Zaharah Ibrahim*, Shafinaz Shahir, Madihah Md Salleh, Adibah Yahya, Mohd Firdaus Abd. Wahab, Haryati Jamaluddin, Shaza Eva Mohamad, Azmi Aris, Zaiton Abdul Majid, Chong Chun Shiong, Norahim Ibrahim, Wan Rosmiza Wan Dagang, Nurliyana Ahmad Zawawi, Fazilah Abd Manan, Huszalina Hussin, Mohd Hanif Mohamad Nor, Mohd Fahmi Muhammad Mubarak, Mohamed Zuhaili Mohamed Najib and Amalina Ramli

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The treatment of wastewater containing toxic organic and inorganic pollutants has been a great challenge over the decades. To meet the regulatory compliance, the industries will have to invest in higher capital and annual operating costs. As effective treatment plant is generally expensive and unaffordable, the application of beneficial microbes able to breakdown highly complex organic pollutants into simpler degradable compounds is a good alternative and timely solution. The research challenge is to develop mixed culture of microorganisms capable of treating organic or inorganic pollutants from the wastewater. The abilities of versatile microbes to survive in wastewater and utilize pollutants as nutrients is a subject of our research interest. The identification of major pollutants is crucial, as this will enable major groups of target pollutants to be degraded. The microbes will be screened and selected using different techniques developed by our researchers. Ecotoxicity tests were also carried for safety discharge of the treated effluent, In addition, the possibility of converting pollutants into value-added materials such as biomaterials and bioenergy will also be highlighted. Since the microbial metabolism and microbial adaptation processes in the environment are diverse, the success of the biological treatment process is highly dependent on the survivability of these microbes in the wastewater and the local weather conditions. An effective treatment processes using beneficial microbes is anticipated to contribute to an overall treatment that is eco-friendly, innovative and sustainable.

Keywords: beneficial microbes, organic and inorganic pollutants, metabolism, adaptation, biomaterials, bioenergy

INVITED SPEAKER 10

Prof. Dr Nazalan Najimudin
School of Biological Sciences
Universiti Sains Malaysia

Assembling Nitrogen Fixation Genes for Plants: Lessons from the Gram-Positive Bacteria

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Most of nitrogen fixation studies focussed on Gram-negative bacteria while Gram-positive diazotrophs received very little attention. Research on Gram-positive diazotrophs is much needed, especially to look at new features of *nif* genes regulation. An early model of a nitrogen fixing Gram-positive bacterium employed was the anaerobic bacterium *Clostridium pasteurianum*. The primary structure of *C. pasteurianum* nitrogenase components is significantly less related to that of nitrogenases from other microorganisms and it has six copies of *nifH*-like sequences. Unfortunately, the capacity to perform genetics on this bacterium is difficult to achieve. Bacteria of the genus *Paenibacillus* are Gram-positive, facultatively anaerobic diazotrophs clustered into rRNA group 3. This cluster also includes *P. durus*, *P. macerans* and *P. polymyxa*. They fix atmospheric nitrogen with high efficiency. *P. durus* ATCC 35681 differs from the majority of nitrogen fixers as its ability to fix nitrogen is not affected by the presence of nitrate or ammonia. Its genome revealed a total of 6 *nifH* and 4 *nifB* genes. The major nitrogen fixation operon has the genes *nifB1H1DKENXhesA* arranged as a long operon. Transcriptomic analysis revealed that the genes are essential for nitrogen fixation are turned on despite the presence of fixed nitrogenous compounds. Interestingly, it lacked the typical NifA and NifL regulators that exist in the Gram-negative bacteria. Besides being a facultative anaerobe with undemanding growth conditions, *P. durus* is also amenable to genetics and thus making it a suitable Gram-positive model to study nitrogen fixation.

Keywords: nitrogen fixation; *Paenibacillus*; Gram-positive diazotrophs

INVITED SPEAKER 11

Dr Citartan Marimuthu
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Aptamers as the Thriving Molecular Recognition Elements

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What were classically recognized as mere genetic information carriers were then gradually lauded as the surrogates of antibodies due to their extensive application in an array of diagnostic and therapeutic applications since its inception in 1990? Known as aptamers, these synthetic nucleic acid molecules have the propensity to bind target with high affinity and specificity. Relatively to antibodies, aptamers are much smaller in size, exhibiting no batch-to-batch variation and less immunogenic with a very high permeability. Compelled by the splendour of aptamers, we sought to isolate aptamers against various targets including infectious disease-specific biomarkers and transcription factors by the *in vitro* selection process known as Systematic Evolution of ligands by Exponential Enrichment (SELEX). The aptamers selected could recognize their cognate targets with the dissociation constant values within nanomolar range. The isolated aptamers could be potential molecular recognition elements in both diagnostic and therapeutic applications.

Keywords: Aptamer; bind target; high affinity; SELEX

INVITED SPEAKER 12

Dr Norlia Basherudin
Forest Research Institute Malaysia

De Novo Assembly and Analysis of *Eurycoma longifolia* Transcriptome to Identify Genes Involved in the Biosynthesis of Active Secondary Metabolites

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Eurycoma longifolia or locally known as Tongkat Ali is a popular medicinal plant in Malaysia. It is indigenous to South-East-Asian countries such as Malaysia, Indonesia and Vietnam. The plant extract, particularly from root have been used in traditional medicines for antimalarial, cytotoxic and aphrodisiac properties. Despite been widely used in pharmaceutical industries, genomic data of this species in public databases is very scarce. In this study, Illumina/Solexa platform has been used to sequence a cDNA library generated from roots of *Eurycoma longifolia*. More than 40,000,000 high quality reads were generated. A total of 69,754 contigs were obtained by de novo assembly with an average sequence length of 724 bp. Out of 51,551 non-redundant contigs 36,906 (72 %) unique contigs were annotated and 6,652 of the contigs were categorized under metabolic process. Kyoto Encyclopaedia of Genes and Genomes (KEGG) analysis mapped 2,302 of the contigs to at least one of 127 metabolite pathways. Among them, 450 contigs were involved in phenylpropanoid biosynthesis, 217 in flavonoid biosynthesis, 94 in terpenoids backbone biosynthesis and 56 were in flavone and flavanol biosynthesis. These contigs and putative functional data could be a resource for future investigation of secondary metabolite production in *Eurycoma longifolia*.

Keywords: *Eurycoma longifolia*, transcriptome, secondary metabolites

SPEAKER 1.1
Assoc. Prof. Dr Amir Husni Mohd. Sahriff
Universiti Malaysia Sabah

Selected Trace Minerals Concentrations Found in Two Varieties of Sweet Potatoes (*Ipomea Batatas*) Grown on BRIS Soils in the East Coast of Peninsular Malaysia

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Two varieties of sweet potatoes, one orange and the other purple grown on Rudua soil series and Jambu soil series, belonging to the BRIS soils were chosen for this study. These two varieties of sweet potatoes were analysed for their trace minerals composition content in their respective tuber tissues. In addition, soil pH and soil moisture content were also determined. Rudua soil series had higher content of all the trance minerals than that of Jambu soils series. The trace element concentrations in the tissues of sweet potatoes range from 0.037-0.130 mg/kg in Zn to 0.281-0.334 mg/kg in Fe to 0.014-0.032 mg/kg in Cu to 0.298-0.508 mg/kg in Ni and 0.746-2.16 mg/kg in Pb on dry matter basis. The soil pH is less acidic in the Rudua series (5.97) compared to Jambu series (5.26), which again favours higher concentrations of trace elements in the orange variety compared to Purple variety. This study also indicated the positive correlation between nutrient concentration in the tissue of the sweet potatoes and the amounts of trace mineral concentration available in the soils. This study truly exhibited the fact that, uptake of trace minerals by the sweet potatoes is govern by the presence of these minerals in the soils, soil pH and soil moisture content.

Keywords: Sweet potato; BRIS soils; trace minerals

SPEAKER 1.2
Dr Mohd Zulkhairi Mohd Yusoff
Universiti Putra Malaysia

The Importance of Pseudogene in Hydrogen Metabolism of *Escherichia coli*

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Hydrogen holds the promise for a renewable and clean energy source. It can be generated by various methods. However, biological production gain mainstream interest as it can be produced easily from carbon source through dark fermentation. *Escherichia coli* is the most extensively used bacterium for hydrogen production. A pseudogene is a DNA sequence with high homology to a functional gene. Pseudogenes are considered to be non-functional genes that lack physiological roles. By screening 3985 *E. coli* mutants using chemochromic membranes, four pseudogenes were found involved in hydrogen metabolism. Knockouts of pseudogenes *ydfW* and *ypdJ* had a defective hydrogen phenotype on glucose and formate, respectively. Also, the knockout of pseudogene *yqiG* could formed hydrogen from formate but not from glucose. For the *yqiG* mutant, hydrogen recovery was obtained by the complementation of YqiG via a plasmid. The knockout of pseudogene *ylcE* showed hydrogen deficiency in minimal media which suggested that the role of YlcE is associated with cell growth. Hence, the products of these four pseudogenes play important physiological roles in hydrogen production in *E. coli*.

Keywords: Hydogen; *Escherichia coli*; pseudogene

SPEAKER 1.3
Dr Alina Wagiran
Universiti Teknologi Malaysia

Application of Bar-High Resolution Melting Analysis for Detection *Eurycoma longifolia* in Selected Herbal Products in Malaysia

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The *E. longifolia* is widely known in Malaysia due to its aphrodisiac properties and many such claimed product has been marketed. Due to its high demand unscrupulous manufacturer may substitute the raw materials with other species; thus, lacking authenticity in herbal product is a public health risk. Therefore, the correct identification of such species is important to ensure herbal quality, consumer safety and its authenticity. Hence, any measures that may aide product authentication would be beneficial. Therefore, a high-resolution melting assay (HRM), targeting a DNA barcoding region (Bar-HRM) of internal transcribed spacer 2 (*ITS2*) was developed for 4 selected herbal products. The herbal products sample were obtained randomly in market and selected depend on its packaging label. The present study revealed that the use of *ITS2* barcode enable detection of three genuine products that were similar to *E. longifolia* root (control) but one of the products is not. These demonstrated that *E. longifolia* species could be clearly distinguished based on its melting temperature. bioinformatics analysis of ITS2 showed that 3 herbal products were clustered in the same clade to *E, longifolia* root and ITS2 Genbank (accession no: KY553292.1). The Multiple Sequence Alignment and Neighbor-joining tree analysis were in agreement with HRM analysis data. The reliability and sensitivity of Bar-HRM to detect small traces of targeted *E.longifolia* DNA was as low as 1%. The present study demonstrates that Bar- HRM based method develop for authentication tool will ensure high level of accuracy thus serve as standard tools to identify genuine herbal products in herbal markets.

Keywords: Bar-High Resolution Melting Analysis; *Eurycoma longifolia*; *ITS2*

SPEAKER 2.1
Shankar Ramanathan
Universiti Teknologi Malaysia

Production of Biobutanol by *Clostridium beijerinckii* SR1 Using Sea Water Medium

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Biobutanol produced by *Clostridium* sp. via acetone-butanol-ethanol fermentation (ABE) under strict anaerobic condition served as the most promising biofuel. During ABE fermentation, culture undergoes a metabolic shift from acidogenic phase to solventogenic phase for the formation of solvents. In this preliminary study, production of biobutanol using locally isolated strain using sea water was performed in batch culture. Analysis of filtered sea water from Bakar Batu, Johor showed total carbon and nitrogen of 0.1629% (w/v) and 0.003% (w/v), respectively with C/N ratio of 0.0016. The sodium, calcium, magnesium and potassium concentration were 176.60, 21.92, 23.63 and 58.96 ppm, respectively. The strain used was isolated from contaminated lake sediment in Port Klang, Selangor was further identified as *Clostridium beijerinckii* SR1 using 16S rRNA studies with accession number of KJ934638. Application of complete Reinforced Clostridium Medium (RCM) with sea water resulted in highest butanol production and productivity of 0.416 g/L and 0.009 g/L/h, respectively with yield of 15.46%. The $Y_{p/s}$ and $Y_{p/x}$ value obtained were 0.15 g/g and 2.10 g/g, respectively. Total cell concentration (X) obtained was 0.23 g/L with μ_{max} and doubling time (t_d) of 0.090 h^{-1} and 15.47 h^{-1}, respectively. Application RCM medium without an addition of vitamin solutions (thiamine and biotin) resulted in biobutanol production and productivity of 0.398 g/L and 0.008 g/L/h with yield of 15.48%. Total cell concentration was 0.27 g/L with μ_{max} and doubling time (t_d) of 0.100 $h^{-1}$and 14.06 h^{-1}, respectively. Thus, sea water which contains essential minerals in acceptable concentration was successfully utilized for potential biobutanol production in future.

Keywords: Sea water, biobutanol, *Clostridium beijerinckii* SR1, ABE fermentation, batch culture

SPEAKER 3.1
Assoc. Prof. Dr Noorhisham Tan Kofli
Universiti Kebangsaan Malaysia

Amino Acid and Fatty Acid Profiling of Local Fermented Rice Grain (*Bedak Sejuk*) and Its Soaking Water

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The current cosmetic industry is fast moving and always gives the best product to consumers. Amongst the current new emerging skincare, traditional cosmetic *bedak sejuk* still has a demand in Malaysia's cosmetic industry, however, lacks scientific information on its benefits. This research was carried out to determine the amino acid and fatty acid profile as well as the concentration of free fatty acid in *bedak sejuk,* including the soaking water that was prepared using IUPAC standard methodology. Results showed 16 out of 17 types of amino acids were detected in both *bedak sejuk* and soaking water. The type of amino acids detected were aspartic acid, serine, glutamic acid, glycine, histidine, arginine, threonine, alanine, proline, tyrosine, valine, methionine, lysine, isoleucine, leucine and phenylalanine. The highest concentration of amino acid found in *bedak sejuk* was glutamic acid (10.33×10^{-3} g w/w) and the lowest was methionine with concentration of 0.36×10^{-3} g w/w. Similar observation was found in soaking water, with glutamic acid content at 1.31×10^{-3} g w/w and methionine at 0.055×10^{-3} g w/w. As for fatty acid profiles, it was found that more fatty acids were detected in *bedak sejuk* compared to the soaking water. Only 7 out of 37 types of fatty acid tested were discovered in the soaking water while 17 were detected in *bedak sejuk*. The highest concentration of fatty acids in *bedak sejuk* was linoleic acid with concentration of 44.336 % w/w followed by palmitic acid with concentration of 34.791 % w/w. Meanwhile for soaking water, oleic acid recorded the highest concentration at 21.561% w/w. The presence of components such as sphingolipid, amino acids and fatty acids in *bedak sejuk* scientifically indicated that *bedak sejuk* has properties that can potentially use in cosmetic industry.

Keywords: *Bedak sejuk*, rice cosmetics, amino acid, fatty acid, rice fermentation

SPEAKER 3.2
Dr. Che Azurahanim Che Abdullah
Universiti Putra Malaysia

Preparation of Hydroxyapatite from Nacre Layer as Biomaterial for Dental Application

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Hydroxyapatite, (HAp), $Ca10(PO_4)6(OH)_2$, is a biomaterial which is naturally found in the inorganic part of human bone and enamel. HAp can be easily attached to the hard tissue like enamel without giving any harm to the living tissue. Thus, it is a biomaterial of great interest with various application. Current research focuses mainly on the preparation of HAp from the nacre layer as the calcium precursor for dental application. Wet chemical precipitation method where chosen to prepare the HAp by simply mixing the calcium hydroxide $Ca(OH)_2$ and phosphoric acid (H_3PO_4) as the phosphorus precursor. Samples fabricated in the form of pellet and sintered using microwave oven. The prepared samples were characterized by X-Ray Diffraction (XRD), Fourier Transform Infrared Spectroscopy (FTIR), Scanning Electron Microscopy (SEM) and Energy Dispersive X-Ray Spectroscopy (EDX) to determine the chemical, structural, morphology and molecular bonding properties. XRD patterns confirmed the pure single phase of HAp by comparing with the standard HAp pattern. The functional groups for HAp were analyzed using FTIR. The EDX analysis revealed the elements in HAp, meanwhile, the ratio between calcium and phosphorus for each sample was calculated to determine the stoichiometric of HAp.

Keywords: Hydroxyapatite; nacre; morphology; dental

SPEAKER 3.3
Dr. Mohd Helmi Sani
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Selection of Microcarriers for the Mammalian Cell in Microwell Attachment Plates

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Microcarrier based cell culture system allows the growth of anchorage-dependent cells for the upscale process in the biopharmaceutical industry. However, the conventional screening conditions of microcarrier based cell culture in large scale is not cost effective and use lots of materials. In this work, Chinese hamster ovary (CHO) cells were seeded with the selected microcarriers in a 24 multi-well attachment plate and the growth rate of the cells attached on the microcarriers in the microwell plates were screened. Two microcarriers selected were Cellonsphere™ 3 and Cytodex-3 and two concentrations were prepared for each microcarrier which were 5% and 7%. The cell number was calculated using trypan blue exclusion method, whereas the glucose concentration was measured by using 3,5-dinitrosalicylic acid (DNS) assay. Initially, three seeding densities (7×10^4 cell/mL, 1×10^5 cell/mL, and 6×10^5 cell/mL) were chosen and seeded with the cells for 10 days. After the growth rate analysis, the best seeding density was 1×10^5 cell/mL and selected to be seeded with the microcarriers and analysed for 7 days. This seeding density had the highest growth rate and lowest doubling time with the values of 0.448±0.118/h and 1.64±0.502h respectively. Overall, Cellonsphere™ 3 with 5% concentration had the highest growth rate and lowest doubling time with the values of 0.772±0.302 /h and 1.01±0.438 h respectively. However, based on the cell densities and cell viabilities, Cytodex-3 with 5% concentration had the highest live cell count (33.00 ±2.60) $\times10^4$ cell/mL. In conclusion, the most suitable microcarrier selected was Cytodex-3 with 5% concentration since it showed a better cell attachment and could facilitate the upscale process of biopharmaceutical industry.

Keywords: Microcarrier; mammalian cells; Chinese hamster ovary; microwell

SPEAKER 4.1
Dr Noor Liyana Yusof
University Putra Malaysia

Vacuum Impregnation of Spinach Tissue: Effect on Metabolic Activity and Package Gas Composition

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Vacuum impregnation (VI) is a unit operation that allows the introduction of solutions into porous structure of plant tissues. The tissue is immersed in the solution of interest and is then subjected to partial vacuum, causing the removal of air. When the atmospheric pressure is restored, the solution is drawn into the tissue, replacing the air. The application of VI with different substances into baby spinach leaves is studied as means of affecting the metabolic activity of the leaves during modified atmospheric packaging (MAP). The short-term metabolic response of impregnating spinach leaves with different substances (calcium lactate, sucrose citric acid and ascorbic acid) was investigated using isothermal calorimetry at 5 °C and 21 °C, 2 h after VI treatment. The gross metabolic activity of the impregnated spinach leaves changed significantly, depending on the impregnation solute and treatment temperature. Sucrose induced the highest metabolic heat production at 21 °C, whereas calcium lactate led to the highest metabolic activity at 5 °C. The high metabolic activity of sucrose-impregnated leaves was reflected by high oxygen consumption and carbon dioxide production measured in the packaged product stored at 21 °C. However, this was not reflected by the changes in atmosphere inside the calcium lactate-impregnated, packaged products. The incongruity between calorimetric and atmospheric measurements may be the result of the different time scales of the measurements. The results obtained could be of importance in the food industry as they provide a better understanding of how VI could influence specific quality characteristics and respiration upon packaging.

Keywords: Spinach; Emerging Technology; Modified Atmosphere; Food Quality; Metabolic Activity

SPEAKER YR 1.1
Nur Fariza Abdul Rahman
Universiti Putra Malaysia

Extraction of Ferulic Acid from Lemongrass Leaves (*Cymbopogun citratus*) using Hydrothermal Pretreatment

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Lemongrass leaves is one of Malaysia most abundant agricultural waste or biomass that is renewable, low cost, and has high content of phenolic compounds such as ferulic acid. However, due to rigid and complex structure of biomass, the leaves need to be pre-treated in order to ease the extraction. In this study, hydrothermal pre-treatment was used to extract the ferulic acid from lemongrass leaves which was conducted using laboratory autoclave and miniclave. A 2^3 full factorial design was adopted in this study and three parameters were varied namely temperature (°C), time (min) and substrate/water loading (%). The results showed that both models for autoclave and miniclave were significant with Prob F value less than 0.05. However, miniclave have shown superiority over autoclave based on less amount of substrate and shorter time required with higher amount of ferulic acid obtained.

Keywords: Lemongrass leaves; Hydrothermal; Ferulic acid

SPEAKER YR 1.2
Mohd Azwan Jenol
Universiti Putra Malaysia

Bioelectricity Generation from Sago Hampas Using Direct Biomass Fuel Cell

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Microbial fuel cells (MFC) offer a technology for simultaneous biomass degradation and biological electricity generation. However, there is very little information on utilization of solid biomass in bioelectricity generation using MFC. In Malaysia, it is estimated 7 tons of sago hampas is produced per day from sago starch processing mill, which consist approximately 58% of starch. With this amount of starch, sago hampas shows a great potential to be a substrate for the generation of bioelectricity in MFC. In this study, we demonstrated the utilization of sago hampas as a carbon source for the bioelectricity generation using MFCs by *Clostridium beijerinckii* SR1. The maximum power density obtained from 20 g/L of sago hampas was 166.0 mW/m^2 with stable cell voltage out of 211.7 mV. Total substrate consumed was 95.1%, with the respect of 10.7% CE. These results demonstrate the feasibility of solid biomass to be utilized as a main electron donor for the power generation in MFCs as well as high substrate degradation efficiency.

Keywords: Sago hampas; Starch; Bioelectricity generation; Direct biomass fuel cell

SPEAKER YR 1.3
Norulsazyani Mohd Safri
Universiti Teknologi Malaysia

Purification and characterization of biovanillin from lemongrass hydrolysate in submerged fermentation using molecular imprinting polymers (MIPs)

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Phanerochaete chrysosporium was known to be able to biotransform lemongrass waste into biovanillin, a widely used flavor compounds in foods, beverages, and pharmaceutical products. Apart from biovanillin, *P. chrysosporium* also produced ferulic acid, vanillyl alcohol, vanillic acid and p-coumaric as its by-product. This work aims at isolating and purifying biovanillin produced extracellularly by *P. chrysosporium,* using molecular imprinting polymer (MIP) technique. High performance liquid chromatography (HPLC) was used to assess the vanillin recovery and accuracy by spiking the culture broth or supernatant with standard vanillin at concentration within 1.0 – 3.0 mg/ml. To evaluate its structural component, the isolated biovanillin was confirmed by Fourier-transform infrared spectroscopy (FTIR). Results showed that sample spiked with 2.0 mg/ml standard vanillin showed high selectivity with binding amount of 17955 µmol/g. This value represents the recognition of vanillin-imprinted polymers towards biovanillin. The biovanillin recovery using vanillin-imprinted polymer was found to increase to 2.46-fold than that of sample without polymer indicated specificity to vanillin. The recovery of biovanilin from fermentation broth using MIP with vanillin-imprinted polymer was 81.95% with relative standard deviation of 3.27%. In FTIR, biovanillin shows a slightly broad peak at 3211 cm^{-1}, which represents the hydroxyl group and an intense peak at 1431 cm^{-1} that indicates the presence of aromatic rings. Its production was found to be 24 mg/L after 48 h with biovanillin productivity of 0.5 mg/L h^{-1} from its HPLC data. The result demonstrated the potential recovery of biovanilin from *Phanerochaete chrysosporium* using molecular imprinting polymer technique.

Keywords: Vanillin; Molecular imprinting polymer; Lemongrass hydrolysate; High performane liquid chromatography, fourier-transform infrared spectroscopy

SPEAKER YR 1.4
Rohaya Mohd Noor
Universiti Teknologi Malaysia

Potential Application of Lignin from Paddy Husk for Biovanillin Production by *Phanerochaete chrysosporium* in Submerged Fermentation

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The processing of paddy produces two main types of residues namely paddy husk and paddy straw. Paddy husk, the outer coat of paddy grain consists approximately 25-30% of lignin. It contains ferulic acid that acts as precursor for biovanillin production. In this study, lignin recovery from paddy husk was investigated for biovanillin production by *Phanerochaete chrysosporium* in batch culture, using submerged fermentation which was conducted at 30° C, 150 rpm. The biovanillin yield of lignin obtained from physical, chemical, physicochemical and biological pre-treatments were compared. Lignin recovered from microwave irradiation at 330W for 12 min was able to produce the biovanillin up to 0.0997 g/L. The recovery of lignin from microwave was optimized by Response Surface Methodology based on Central Composite Design to improve the production yield of vanillin. Three parameters were studied; namely time (5-30 min), solid to liquid ratio (5-25%) and microwave power (80-800 Watt). The lignin recovered from microwave was chosen for further study by considering the pre-treatment process without any chemical addition which is more environmental friendly for biovanillin production. Lignin recovered from paddy husk was successfully used for the production of biovanillin.

Keywords: Paddy Husk Lignin; Submerged Fermentation; *Phanerochaete chrysosporium*; Degradation; Vanillin

SPEAKER YR 1.5
Norazela Nordin
Universiti Pendidikan Sultan Idris

Optimisation of Photoautotrophic Cultural Conditions for High Biomass and Lipid Production of *Chlorella vulgaris*

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The aim of the study was to investigate the optimum photoautotrophic cultural conditions to enhance the biomass and lipid production of *Chlorella vulgaris*. Five important photo-autotrophic cultural conditions including NO_3^- concentration, pH, light intensity, temperature and CO_2 concentration were studied. Biomass compositions such as lipid, carbohydrates and protein content of the produced biomass were also analysed. Further, lipid production of microalgae biomass under optimum condition lipid enhancement was compared. From the results, the highest biomass productivity of 0.468 g/L/day was achieved at 500 mg/L NO_3^- concentration, pH 8, 10500 lux light intensity, 28°C and 5% CO_2 concentration. These photoautotrophic cultural conditions produced biomass with lipids, carbohydrates, and protein content of 9.54%, 47.43% and 37.53% respectively. Complete elimination of NO_3^- from the culture media and growth under culture condition favourable for lipid accumulation (23500 lux, 40°C, 0.03% CO_2) had resulted in 3.5 fold increase in lipid content of microalgae biomass. The result of this present study could be very useful for the application of two stage microalgae culturing system, that is, 1st stage of biomass accumulation and 2nd stage of lipid enhancement of *Chlorella vulgaris* for biofuel feedstock.

Keywords: *Chlorella vulgaris*; growth optimisation; microalgae biomass; lipid production; biofuel feedstock

SPEAKER YR 1.6

Kazuki Tani
Universiti Malaysia Sabah

Three New Bioactive Sesquiterpenoids from Bornean Soft Coral Genus *Lemnalia*

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Soft coral genus *Lemnalia* sp. (Alcyoniidae) are known to be a rich source of sesquiterpenes and their analogues. Previous bioassay investigation of these secondary metabolites showed cytotoxic, anti-inflammatory and antibacterial activity. As part of our ongoing research initiative, we isolated three new sesquiterpenes, 2-deoxy-12α-methoxy-lemnacarnol, 2-deoxy-12a-ethoxy-lemnacarnol and lemnolin A, along with five known compounds, lemnal-1(10)-ene-7β, 12ξ-diol, Paralemnolin J and K, 1S*,4S*,5S*,10R*-4,10-guaianediol and 4-acetoxy-2,8-neolemnadien-5-onc from *Lemnalia* sp. Their structures were elucidated based on spectroscopic analysis and these compounds have exhibited potent biological activities against marine pathogenic microbes.

Keywords: *Lemnalia* sp., Alcyoniidae, Soft Coral, Marine-Natural-Products, Anti-Microbial

SPEAKER YR 1.7
Christine Rika anak Renggu
Universiti Teknologi Malaysia

The effects of lightweight macrocomposite for palm oil mill effluent (POME) treatment

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Lightweight macrocomposite can be effective means of treating highly polluting palm oil mill effluent (POME). This study prepared lightweight macrocomposite using pumice rock, cement, zeolite and activated carbon, which was named as MAC3. Its efficiency to remove colour, chemical oxygen demand (COD) and ammoniacal nitrogen (NH_3-N) from POME wastewater were analysed and compared with lightweight macrocomposite MAC1 that contained no zeolite and activated carbon (MAC1). The biofilm developed on both macrocomposites were observed using scanning electron microscopy (SEM) and its dry cell weight content. From the results, MAC3 demonstrated highest amount of POME removal with colour reduction up to 65.17% (initial 8900 ADMI), COD removal of 42.51% (initial 1289 mg/L) and NH_3-N reduction of 65.77% (initial 111 mg/L) as compared to MAC1 after 10 days incubation of the macrocomposite with POME sample, In SEM, the biofilm was found to coat both macrocomposites, as clusters of microbial cells were found deposited on its surface. The biofilm was suggested to enhance color and COD removal of POME, indicated by its dry cell weight on MAC3 (3.14 mg/g) that was higher than MAC1 (1.04 mg/g). Both activated carbon and zeolite incorporated in MAC3 has surface areas to act as a promising adsorbent for POME treatment process.

Keywords: Palm oil mill effluent; Macrocomposite; Biofilm; Activated carbon; Zeolite

SPEAKER YR 2.1
Muhammad Afiq Khir Anuar
Universiti Teknologi Malaysia

Potential Use of Chicken Viscera for Cat Food Production

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Hydrolysate from chicken viscera contains protein, fat, and compounds that produce chicken aroma for cat food production. Chicken viscera were hydrolyse using chemical and commercial enzyme to obtain chicken flavoured hydrolysate. Raw chicken viscera shows significant amount of crude protein 13.3% w/w, and crude fat 9.6% w/w. Study on the effect of protein content to storage duration shows that fresh viscera have highest protein content (22.93 g/L) compared to after one-week storage (8.69 g/L) and after two-week storage (6.5g/L). 3 different of hydrolysis were conducted; hydrolysis with indigenous protease without adjusting pH, hydrolysis with indigenous protease pH adjusted to 2.8 using 1N hydrochloric acid and hydrolysis with indigenous protease and 2%(v/v) commercial protease. Hydrolysis using 1N hydrochloric acid at initial pH 2.8 of slightly washed chicken viscera produced protein content 79.32% higher than hydrolysis using 1N hydrochloric acid at initial pH 2.8 of completely washed chicken viscera. However, hydrolysis using 2% commercial protease produced protein content less 6.15% than hydrolysis using 1N hydrochloric acid of slightly washed viscera. Confirmation of chicken flavour development from the hydrolysate are proven by detecting cysteine and methionine using HPLC. These amino acids are the pre-cursor for volatiles 2-methyl-3-furanthiol and 2-methyl-3-furanthiol which are the responsible volatile for chicken flavour. The best amount of cysteine (0.44 mg/mL) and methionine (0.67 mg/mL) produced are from hydrolysis with indigenous protease pH adjusted to 2.8. Crude protein and crude fat obtained from the hydrolysis did not meet the standard set by Association of American Animal Feed Control Officials (AAFCO) and The European Pet Food Industry Federation (FEDIAF) but will be made up by the kibbles production.

Keywords: Chicken viscera; hydrolysate; cat food; flavor; palatant

SPEAKER YR 2.2
Nur Amira Syahirah Mazlan
Universiti Teknologi Malaysia

Characterisation and Optimisation Of Protease Production and Proteolytic Activity Of Thermophilic *Bacillus licheniformis* Strain Mea-01 Isolated From La Hot Spring Terengganu

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A protease-producing bacterium *Bacillus licheniformis* strain MEA-01 was isolated from La Hot Spring, Terengganu. Protease production of the bacterium, herein referred as MEA-01, was optimised based on temperature and incubation period. The bacterium was cultured at temperatures of 40, 45, 48, 50, and 55 °C for 24 hours with 200 rpm; whereas the optimisation of incubation period was investigated at 48 °C within a span of 12-60 hours with 200 rpm. The proteases produced were subjected to standard protein concentration and standard proteolytic activity assays. The result showed MEA-01 at 48 °C by 48 hours of incubation period has the highest protein concentration with 2.216 ± 0.288 mg/mL, while sample at 50 °C after 48 hours has the highest proteolytic activity of 0.1459 ± 0.003 U/mL. Meanwhile, the MEA-01's proteolytic activity was optimised by conducting the caseinolytic assay at various temperatures of 20, 30, 40, 50 and 60 °C for 30minutes; and various incubation periods which were 10 minutes, 20 minutes, 30 minutes, 1 hour, 3 hours, 6 hours, 15 hours and 24 hours at 37 °C. The result showed that the optimum temperature for was 40 °C with 0.226 ± 0.047 µmole of tyrosine and 10.824 ± 2.244 U/mL of proteolytic activity; and the optimum incubation period was 10 minutes with 0.212 ± 0.055 µmole of tyrosine and 30.417 ± 7.899 U/mL of proteolytic activity. According to the collective data, the neutral protease produced by thermophilic *B. licheniformis* strain MEA-01 has the potential application in many biotechnological and industrial purposes that utilise high processing temperature.

Keywords: *Bacillus licheniformis*; protease; protein production; proteolytic activity; thermophilic

SPEAKER YR 2.3
Nurshafika Khalid
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Microbial Community Analyses of Palm Oil Mill Effluent and Oil Palm Empty Fruit Bunch Compost

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Oil palm is one of the largest crops in Malaysia. The production of palm oil generates large quantities of wastewater called palm oil mill effluent (POME) which creates environmental issues for the palm oil mill industry in Malaysia. POME with its high organic content is a great potential for co-composting with empty fruit bunch (EFB), an abundantly produced lignocellulose waste in palm oil mill. This study was conducted to analyse the diversity of microbes from POME and matured compost produced by an oil palm mill in Johor using metagenomic approach. Bacteria and fungi are biological agents that play major roles throughout the composting process until a matured compost was obtained. The 16S rRNA and ITS ribosomal metagenomic sequencing analyses were adopted in order to map the microbial community present in the POME and those in matured compost. The diversity of microbes in matured compost indicates the occurrence of natural selection of microbes throughout the composting process. This analysis provides fundamental data for improved biodegradation of EFB during composting process as well as increasing the efficiency of oil palm waste utilisation.

Keywords: Metagenomic; next gene sequencing; palm oil mill effluent; compost; bioinformatics

SPEAKER YR 2.4
Lam Ming Quan
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Isolation, Identification and Genomic Analyses of Halophilic Bacteria with Lignocellulolytic Abilities

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Halophilic bacteria have been recognized as one group of extremophiles that produce enzymes with great versatility and valuable to industry, including lignocellulolytic enzymes for biofuel application. New lignocellulolytic enzymes could be discovered through bacterial genomic studies. Hence, this study aims to explore the potential of lignocellulolytic abilities of halophilic bacteria via genome analysis. A total of nine halophilic bacteria with lignocellulose degrading abilities were isolated from mangrove soil collected at Tanjung Piai, Johor. These bacterial strains were then identified as *Idiomarina* sp. CL8 and CL9, *Pseudoalteromonas* sp. CL13, *Halobacillus* sp. CL17, *Marinobacter* sp. CL18, *Nitratireductor* sp. CL26, *Thalassospira* sp. CL29, Bacillus sp. CL31 and CL32 via 16S rRNA gene analysis. Based on genomic data analyses of closer species to *Halobacillus* sp. CL17, *Nitratireductor* sp. CL26 and *Thalassospira* sp. CL29, the results revealed the presence of 184, 107 and 113 carbohydrate active enzymes respectively, in the bacterial genome. These carbohydrate active enzymes could be further explored for their potential in lignocellulose degradation.

Keywords: Halophilic bacteria; lignocellulolytic enzymes; genomics

SPEAKER YR 2.5
Sye Jinn Chen
Universiti Teknologi Malaysia

Characterization of Lignocellulolytic Bacteria from Oil Palm Residues

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In this study, eight bacterial strains have been isolated from oil palm residues collected from Kulai, Johor. Strains CK18 and CK37 which showed positive degradation on carboxymethylcellulose were selected for further characterization and subsequently identified as *Enterobacter* sp. and *Bacillus* sp. based on 16S rRNA gene sequence analysis. Strain CK18 is Gram negative, rod shaped, grew at optimum temperature of 37°C and pH 7.0. Cells are non-fermentative, positive for arginine dihydrolase, urease, acetoin and gelatinase production, able to reduce nitrate, hydrolyse aesculin and able to utilize glucose, N-acetyl-glucosamine, maltose, gluconate and malate as carbon sources. Strain CK37 is Gram positive, rod shaped, grew optimally at 37°C and pH 7.0. Cells are non-fermentative, positive for Beta-galactosidase, urease, acetoin and gelatinase production, able to hydrolyse aesculin and *p*-nitrophenyl-β*D*-galactopyranoside and able to utilize glucose, arabinose, mannose, mannitol, N-acetyl-glucosamine, malate and citrate as carbon source. Antibiotic resistance was exhibited by *Enterobacter* sp. CK18 and *Bacillus* sp. CK37 to Lindomycin, Penicillin, Polymycin, Tetracycline, Ampicilin, Kanamycin and Chloromphenicol. Preliminary characterization of endoglucanase and exoglucanase produced by *Enterobacter* sp. CK18 and *Bacillus* sp. CK37 was performed. The optimal temperature and pH of crude endoglucanase activity for strain CK18 and CK37 were 50°C, pH 4.0 and 60°C, pH 8.0 respectively. For crude exoglucanase activity, the optimal temperature and pH exhibited by strains CK18 and CK37 were 50°C, pH 6.0 and 37°C, pH 5.0 respectively. The endoglucanase and exoglucanase from both CK18 and CK37 could be potentially used in bioconversion of lignocellulosic biomass for bioenergy production.

Keywords: *Enterobacter*, *Bacillus*, Oil Palm Residues, Lignocellulose Degradation

SPEAKER YR 2.6

Mazlina Mohd Ariffin
Universiti Teknologi Malaysia

Optimisation of Caseinolytic Enzymes Production from Isolated *Bacillus cereus* 13BN

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Stressful era of modernisation nowadays has been responsible for various cardiovascular diseases (CVD's) such as acute myocardial infarctions, ischemic heart diseases and high blood pressure which leading as the causes of death worldwide. Deposition of blood clots in blood vessels causes thrombosis which is one major and widely occurring CVD's. One of the major pharmaceutical applications of microbial proteolytic proteases is in the treatment of thrombosis. Previously, a proteolytic enzyme producer from one of Malaysian fermented food - *belacan* was successfully isolated and named as *Bacillus cereus* 13 BN. This proteolytic enzyme is systemic enzyme and functionally involved in dissolving the excess fibrin of the blood clots and belong to serine protease family. Considering the potential of this enzyme as an alternative of commercially available anticoagulant, the main focus of this study is to determine the best condition for *B. cereus* 13 BN's enzyme production by using several factors in promoting the production of *B. cereus* 13 BN's extracellular proteolytic enzyme. One of the factors tested is the effects of utilising different carbon sources such as lactose, maltose, galactose, glucose and glycerol in the enzyme's production, as well as the influence of different incubation periods.

Keywords: Proteolytic, *Bacillus cereus* 13BN, carbon sources, incubation period

SPEAKER YR 2.7
Fariha Ibrahim
University of Karachi

Combinatorial Strategy: A Valuable Approach for Enhanced Production of Bacteriocin Produced by *Lactobacillus plantarum* against Food Borne Pathogens

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Food spoilage and food borne pathogens are the major problem despite modern advances in technology. Food borne pathogens cause serious safety and quality issues in different food industries and due to this enhancement of economic losses, food preservation remains a debated issue. In recent years, the demand for natural food additives and preservatives has extensively increased. Food product without addition of chemical preservatives are more attracted by consumers due to their health benefits. One of the alternatives to this issue is bacteriocin. Utilization of bacteriocins produced by lactic acid bacteria (LAB) has received great attention as a natural food preservative due to their GRAS (generally regarded as safe) status as well as their potential therapeutic approach. In the present study, *Lactobacillus plantarum* KIBGE-IB45 was indigenously isolated from cheddar cheese and screened for anti-*Listeria monocytogenes* activity. Current study is an effort for the enhanced production of bacteriocin using combinative approach with the plausible applications of bacteriocin in food industries. To obtain maximum bacteriocin yield, different production parameters were optimized and maximum bacteriocin production was achieved at 32.5°C with initial pH-8.0 of MRS medium after 20 hours of incubation. Bacteriocin was partially purified using gradient precipitation method. Mode of action and antibacterial spectrum of bacteriocin revealed that this bacteriocin has a potential to control and inhibit food-borne and multidrug resistant pathogens. Therefore, it can be used as a bio-preservative and as an alternative therapeutic agent in food and pharmaceutical industries.

Keywords: Bacteriocin; Natural antimicrobial; *Listeria monocytogenes*, Bio-preservative

SPEAKER YR 3.1

Mohamed Roslan Mohamad Ikubar
Universiti Teknologi Malaysia

Oil Palm Frond Petiole for Enzyme Production: Deinking Potential and Environmental Impact

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The Malaysian palm oil industry generates 56 million tonnes of oil palm frond (OPF) waste every year from pruning and replanting activities. At present, leaflets and stems of the fronds are re-used for soil nutrient recycling, while excess petiole are usually burned. Frond petiole has high composition of lignocellulose fiber and its juice is naturally rich in fermentable sugars. Solid state fermentation (SSF) of OPF petiole using different *Aspergillus* and *Trichoderma* sp. generated crude lignocellulolytic mixture high in xylanase (6-109IU/g), ligninase (20-222IU/g) and low in cellulase (3-12IU/g). The SSF of OPF petiole produced high xylanase lignocellulolytic cocktail which can be used for pulp and paper bleaching/deinking process. The remaining OPF petiole residue can be re-used for further enzyme production with addition of fresh medium and this indicated to an increase of xylanase and cellulase production by 26-60%. However, this process is increasing the yield of enzyme without amplifying to benefit to the environmental sustainability. The life cycle analysis of the lab scale processes indicated that the repeated cycle of fermentation strategy is giving adverse environmental impact mainly on climate change, fossil depletion, water depletion and human toxicity. Overall, this study has demonstrated the successful utilization and application of frond petiole for enzyme production, besides generating basic data useful for the improvement of up-scaling process to benefit both production and sustainability.

Keywords: Oil palm frond; Solid state fermentation; *Aspergillus* sp; *Trichoderma* sp; Lignocellulolytic enzymes

SPEAKER YR 3.2
Audu Jemilatu Omuwa
Universiti Teknologi Malaysia

Enrichment of Biohydrogen-producing Microflora from Anaerobic Digested Sludge using Palm Oil Mill Effluent

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The preparation of biohydrogen-producing seeds is paramount for the efficient production of biohydrogen from various substrates using mixed culture. In this study, inoculum seed for biohydrogen production was enriched using the microflora isolated from palm oil mill effluent (POME) anaerobic digested sludge. The sludge was first heat-treated at 90°C for 60 minutes. The heat-treated sludge was then subjected to acclimatization to 10, 30, 60, and 100% POME respectively in a 2.5-L bioreactor operated under mesophilic condition of 30°C. Fed-batch system of cultivation was employed with pH maintained at 5.5. Results showed that biohydrogen generation decreased gradually with the increase in POME concentration. Biohydrogen content was above 20% throughout the acclimatization stage, with 39% as the highest hydrogen obtained at when 10% POME was added. Cumulative volumetric biohydrogen production rate was 592.25 mL/h. Sugar consumption was 93% and 74% in with addition 10% and 100% POME concentration, respectively. In conclusion, biohydrogen-producing microflora has successfully been enriched and acclimatized to POME as substrate, with no methane production throughout the acclimatization process.

Keywords: Palm oil mill effluent, Biohydrogen, Anaerobic digested sludge, Microflora, Acclimatization

SPEAKER YR 3.3

Ahmed Ibrahim Galadima
Universiti Teknologi Malaysia

Optimization of Ferulic Acid Recovery from Lemongrass Leave Hydrolysate Using Central Composite Design

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Optimization towards ferulic acid recovery with lemongrass leaves hydrolysate was performed using Central Composite Design. The optimization of the lignocellulose pre-treatment using liquid hot-water was thoroughly explored and the ferulic acid recovery was grossly affected by the collaborative effects of sodium bisulfite, quantity of lemongrass leaves, temperature and time, and the ferulic acid released was best obtained at (0.5 g), 8 % dry weight, 100 °C and 60 min. respectively. After all, a substantial modification from the main lignocellulosic contents were observed, which enhanced the cellulose content by 39 %, but decreased the contents of extractives, hemicellulose and lignin to 23 %, 29 % and 46 % respectively. This had established the efficiency of the liquid hot-water water pre-treatment method coupled with the use of sodium bisulfite in altering the rigid structure of the lemongrass lignocellulose via upsurging the cellulose digestion, thus facilitates the disruption of the lignin-wall that provided the total loss of the lignocellulose structure. The pre-treatment method clearly revealed that the lignin, which functions as the protective layer to the lignocellulose structure, became loose thereby rendered the cellulose accessible and hence aided its improvement. The research provides a bottom-up method towards reducing the quantity of Lignocellulosic wastes from the environments through production of valuable products. The Design Expert Software has ultimately shown that all the optimization model terms were statistically fit and significant and could be utilized appropriately towards process optimization.

Keywords: Central Composite Design, Lemongrass Leaves, Liquid-hot water, Optimization, Pre-treatment

SPEAKER YR 3.4

Vivian Sien Shi Ting
Universiti Malaysia Sabah

Bioactive Sesquiterpenoids From Bornean Red Algae and Liverwort

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Seaweed genus *Laurencia* and liverwort genus *Gottschelia* have intracellular oil bodies that are bound by single unit membrane. It has been known as a site for the sequestration of sesquiterpene-type secondary metabolites. Significant number of these compounds has been shown to have chemotaxonomical and bioactive importance. As part of continuous effort, we isolated and identified three C_{15} acetogenins (1~3), two chamigrenes (4~5) and three clerodane (6~8) type secondary metabolites. Compounds 1~3 exhibited potent anti-inflammatory activities, while compounds 4 and 5 showed bactericidal activity against seaweed pathogens and human pathogenic bacteria. While compounds 6 and 7 showed mild anticancer activity against MCF-7 cell lines. Compounds from both the investigated red algae and liverwort exhibited potent bioactive activities and could be suggested as lead metabolites for future pharmaceutical studies.

Keywords: Seaweed, Liverwort, Sesquiterpenoids

SPEAKER YR 3.5
Monaliza Mohd Din
Universiti Teknologi Malaysia

Potential Risks of Harmful Algal Blooms in Response to Eutrophication in the Aquaculture Area West Johor Straits

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A study was undertaken to investigate the influence of eutrophication pressure on the diversity and distribution of potential harmful phytoplankton in the aquaculture area of West Johor Straits from October 2016 to December 2017. This area is known for the finfish and green mussel cage aquaculture which serve one of source livelihood. In this study, a total of 32 phytoplankton genera were recorded; 23 belong to the diatoms, and 9 genera were dinoflagellates. Several bloom-forming dinoflagellates that cause paralytic shellfish poisoning such as *Alexandrium* spp. and diarrhetic shellfish toxin-producing genus, *Dinophysis* spp, was found occasionally. Harmful diatoms such as *Pseudo-nitzchia* spp. that associated with Amnesic Shellfish Poisoning (ASP) and *Chaetocerus* spp. (responsible for fish kill) were also encountered in the water samples. Strong linear relationship (r2 = 0.80) was observed between the cell density and concentration of phosphate-phosphorus. Relationship between cell density and nitrate- nitrogen was poor (r2 = 0.51). The study showed that increasing in nutrient concentrations resulted in the increasing of phytoplankton diversity. This study suggests that the diversity and distribution of potential harmful phytoplankton were influenced by the nutrient dynamic in the area and should be taken seriously by the respective authorities in future expansion of aquaculture industry in the straits.

Keywords: Harmful Algal Bloom, Eutrophication, West Johor Strait, Aquaculture

SPEAKER YR 3.6

Chin-Soon Phan
Universiti Malaysia Sabah

Soft Coral-derived Secondary Metabolites against Adult T-Cell Leukemia

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Adult T-cell leukemia is an aggressive malignant caused by the human T-cell lymphotropic virus type I, which endemic in regions such as Japan, South American, the Caribbean Basin, West-Central Africa, Northern Iran, Southern India and other isolated tropical areas. In 2010, this disease is considered incurable. After six years, treatment of this disease remains a challenge. Therefore, searching for bioactive substances against adult T-cell leukemia cells is essential. Several secondary metabolites isolated from Bornean soft coral *Xenia* sp. including one new xenicane diterpenoid, 15-deoxy-isoxeniolide-A (**1**) along with four known compounds 9-deoxy-isoxeniolide-A (**2**), isoxeniolide-A (**3**), xeniolide-A (**4**) and coraxeniolide-B (**5**) displayed cytotoxic activities against adult T-cell leukemia, S1T cells. One of these compounds showed strong activity and might develop into new cytotoxic agent against adult T-cell leukemia.

Keywords: Soft coral; Alcyonacea; Terpene; Adult T-cell leukemia; S1T

SPEAKER YR 4.1
Siti Huzaimah Ribut
Universiti Putra Malaysia

Structural, Optical and Antibacterial Activity of Low Cost and Biogenic Zinc Oxide Nanoparticles (ZnONPs)

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In wastewater treatment, chemical disinfection such as chlorination can react with various components in natural water leading to the by-product formation that potentially hazardous to the environment which could be adversely affect human health. Metal oxide nanoparticles can be one of the alternatives to improve the wastewater treatment since it is not a strong oxidant and partly neutral to water. To minimize the use of chemicals and by-product formation in wastewater treatment, the use of plant extract in the synthesis of nanoparticles can be a green synthesis method, cost effective, renewable and eco-friendly approach. Therefore, this research goal is to prepare the biogenic ZnONPs by using *Citrus hystrix* plants under different concentration. The best growth condition will be determined based on structural and optical properties of biogenic ZnONPs produced. In term of application, biogenic ZnNONPs shows attractive antimicrobial properties over bacteria contaminants in wastewater. Hence, *in vitro* antibacterial activity of biogenic ZnONPs will later be evaluated using the ZnONPs produced. The expected outcome from this research is to provide a new production of ZnONPs based on green synthesis technique as plant can act as reducing agent to improve the ZnO structural properties.

Keywords: Biogenic ZnONPs; Green Synthesis; Structural; Optical; Antibacterial

SPEAKER YR 4.2
Khalida Rahayu Zainon
Universiti Putra Malaysia

Nanomaterials Enhanced siRNA Delivery System for Treatment of Human Lung Carcinoma

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Gene therapy becomes a new approach in targeting cancer cells and in the same way to eliminate the limitations possessed by conventional drug delivery system. The systemic toxicity of chemotherapy regimens often results in various side effects and increased risk of developing other types of cancer in long term. Small interfering RNAs (siRNA) are introduced into the cancer cell to induce gene silencing mechanism for targeted gene therapy. Current work focused on the use of biocompatible nanoparticles as safe delivery vehicles of genetic material and their efficiency in terms of intracellular delivery of siRNA. Magnetic nanoparticles (MNPs) possess an ability to package siRNA into nanoparticles for it to enter the cancerous cell membrane easily. Semiconductor quantum dots (CdSe-ZnS) functions as multi-colour biological probes which helps in monitoring siRNA delivery. The fluorescent nanoparticles QD able to track delivery of nucleic acid, sort cell by degree of transfection and purify homogenously silenced subpopulations. Both type of nanomaterials are made water soluble through amphiphilic polymer exchange process. Generation fourth of polydopamine (G_4) dendrimers are used as the surface coating of MNPs-siRNA complex. Dendrimers functions to further condense the complex which will lead in increased cellular uptake due to its small size and good biodistribution profile. The formulation is tested on 2 different cell lines; A549 human lung carcinoma and MRC5 human lung fibroblast. MTT assays are conducted in order to determine the toxicity of the nanomaterials-siRNA formulations. The incorporation of SPIO nanoparticles and QD in the siRNA delivery will assist in enhancing gene silencing activity yet providing an efficient, multifunctional and nontoxic siRNA delivery agent for cancer therapy.

Keywords: Nanomaterials; siRNA; Magnetic Nanoparticles; Quantum Dots; Gene Therapy

SPEAKER YR 4.3
Emmellie Laura Albert
Universiti Putra Malaysia

The Studies of the Effects of Different Ratio of Magnetic Nanoparticle to the Conjugation with Graphene Oxide

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Graphene oxide (GO) is a wonder material receiving great attention owing to its outstanding properties. Present investigation centre on the conjugation of magnetic nanoparticle with GO by means of simple emulsion technique. GO specialty such as big surface ratio and magnetic nanoparticle superparamagnetic properties make the nanocomposite made of this material interesting for biomedical application. Appropriate adjustment to the ratio of magnetic nanoparticle to GO were investigated in order to know the best ratio of magnetic nanoparticle to be loaded onto GO for suitable application in biomedical field. The magnetic nanoparticle was varied to GO from 1:1, 1:2, and 1:3. The chemical interaction, nanocomposite crystallinity, surface morphology and magnetic behaviour of the nanocomposites were carefully assessed using several equipment such as Fourier transform infrared spectroscopy (FTIR), X-ray diffraction (XRD), Raman spectroscopy (RAMAN), Vibrating Sample Magnetization (VSM), and Atomic force microscopy (AFM). The magnetic nanoparticle synthesized by co-precipitation method were confirmed to be Iron (III) oxide (IO). The magnetic nanoparticle conjugated with GO are superparamagnetic with maximum magnetic saturation at ratio of GO to IO at 1:2.

Keywords: Magnetic; Graphene Oxide; Magnetite Nanoparticle

SPEAKER YR 4.4
Natrah Shafiqah Rosli
Universiti Putra Malaysia

Nano-Titania Obtained from Natural Ilmenite for Photocatalytic and Antibacterial Properties

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Undoped TiO_2 nanoparticles (AL) and doped TiO_2 nanoparticles with recycled graphite (AGD) have been successfully synthesized by the Alkaline Fusion method using synthetic rutile. In this work, the synthetic rutile was derived from natural Malaysian Ilmenite's waste to produce low cost of TiO_2 nanoparticles by environmentally friendly process. In terms of their potential applications, the effectiveness of each sample in photocatalytic activities and antibacterial properties was investigated by degradation of cigarette smoke and inhibition zone of the bacteria *Escherichia coli* respectively. The result showed modified sample with graphite doped able to degrade the smoke faster than pure TiO_2 nanoparticles when exposed to the visible light region and capable to kill the bacteria. In this regard, recycled graphite was chosen as a one of the doping materials in order to modify the energy band gap of TiO_2 nanoparticles. The energy band gap of modified TiO_2 nanoparticles decreases to 2.90 eV compared with the commercial, 3.06 eV. These results conclude that the lower energy band gap can increase the photocatalytic properties of TiO_2 nanoparticles.

Keywords: Titanium Dioxide; Titania Nanoparticles; Synthetic Rutile; Nanoparticles; Nanobiotechnology

SPEAKER YR 4.5
Muhammad Amir Faiz Bin Mohd Shaifuddin
Universiti Putra Malaysia

Metal Free Catalyst Carbon Nanotubes (CNTs) From Tea Waste Doped with ZnO Nanoparticles (ZnONPs)

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Carbon nanotubes (CNTs) possess high potential to be used in drug delivery system. Unique properties of CNTs such as the porosity of it can be exploited to act as matrix host. Furthermore, the usage of CNTs gained interest as their capacity to interact to macromolecules such as proteins and DNA. Despite the comprehensively demonstrated the use of CNTs, banter about incorporates the understanding credited to CNTs toxicity data. The toxicity related to properties of the CNTs which also include the method of synthesis the CNTs by using metal catalyst. Conventional technique of synthesizing carbon nanotubes (CNTs) use transition metal as catalyst. The catalyst residue remained in the grown CNT scan caused high toxicity and decreasing in cell viability. The advantage of this research is the usage of green catalyst which in purpose to get rid the toxicity. Unlike conventional which taking methane as precursor for carbon source, this research put tea waste into the spotlight to replace methane as carbon source. Previous research on tea waste has concluded the hydrocarbon presents is between light and heavy petroleum products. Pyrolysis is the chosen method on tea waste to obtain the carbon source. The synthesis of CNTs will be done by using chemical vapor deposition (CVD) method. The antibacterial activity of ZnO nanoparticles (ZnONPs) was said depends on the microstructural properties which affected by the pH of solution. Sol gel assisted hydrothermal method gained interest recently and was chosen to produce ZnONPs which later will be doped with CNTs.

Keywords: Carbon nanotubes; Chemical vapor deposition; Tea waste; Non-metal catalyst

SPEAKER YR 4.6
Chin-Wei Chang
National Tsing Hua University, Hsinchu, Taiwan

Development and Application of a New Cre/loxP-based Long-Term Gene Expression System in Single Recombinant Baculovirus

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Cre/loxP-based Baculovirus (BV) system is a binary gene delivery system which enables long-term transgene expression. It requires the delivery of two Baculoviruses, one carrying the transgene cassette flanked by loxP and the other expressing Cre recombinase. Inside a target cell, a transgene cassette is excised by the Cre recombinase, which recircularizes to form an episomal DNA minicircle. Developing a single BV system containing two cassettes may greatly benefit future applications. However, the leakage of *cre* may cause enormous loss of transgene in general BV production process. To stringently block Cre expression during the production of such single BV, we exploited the intron splicing mechanism in combination with specific microRNA to temporally control Cre expression. We tested 5 different introns, each of which was inserted into the *cre* open reading frame (ORF) and the best intron that successfully limited Cre expression in both *E. coli* and insect cell was chosen. To further downregulate Cre expression level, the insect specific microRNA *bantam* complementary sequence was inserted into the 3' untranslated region (UTR) of *cre*. These strategies altogether reduced approximately 99.4% of the mature *cre* mRNA level in the insect cell comparing with the control group (BV with unmodified Cre expression cassette). This newly developed single Cre/loxP-based Baculovirus vector showed 90% transgene expression cassette in the second passage, and high recombinant efficiency in different types of mammalian cell was maintained.

Keywords: Cre/loxP recombination; Baculovirus; DNA minicircle; prolonged expression; gene regulation

SPEAKER YR 5.1
Nur Syafiqah Muhammed
Universiti Teknologi Malaysia

Molecular Cloning, Preliminary Expression and Bioinformatic Analysis of an Extracellular Subtilisin-Like Serine Protease from Acinetobacter baumannii TU04

Nur Syafiqah Muhammed[a], Nurulfarhana Hussin[a], Lim Aik Siang[a], Nurriza Ab. Latif[a], Zaharah Ibrahim[a], Shaza Eva Mohamad[b] and Haryati Jamaluddin[a]

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Extracellular proteases have been implicated as one of the virulence factors that contributed to the *Acinetobacter baumannii* pathogenicity. However, studies on the functional and structural characteristics of *A. baumannii* proteases are limited. In this study, we successfully isolated and cloned a gene corresponding for an extracellular subtilisin–like serine protease (SPSFQ) from *A. baumanni*. The cloned gene sequence for SPSFQ encoded for 414 amino acid residues comprising of two domains; inhibitor I9 (amino acids 49-121) and peptidase S8 (amino acids 152-395) domain with expected molecular weight size of 43 kDa. Expression studies of recombinant SPSFQ at 37°C showed that recombinant SPSFQ had undergone auto-proteolysis to remove the N-terminal inhibitor I9 domain and was thus expressed as a mature catalytically active enzyme at an estimated molecular weight of 30 kDa as observed on SDS-PAGE and western blot. Preliminary enzymatic analysis showed that mature SPSFQ was able to digest skim milk and casein. Sequence analysis of recombinant SPSFQ showed that it has 61% sequence identity to a thermophilic keratinase from *Meiothermus taiwanensis* (MtaKer) (PDB: 5WSL). Primary sequences analysis of SPSFQ was also predicted to contain two disulphide bonds at positions Cys160-Cys256 and Cys192-Cys287as well as two calcium ions binding sites identical to MtaKer. Further characterization of SPSFQ will provide insights information into the proteases associated factors that contribute to *A. baumannii* pathogenicity and it is hope that data from our work can be extended to research leading to the design of new antibiotic or antivirulence drugs targeting *Acinetobacter baumannii* proteases.

Keywords: *Acinetobacter baumannii*; Extracellular protease; heterologous expression; Bioinformatics; Proteolytic activity

SPEAKER YR 5.2
Uchenna R. Ezeilo
Universiti Teknologi Malaysia

Moisture Content and Temperature Optimization of Cellulase and Xylanase Production by Newly Isolated *Trichoderma asperellum* UC1 using Raw Oil Palm Frond Leaves as Substrate in Solid State Fermentation

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The major bottleneck in the enzymatic saccharification of lignocellulosic biomass for ethanol production is the cost of cellulase and xylanase enzymes. The cost of producing them can be reduced by various multi-faceted approaches which includes the use of low cost and abundant lignocellulosic substrate for their production through efficient fermentation strategies such as solid-state fermentation (SSF). In this study, the production of cellulase and xylanase by a newly isolated ascomycetes fungi *Trichoderma asperellum* UC1, using raw oil palm frond leaves (OPFL) as the growth substrate under SSF was investigated. Vital SSF process parameters, namely moisture content and temperature were optimized for maximal enzyme yield using the method of one variable at a time (OVAT). High initial moisture content of the OPFL medium had a positive effect on cellulase and xylanase production, whereas the incubation temperature influenced the enzyme production in the range tested. The optimal moisture content and incubation temperature were recorded at 90% and 30° C respectively and a combination of these two at an initial pH of 5 and an inoculum size of 2.0×10^8 spores/g gave rise to maximal CMCase, FPase, β-glucosidase and xylanase activities of 133.87 U/g, 13.3 U/g, 132.95 U/g and 181.80 U/g respectively. These results suggest that raw OPFL may hold great potential as a cheap alternative substrate for commercial production of the carbohydrate hydrolysis enzymes, cellulase and xylanase, by *Trichoderma asperellum* UC1 under SSF.

Keywords: Temperature optimization; oil palm frond; moisture content optimization; solid state fermentation; fungal enzymes

SPEAKER YR 5.3
Nor Syafirah Zambry
Universiti Sains Malaysia

Bioprocessing Influences Lipopeptide Biosurfactant Production in *Streptomyces* sp. PBD-410L

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Biosurfactant is a biologically-derived surfactant, produced by a heterogeneous group of living cells. The most reported biosurfactant producers are of bacterial origin, some of which contribute towards potential pathogenicity. Alternatively, *Streptomyces* sp. can be an appropriate candidate for a safer and an industrially viable host for the production of biosurfactants due to their non-pathogenicity to human. The present study aims to enhance biosurfactant production by *Streptomyces* sp. PBD-410L through the manipulation of bioprocessing parameters, namely dissolved oxygen tension, temperature and C/N ratio in a stirred-tank benchtop bioreactor cultivation. Results show that highest biomass growth was achieved at 9.1±0.6 g/L when dissolved oxygen of the culture was left uncontrolled throughout fermentation period, at an agitation speed of 200 rpm and the temperature controlled at 28 °C. The broth sample from this culture gave a clearing diameter of 55 mm in oil spreading technique (OST) and an emulsification activity (E_{24}) of 63.3 %. Further increase of OST (70.3± 0.6 mm) and E_{24} (70 %) were observed when this filamentous bacterium was cultivated at a temperature of 37 °C. Alteration of the C/N ratio in the culture medium from 23.33 (3 % v/v palm oil, 2 g/L potassium nitrate) to 20 (1.6 % v/v palm oil, 4 g/L potassium nitrate) enhanced biosurfactant productivity, giving OST from 3.9 to 5.6 mm/day and E_{24} from 5.9 to 8.2 %/day. These results demonstrate the significance of the bioprocessing strategies in enhancing the biosurfactant production from a filamentous bacterial host.

Keywords: *Streptomyces* sp.; lipopeptide biosurfactant; temperature; dissolved-oxygen; C/N ratio

SPEAKER YR 5.4
Nur Husna Haron Narashid
Universiti Teknologi Malaysia

Microbial Profiling of Chicken Viscera for Development of Microbial Cocktail for the Production of Flavour

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The continuous growth of poultry industry in Malaysia has resulted in a significant increase of waste by-product generation that has could potentially be used as renewable resource for the production of value-added products. However, these wastes were not efficiently utilized due to the lack of innovation and scientific research. Thus, this research focused in utilizing indigenous proteolytic bacteria from chicken viscera to produce flavour for cat food palatant production. Twenty nine pure bacteria strains were isolated where only three potential proteolytic strains coded as H1, L4 and L6 were selected for further investigation based on their halozone formation and protease activities. Six different microbial cocktails were tested at three various temperatures while the initial pH and total fermentation hour remained constant in order to optimize protein production. The highest protein concentration was discovered in a product that incorporated cocktail H1+L6 (12.025 mg/mL). Amino acid analysis was carried out to determine whether those with the highest protein concentration also produced the highest amount of cysteine and methionine which served as the essential precursors of the chicken flavour. Product from cocktail H1+L6 produced an extraordinarily high amount of methionine (29.130 mg/mL). The highest production of cysteine (1.760 mg/mL) was seen in the product the incorporated L4 alone.

Keywords: Chicken viscera; proteolytes; cysteine; methionine; flavour production

SPEAKER YR 5.5
Izzah Afifah Noh
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Antioxidant Properties of Crude Extract and Compounds from the Stem Bark of *Calophyllum ferrugineum* and *Calophyllum andersonii*

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Numerous species from *Calophyllum* have been discovered containing bioactive compounds that act as antioxidant, anticancer, antimicrobial and anti-HIV agent. The least exposure of *Calophyllum* genus in Sarawak especially on *Calophyllum ferrugineum* and *Calophyllum andersonii* has led to this study. The stem barks for both species were extracted with hexane and methanol. The antioxidant activity of the crude extracts and compounds were evaluated using 2,2-diphenyl-1-picrylhydrazyl (DPPH) free radical scavenging activity assay. *C. ferrugineum* methanol extract showed stronger antioxidant activity with an IC_{50} value of 35 µg/mL compared to hexane extract with an IC_{50} value of 96 µg/mL. However, *C. andersonii* showed weaker antioxidant activity for both hexane and methanol crude extract with IC_{50} values of 67 and 58 µg/mL, respectively. The standards used for this study were ascorbic acid and quercetin with IC_{50} values of 15 and 17 µg/mL, respectively. The compounds from both species were friedelin, lupeol, isocalanone and thwaitesixanthone were also tested on the antioxidant activity with IC_{50} values of 176, 98, 28, 41 µg/mL, respectively. The IC_{50} data obtained from *Calophyllum ferrugineum* and *Calophyllum andersonii* showed these species to have significant antioxidant potential that can be candidate for future antioxidant agent.

Keywords: *Calophyllum ferrugineum*, *Calophyllum andersonii*, DPPH assay

SPEAKER YR 5.6
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Two Stage Study of Mesophilic Methane Production from Sago Mill Effluent Using Mixed Microbial Consortia in an anaerobic sequencing batch reactor (ASBR)

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This study attempted to produce methane from effluents using hydrogen reactor treating sago mill effluent in a two-stage anaerobic digestion system. The production was carried out under mesophilic condition (37 °C) in an anaerobic sequencing batch reactor (ASBR). The experiment was performed at various hydraulic retention times (HRTs) of 12 to 1.5 days in corresponding to organic loading rate (OLR) of 1.47 to 9.44 kg COD/m^3.d, respectively. The performance of methane and organic matter degradation was also evaluated. The results showed that during two stage anaerobic digestion, maximum methane production rate and yield obtained was having an HRT of 2 days at 1.588 L CH_4/L $_{ww}$. d and 0.3963 L CH_4/g COD $_{removed}$ respectively. The ASBR reactors performed well in producing methane with maximum COD removal of 85% at HRT 4 days. Overall, the results of this study demonstrated the feasibility of producing methane from hydrogenic effluent using two stage anaerobic digestion system.

Keywords: Metroxylon sago; Hydrogen effluent; Anaerobic digestion

SPEAKER YR 5.7
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Saccharification of Plant Biomass Waste: An Economical Approach to Produce Xylanase and Xylose

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Plant biomass waste causes environmental pollution if it is not properly disposed-off. The use of plant biomass waste as a substrate to produce value added products is considered as an important strategy that could minimize the environmental effect and can also have cost effective impact on industrial enzyme biosynthesis. Industrial enzymes, particularly xylanases of microbial origin, have more demand for their applications in vast biotechnological processes including paper and pulp, food and animal feed industries. Xylanases are also used for bioconversion of plant biomass waste matrices into valuable chemical products. Xylanases are hydrolase that effectively catalyses β-1,4 linkages of xylan into xylose monomers. Microbes mainly filamentous fungi are mostly considered as a promising candidate to produce xylanase. In this study different plant biomass waste were exploited under submerged fermentation to produce xylanase using *Aspergillus niger* KIBGE-IB36. Furthermore, these plants matrices were also utilized for the saccharification to produce xylose. Among all plant biomass waste high titre of xylanase production was observed in wheat bran (2%) as a sole carbon source. The partially purified xylanase was further used for the pre-treatment of plant biomass waste. The pre-treatment with xylanase revealed increasing pattern of reducing sugars at different intervals of time. Scanning electron microscopy (SEM) exposed profound structural change in the surface topology of plant biomass waste. Present study successfully develops a dual use of plant biomass waste that assists in the production of xylanase and xylose. Both commercially important metabolites have potential applications in food, pharmaceutical and chemical industries.

Keywords: *Aspergillus niger*; Xylanase; Plant biomass waste; xylose; Pre-treatment

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POSTER PRESENTER 001

Dr Lai Kok Song
Universiti Putra Malaysia

Identification and characterization of the vacuolar processing enzyme (vpe) gene family and its response to *Fusarium oxysporum* in banana

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Banana is world's fourth most important crop. However, panama disease, caused by soil borne fungus - *Fusarium oxysporum f. sp. cubense* (*Foc)* has been the major obstacle in banana industry. To date, effective solution for panama disease remain unavailable. Hence, better understanding of the molecular events during *Foc* infection is crucial for the developing protection strategies against panama disease. Therefore, this research was undertaken to study the molecular characteristic of *Musa acuminata* vacuolar processing enzyme (*Ma*VPE) – a cysteine proteinase that mediates programmed cell death during *Foc* Tropical Race 4 (*Foc*TR4) infection. We have successfully identified a total of 7 VPEs (*Ma*VPE1, *Ma*VPE2, *Ma*VPE3, *Ma*VPE4, *Ma*VPE5, *Ma*VPE6 and *Ma*VPE7) from the DH-Pahang (AA group) banana genome. Phylogenetic analysis showed that the deduced amino acids sequences of *Ma*VPEs have high similarity with VPEs from other plant species (*Nicotania tobacuum* and *Arabidopsis thaliana*). Subsequent, tissue specific analysis by semi-quantitative reverse transcription PCR revealed that these genes were differentially expressed in root, corm, pseudostem, leaf, fruit and flower tissues. To gain insight on the interactions between *Ma*VPE genes and FocTR4 infections, expression profiling by quantitative real time PCR were performed at 0, 24, 48 and 72 hours post inoculations (hpi) with *Foc*TR4. The results revealed that most of *Ma*VPE genes expression was induced after FocTR4 infection, specifically at 24 and 48 hpi. Consistently, caspase-1-like assay also showed an increase of enzyme activity after inoculation with *Foc*TR4. Our current results suggest that *Ma*VPEs play an important role in banana resistance towards *Foc*TR4.

Keywords: *Musa acuminata* (*M. acuminata*); *Fusarium oxysporum* f. sp. *cubense* (*Foc*); vacuolar processing enzyme (VPE); programmed cell death (PCD); panama disease

POSTER PRESENTER 002
Auni Aqilah Ahmad Tarmizi
Universiti Teknologi Malaysia

DNA barcoding and chemical evaluation for the authentication of selected Kacip Fatimah herbal medicinal products in Malaysia

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The demands for *Labisia pumila* (Kacip Fatimah) herbal medicinal products (HMPs) have extensively increased over the years due to its claimed therapeutic benefits to women's health. However, the efficacy and safety of such products are anonymous as they might be adulterated with other substances. In this study, DNA barcoding was used to detect adulterants in Kacip Fatimah HMPs. Sample leaves from 2 different varieties of *Labisia pumila; var. pumila* and var. *alata* were used and 11 different types of HMPs were selected. Genomic DNA extractions for both plant and HMPs were done using Nucleospin Plant II kit followed by PCR amplification using nuclear marker *ITS2*. The result showed only 3 products were successfully amplified. The sequencing results were analysed for species identification with reference to NCBI Genbank database. Comparison of Kacip Fatimah plant *ITS2* barcode with databases showed 85% to 95% of similarities with other genus such as *Embelia* sp., *Ardisia* sp., *Primula* sp, and *Lysimachia* sp. All 3products compared with reference barcodes showed identity of 81% for Product 1, 93% for Product 2, but no significant similarities found for Product 3. The phylogenetic tree analysis using Neighbour-Joining method showed 93% of highly significant between Product 1 and the plants, but less likely to be significant with the other two. The species-specific level identification was considerably low due to insufficient reference data of the *ITS2 Labisia pumila*. Therefore, it is recommended to develop a standard herbal barcode library with updated reference sequence data in the authentication of HMPs.

Keywords: DNA Barcoding; Labisia *pumila*; ITS2

POSTER PRESENTER 003

Dr Fauziah Abu Bakar
Quest International University, Malaysia

Engineering of expression construct harbouring *Carica papaya L. WRKY* gene

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Carica papaya is an economically important fruit in the world with outstanding nutritional and medicinal values. Its susceptibility to abiotic stress which affects the growth and harvest causes significant yield loss to farmers. As such, improving resistance to this stress is one of the primary goal in this project. In recent years, significant progress has been made to understand the genes that play critical roles in abiotic stress response, especially some transcription factor (TF) encoding genes. Among all TFs, WRKY TF gene family is one of the best-studied TFs involved in various stress responses. To date, only a small number of WRKY TFs have been functionally characterized in *C. papaya*. The aim of this study is to produce recombinant construct harbouring WRKY gene in pGEM-T Easy cloning vector, prior to insertion into pCAMBIA 1304 plant expression vector. The presence of 465 bp on agarose gel electrophoresis indicated that WRKY gene was successfully amplified from all treated samples. DNA sequencing analysis revealed that these treated samples are closely related to *Carica papaya* species with 95% similarity. Following transformation, 4 out of 5 colonies that were randomly selected showed the WRKY gene has been successfully inserted into pGEM-T Easy cloning vector. In future, the WRKY gene from pGEMT-*wrky* recombinant construct will be transferred into pCAMBIA 1304 plant expression vector for further study in plant. The success of demonstrating the WRKY gene towards the response in abiotic stress will enable us to engineer stress tolerant transgenic crops for sustained growth and productivity under unfavourable conditions.

Keywords: Recombinant construct; *Carica papaya*; abiotic stress; WRKY gene

POSTER PRESENTER 004

Dr Koh Soo Peng
Malaysian Agricultural Research and Development Institute

The role of *SCOBY* strains in improving functional bioactivities of fermented jackfruit beverages

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The desire to explore natural source from plant and fruit have attracted researcher focus to the development of bioingredient for maintaining good health. To date, jackfruit is known mainly for fresh consumption and its leaves still underutilized even though they were reported to have multiple pharmacological properties. In this study, our main aim was to explore the potential of functional health benefits of fermented jackfruit beverage produced using symbiotic culture of bacteria and yeast (SCOBY) through controlled biofermentation process. The SCOBY strains was selected from MARDI's Collection of Functional Food Culture (CFFC) and has GRAS (generally recognized as safe) status. It was noted that this fermented jackfruit matrices were more palatable and showed significant improvement in functional bioactivities than non-fermented jackfruit and were confirmed by the findings from in vitro study on tyrosinase, elastase and acetylcholinesterase (ACHE) inhibition assay. Higher inhibition of tyrosinase and elastase activity displayed by fermented jackfruit beverage (leave & pulp) demonstrated the potential usage as whitening and anti-ageing bioingredient. Besides, fermented jackfruit beverages were found to have >80% inhibition against acetylcholinesterase activity. The inhibition of acetylcholinesterase will delay the development of Alzheimer disease. This phenomenon showed that there is a potential of consuming fermented jackfruit beverage as a preventive measure to combat this degenerative disease that have affecting aging populace.

Keywords: Elastase; tyrosinase; acetylcholinesterase; jackfruit; fermentation

POSTER PRESENTER 005

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Pai Chai University, South Korea

Screening of essential oil toxicity against entomopathogenic fungus *Beauveria bassiana*

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Entomopathogenic fungus such as *Beauveria bassiana* and plant essential oils (EOs) have the potential to be used as alternative insecticides and acaricides. Synergy effect will be expected against pests if the fungus and EOs are combined together. Ironically, EOs have strong antifungal activity. To select non-toxic concentration for *B. bassiana*, EO concentrations ranging 0.8%~0.05% were used to evaluate germination, sporulation and vegetative growth rates of the fungus. Among fifteen EOs, four EOs (*Thymus vulgaris*, *Pimento racemose*, *Syzygium aromaticum*, *Cinnamomum zeylanicum*) were highly toxic (100% growth inhibition) at all concentrations tested against the fungus. Although five EOs (*Lavandula angustifolia*, *Rosmarinus officinalis*, *Pelargonium roseum*, *Melaleuca alternifolia*, *Mentha spicata*) tested at concentration of 0.8% killed the fungus with 100% growth inhibition, their toxicities tested at concentration of 0.05% were reduced the growth inhibition rate of 4.9%, 0%, 37.0%, 13.6% and 18.5%, respectively. On the other hand, three EOs (*Eucalyptus globulus*, *Brassica nigra*, *Helianthus annuus*) at concentration of 0.8% showed the mild growth inhibition (12.3%, 8.6%, 12.3%) when compared with non-treated control. In addition, *E. globulus*, *B. nigra*, *H. annuus* were non-toxic for the fungus in concentrations less than 0.2%, 0.4% and 0.4%, respectively. Based on the results of the toxicity assays against *B. bassiana*, the combination of *B. bassiana* + *E. globulus* at 0.2%, *B. bassiana* + *B. nigra* at 0.4% or *B. bassiana* + *H. annuus* at 0.4% might be used for controlling arthropod pests.

Keywords: Entomopathogenic fungus; *Beauveria bassiana*; essential oils (EOs); synergy effect; non-toxic concentration

POSTER PRESENTER 006

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Isolation of a new disease fungi from kuini

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Mangifera odorata is a species of plant in the family Anacardiaceae. It is one of a highly demanding fruit in Malaysia. Due to that, a **study has been conducted to identify the pathogens towards this plant.** The fruits of *M. odorata* were collected from MARDI Sintok Station. The part of the fruits that has blemish spot was surface sterilized and cut into pieces before putting onto potato dextrose agar (PDA) plate. After 7 days of incubation, the emerging fungi was chosen and subcultured on a fresh new PDA. The fungi was then subjected to molecular identification using ITS sequence. Result, from the identification, showed that the fungi isolated was *Neofussicoccum* sp. a member from the family of Botryosphaeriaceae. *Neofussicoccum* sp was known to cause stem canker disease to red flesh dragon fruits in Malaysia. However, there is no other report of this fungi on *M. ordorata* and this report may serve as a first report on such case. Action must be taken to ensure the infection of *Neofussicoccum* sp. on *M. ordorata* was minimized if not eradicated.

Keywords: *Neofusicoccum* sp.; *Neoscytalidium* sp.; Kuini; ITS

POSTER PRESENTER 007

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Antioxidant enzyme activities and secondary metabolite profiling of oil palm seedlings treated with combination of NPK fertilizers infected

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Oil palm (*Elaeis guineensis* Jacq) is one of major sources of edible oil. Reducing the effect of *Ganoderma,* main cause of basal stem rot (BSR) on oil palm, is the main propose of this study. Understanding the oil palm defence mechanism against *Ganoderma* infection through monitoring changes in the secondary metabolite compounds levels before/after infection by *Ganoderma* under different fertilizing treatment is required. Oil palm requires macro- and micro-elements for growth and yield. Manipulating the nutrient for oil palm is a method to control the disease. The 3-4 month olds oil palm seedlings were given different macronutrient treatments to evaluate induction of defense related enzymes and production of secondary metabolite compounds in response to *G. boninense* inoculation. The observed trend of changes in the infected and uninfected was a slightly higher activity for β-1,3-glucanases, chitinase, peroxidase and phenylalanine ammonia-lyase during the process of pathogenesis. It was found that PR proteins gave positive response from the interaction between oil palm seedlings and *Ganoderma* infection. Although the responses were activated systematically but they were short-lasting as the changes in enzymes activities appeared before the occurrence of visible symptoms. Effect of different nutrients doses obviously observed among the results of the secondary metabolite compounds. Many identified/unidentified metabolite compounds were presented in which some involved in plant cell defence mechanism against pathogens; mostly belong to alkaloids with bitter-tasting nitrogenous-compounds, and some with the potential to be used as new markers to detect basal stem rot at the initial step of disease.

Keywords: Secondary metabolite compounds; Oil palm; *Ganoderma boninense*; antioxidant enzyme activities; NPK fertilization

POSTER PRESENTER 008

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Isolation and characterization of *Lactobacillus* bacteria from deer farm in Bintulu, Sarawak

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The complex soil biodiversity that home several thousand organisms plays an important role in supporting the enormous ecosystem by affecting soil fertility, plant productivity and human health. However, the microbial diversity distribution is still poorly understood. The aim of this study was to isolate and characterize *Lactobacillus* bacterial communities in a deer farm in Bintulu, Sarawak. A total of100 *Lactobacillus* bacteria isolates from 10 samples were obtained from the deer farm. The bacteria present in the soil were pre-cultured and plated in duplicates on nutrient agar and de Man Rogosa Sharpe agar plates. All plates were incubated at 37 ± 1 °C for 24 to 48 hours under anaerobic conditions. Biochemical tests and genotypic characterization were conducted to identify the bacteria from the soil samples. Result showed a total mean bacteria colony count ranging from 2.1×10^7 to 5.2×10^8 cfu/ml of which, 71.35% were Gram negatives and 28.65% Gram positives. Only 0.94% of the bacteria isolates were identified as *Lactobacillus* spp. The diversity and richness of soil bacterial communities in different types of ecosystem could largely be explained by soil pH. Bacterial diversity was highest in neutral soils and lower in acidic soils. A total of twenty-five *Lactobacillus* spp. bacteria were identified.

Keywords: Bacteria; deer farm; *Lactobacillus*; Soil

POSTER PRESENTER 009
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Isolation and Molecular Identification of Bacteria in Contact Lens and Solution

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As the number of individuals with short-sightedness, far-sightedness and astigmatism increases, the use of contact lens has risen drastically. This study aimed to isolate and identify bacteria that invade lens and can be sight-threatening. Bacterial sample from contact lens and solution were grown on LB agar and primarily identified based on colony morphology. Four bacteria were isolated but only two were chosen for further analysis. Both bacteria appeared to be Gram negative with rod shaped. Biochemical tests such as oxidase, catalase, indole, MR-VP as well as motility test were performed to identify these bacteria. For molecular identification, 16S rRNA fragments were amplified and sequenced. Edited sequences were compared with those in the DNA database (NCBI). Bacterium in daily contact lens was identified as *Achromobacter xylosoxidans* with 99.69% similarity to *A. xylosoxidans* strain R8-558 isolated from *Jatropha curcas L.* The bacterium in daily contact lens solution was identified as *Klebsiella oxytoca* with 99.78% similarity to *Klebsiella* species found in cave water in India. The relationships of these bacteria with their respective strains were further studied by constructing phylogenetic tree using the maximum likelihood method to determine their relatedness. The tree for *Achromobacter* species was constructed using Tamura 3-parameter with gamma distribution and invariant sites. Phylogenetic tree of *Klebsiella* species was constructed using Kimura 2-parameter with invariant sites. This study hopes to increase awareness on the presence of pathogens such as *A. xylosoxidans* and *K. oxytoca* in contact lens and solution which aid in the prescription of appropriate treatment.

Keywords: 16S rRNA, phylogenetic tree, microbial contamination, disinfecting solution, eye infections

POSTER PRESENTER 010
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Desulphurisation of sour crude oil by sulphur utilising bacteria through the 4S pathway

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Crude oil is the most highly demanded raw fuel source in a global value chain. Biodesulphurisation (BDS) has a good potential alternative over hydrodesulphurisation (HDS), particularly for upgrading and improving sour crude oil with low capital needs. HDS displayed removal of non-aromatic heterocyclic sulphur that change the calorific value of the oil while BDS performed specific removal of only polyaromatic sulphur heterocyclic that conserved the fuel value of the crude oil. Eight potential desulphurising bacteria through the targeting of C-S bond specific cleavage in sulphur removal from dibenzothiophene (DBT) and Iraqi sour crude oil have been successfully characterised using 16S rDNA sequences analyses. *S. maltophilia* CNK1 showed the greatest desulphurisation and formation rate of 2-HBP rate in comparison with other bacteria tested. Maximum BDS rate (12*µmol/gDCW h-1*) was obtained using DBT in the culture at pH 7.0, added with 5 g/L glucose as carbon source, 0.2% (w/v) casein and/or malt extract as nitrogen source and incubated with agitation (180 rpm) at 30°C. *S. maltophilia* CNK1 also displayed the greatest sour crude oil desulphurisation activity. Removal of organic sulphur from crude oil was improved by ~50% in the bioreactor compared to those in the shake flasks. Desulphurisation activity by CNK1 was further enhanced using the stirred tank and airlift reactor with 10% (v/v) loading of AHD and BSH crude oil, with the total sulphur reduction rate of 47.21% and 52.61%, and the reduction of organic sulphur of about 50.20 and 71.84% based on GC/FID analyses.

Keywords: Biodesulphurisation; 4S pathway; sour crude oil; dibenzothiophene

POSTER PRESENTER 011
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In-vitro antioxidant and anti-propionibacterium acnes activities of cold water, hot water and methanol extracts from *Sanguisorba Officinalis L.* roots

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Sanguisorba officinalis L. root (SOR) displayed antimicrobial activity against *Propionibacterium acnes* and *in vitro* antioxidant activities. To determine whether such activities can be attributed to total phenolic content (TPC), total flavonoid content (TFC), total tannin content (TTaC) and total terpenoid content (TTeC), SOR was extracted by cold water (CWE), hot water (HWE) and methanol (ME) and each extract was further fractionated successively with hexane, ethyl acetate (EA) and butanol. To elucidate the major active components in EA fractions, thin layer chromatography (TLC) and high-performance liquid chromatography (HPLC) were performed. CWE, HWE, ME and their respective EA fractions showed antimicrobial activity against *P. acnes* by using paper disc diffusion method on agar plate, minimum inhibitory concentration (MIC) and minimal bactericidal concentration (MBC). Among SOR extracts and fractions, ME and ME-EA showed the lowest MIC (312 and 156 µg/mL) and MBC (312 and 156 µg/mL), respectively. *In vitro,* antioxidant assay revealed that HWE showed the best scavenging capacities of DPPH radicals and hydrogen peroxide as well as lipid peroxidation inhibition. There were some differences in peak patterns among CWE-EA, HWE-EA and ME-EA by HPLC analyses. The most abundant phenolic compounds in HWE-EA were ferulic acid, quercetin and kaempferol, and the most abundant phenolic compounds in ME-EA were ferulic acid and coumarin.

Keywords: *Sanguisorba officinalis* L. root (SOR); antimicrobial activity, *Propionibacterium acnes*; cold water extract (CWE); hot water extract (HWE)

POSTER PRESENTER 012

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Production and characterization of chemically induced *Propionibacterium acnes ghosts*

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Propionibacterium acnes, a gram-positive, anaerobic and lipophilic bacterial pathogen that causes inflammatory acne vulgaris. The aim of the study was to produce and characterize the *P. acnes* ghosts (PAGs) by chemical-mediated lysis. Non-living PAGs were generated by using minimum inhibitory concentration (MIC) of sodium hydroxide (NaOH). The MIC of NaOH was 12.5mg/mL and the lysis efficiency of *P. acnes* cells was reached to 100%. Moreover, no viable colonies were detected in PAGs. SDS-PAGE analysis was used to evaluate remaining protein in PAGs. DNA-free PAGs were confirmed by agarose gel electrophoresis and real-time qPCR. The formation of PAGs with trans-membrane lysis pores was visualized by scanning electron microscopy. Thus, these findings will be useful to test PAGs as a vaccine candidate using experimental animals against *P. acnes* challenge.

Keywords: *Propionibacterium acnes* ghosts (PAGs); minimum inhibitory concentration (MIC); sodium hydroxide (NaOH); trans-membrane lysis pores; vaccine candidate

POSTER PRESENTER 013

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Inhibitory effects of cold water and hot water extracts from *Rehmannia glutinosa* on Melanogenesis in *B16G10* Cells

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Two different extracts (cold water extract; CWE and hot water extract; HWE) of *Rehmannia glutinosa* were investigated for their effect on tyrosinase using both L-DOPA and L-tyrosine as substrates. The IC_{50} of CWE, HWE and kojic acid were found to be 385.9, 361.4 and 34.9 μg/mL, respectively when L-DOPA was used as a substrate. The IC_{50} of CWE, HWE and kojic acid were found to be 314.2, 274.3 and 46.1 μg/mL, respectively, when L-tyrosine was used as a substrate. Following the results obtained from the tyrosinase inhibition, both CWE and HWE were tested on their effect on melanin production and their cytotoxicity on melanoma B16F10. No toxicity was found in CWE below the concentration at 200 μg/mL and HWE below the concentration at 180 μg/mL. Results of melanin assay using B16F10 cells co-treated with α-MSH and CWE (20 μg/mL) or α-MSH and HWE (20 μg/mL) showed a significant reduction of melanin content. In addition, mRNA expression levels of MITF (microphthalmia-associated transcription factor), tyrosinase, TRP-1 and TRP-2 were significantly reduced in α-MSH-stimulated B16F10 cells. The expression inhibitory effect of MITF, tyrosinase and TRP-1 was highest in HWE, while the expression inhibitory effect of TRP-2 was highest in CWE. Therefore, it was confirmed that CWE and HWE extracts from *R. glutinosa* have a whitening effect.

Keywords: *Rehmannia glutinosa;* cold water extract (CWE); hot water extract (HWE); *MITF, Tyrosinase, TRP-1, TRP-2*

POSTER PRESENTER 014

Assoc Prof Dr Tzann-Shun Hwang
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Using different cereals as media to culture *Antrodia camphorata* and investigating the immuno-modulating effect of its methanolic extracts

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Antrodia camphorata is a basidiomycete in Polyporaceae, which causes brown heart rot in *Cinnamomun kanehirai* hay (Lauraceae). It has been utilized in traditional Taiwan medicine. Its crude extracts have shown a lot of pharmacological effects, such as anti-cancer, anti-inflammatory, anti-hepatitis B virus replication, anti-oxidant, hepatoprotective, neuroprotective, antihypertensive, vasorelaxation activities, and prevention of liver fibrosis. Solid media of food-ingredient was used, instead of *C. kanehirai* woodchuck, to culture the *A. camphorate* fruiting body. In present study, *A. camphorata* cultured on different types of food-ingredient media was used to determine the best culture condition with high nutraceutical products such as triterpenoids and polysaccharide and used to compare with the submerged culture of it. Results showed that oatmeal produced the thickest *A. camphorata* fruiting body and the highest dried weight (average 1.3g/ culture plate). Component analysis showed oatmeal-cultured *A. camphorata* contained 9% triterpenoid. Food-ingredient solid medium had a high concentration of triterpenoid produced by *A. camphorata* fruiting body (9%), which was higher than that of submerged-cultured mycelium (1.73%). This could be a high efficiency and cheaper way to produce *A. camphorata*. The methanolic extract of *A. camphorata* was investigated for its effects on stimulating cytokine expression in mouse splenocytes. Ten cytokines, i.e. IL-1, IL-2, IL-4, IL-6, IL-12, IFN-g, TNF-α, GMCSF, G-CSF, and M-CSF, were chosen and analysed. Results showed that most of them were significantly expressed by treating with the extracts of *A. camphorata*.

Keywords: *Antrodia camphorata;* fruiting body; cereals culture; immuno-modulating effect, triterpenoids

POSTER PRESENTER 015

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Host specificity and efficacy of rhizobial symbionts of *Leucaena leucocephala* (petai belalang) in Ipoh, Malaysia

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Leucaena leucocephala or locally known as Petai Belalang is a tropical legume species that has been dubbed as a 'miracle tree'. This is due to its various beneficial uses including high biomass production, soil improvement, soil erosion control timber source, as food course and also its medicinal properties. Currently, in Malaysia, it is widely explored for its potential use as a complementary biomass crop to oil palm. However, the growth of Petai Belalang could adversely affected by low nitrogen availability in the soil. A promising sustainable approach to combat this problem is by exploiting the legume-rhizobia N_2 fixation. This study investigated the host specificity and rhizobial symbionts of *L. leucocephala* in Ipoh, Malaysia. The results of this study indicated that six out of nine selected bacterial strains sampled from various field sites in Ipoh can form functional N_2-fixing nodules on *L. leucocephala, which* indicates that they are indeed 'true' rhizobial symbionts. Generally, the dry matter production of *Leucaena* was significantly greater in plants inoculated with the six effective rhizobial strains compared to those of control plants and non-nodulated plants when grown in low N environment. Phylogenetic analysis of *nodC* gene sequences indicated that Petai Belalang is 'promiscuous' and can be effectively nodulated by rhizobia of the genera *Ensifer* and *Rhizobium*. Further work could be carried out to fully explore the prospect of developing a biofertilizer *for L. leucocephala* while reducing the heavy reliance on N fertilizers.

Keywords: *Leucaena leucocephala*; rhizobia; biofertilizer; legume; nitrogen fixation

POSTER PRESENTER 016
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Palm-based oleochemicals as substrate for biosurfactant production by *Pseudomonas* sp. LM19

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Biosurfactants are bio-based surface-active amphiphilic compounds that is able to overpower the synthetic surfactants in term of biodegradability, low toxicity and high specificity. However, higher production cost including the usage of expensive substrate has restricted its industrial applications and few ideas have been proposed to lower down the overall production cost. One of the aims is to optimize the formulation of production medium and to use a cheaper substrate to produce biosurfactant. Fortunately, Malaysia is rich with palm-based oleochemicals from the palm oil milling process that become potential substrate in biosurfactant production by *Pseudomonas* sp. LM19. Thus, the objective of this work was to determine the suitability of few palm-based oleochemicals to be used as substrate for biosurfactant production. The tested feedstocks were glycerol, palm kernel fatty acid distillate (PKFAD) and palm fatty acid distillate (PFAD) at the concentration of 1% - 3%. Moreover, the growth performance of the *Pseudomonas* sp. LM19 was conducted using four different production media (LB, BH, MSM and PPAS) supplemented with those three. The results showed that the biosurfactant production was maximum (0.43 g/L) on day 6 when using 1% PFAD as substrate in BH medium. Besides, glycerine, PFAD, and PKFAD exhibited promising result in their emulsification index, ranged from 40-44%. The maximum biosurfactant produced from glycerine, PFAD and PKFAD were 0.3 g/L, 0.5 g/L and 0.6 g/L, respectively. The finding on screening of suitable carbon source serves as preliminary data for future optimization of production medium for biosurfactant.

Keywords: Glycerine; palm kernel fatty acid distillate (PKFAD); palm fatty acid distillate (PFAD); biosurfactant

POSTER PRESENTER 017

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An in vitro study on the effect of combined treatment with photodynamic and chemical therapies on *Candida albicans*

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Candida albicans is the most commonly encountered human fungal pathogen that cause candidiasis, and it is traditionally treated with antimicrobial chemical agents. The antimicrobial effect of these agents are largely weakened by drug resistance and biofilm-associated virulence. Enhancement of the antimicrobial activity of existing agents is needed for effective candidiasis treatment. Our aim was to develop a therapy that combined biofilm disruption with existing antimicrobial agents. Photodynamic therapy (PDT) utilizing curcumin and blue light was tested as an independent therapy and in combination with fluconazole treatment. Viability assays and morphology analysis were used to assess the effectiveness of *C. albicans* treatment. As a result, fluconazole treatment decreased the viability of planktonic *C. albicans*, but the decrease was not as pronounced in adherent *C. albicans* because its biofilm formed was markedly more resistant towards the antimicrobiotic. PDT effectively eradicated *C. albicans* biofilms, and when combined with fluconazole, PDT significantly inhibited *C. albicans*. This study suggests that the addition of PDT to fluconazole for treatment of *C. albicans* infection enhances its effectiveness and can potentially be used clinically.

Keywords: Photodynamic therapy; *Candida albicans*; curcumin; fluconazole; biofilm

POSTER PRESENTER 018
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Chemically-induced *Salmonella typhimurium ghosts* as efficient ins1 gene DNA delivery vehicle in-vitro

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For the first time, chemically-induced *Salmonella typhimurium* ghosts (STGs) were used as a delivery carrier for the murine *Ins1* gene fused with red fluorescence protein (DsRed2) gene to murine macrophages. Using RT-PCR, *Ins1* gene (333 bp) was amplified from total RNA of pancreas tissues of Balb/C mouse. A recombinant plasmid, pIRES2-DsRed2-INS1, was generated by insertion of *Ins1* DNA into pIRES2-DsRed2. Loading of pIRES2-DsRed2-INS1 into STGs was performed by diffusion of the plasmid into the STGs through the lysis hole. Using real-time qPCR, we determined the amount of pIRES2-DsRed2-INS1 DNA recovered from STG loaded with various concentrations of DNA amount for loading input. When 1 ~ 200 μg of the recombinant plasmid were used for the loading into STG, 11.8 ~ 118 ng of DNA were recovered from STG. The amount of the pIRES2-DsRed2-INS1 in the STG pellets without washing was 5.13% of initial input DNA for loading into STG. It represents the loaded pIRES2-DsRed2-INS1 together with the residual pIRES2-DsRed2-INS1 in the inter-ghost space. *In vitro* transfection studies showed that the STGs efficiently delivered the pIRES2-DsRed2-InS1 inside the macrophages. Using confocal laser scanning microscope, DsRed2 activity can be seen throughout the transfected cells treated with STGs loaded with recombinant pIRES2-DsRed2-INS1. Most importantly, STGs loaded with pIRES2-DsRed2-InS1 showed higher expression level of *Ins1* gene than plasmid itself. In conclusion, our findings demonstrated that chemically induced STGs could be used as a delivery vehicle for the target gene DNA.

Keywords: Chemically induced *Salmonella typhimurium* ghosts (STGs); *Ins1* gene; pIRES2-DsRed2-INS1; murine macrophages; delivery vehicle

POSTER PRESENTER 019

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Optimization of Kop Nuts (*Ostodes pauciflora*) extraction for antioxidant study

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Kop nuts (*Ostodes pauciflora*) are indigenous to Borneo and known for its edible nut kernel amongst the native people of Borneo especially the *Bidayuh*. The different ethnics of the Borneo, the *Bidayuh* refers the nuts as "*Buak Kop*" (Padawan area) and "*Buak Broti*" (Bau area), while the *Iban* called it "*Meranti*". Scientific information on this nut is very limited. The aim of this study was to optimize the extraction of phenolic compounds of kop nuts for determination of total phenolic and flavonoid content. Prior to extraction, kop nuts were freeze dried and grounded. Extraction was performed using ethanol with concentration of 70% and 80% with volume (ml) to weight (g) ratio of 20:1, 30:1 and 40:1. Ultrasound treatment of 5 min, 10 min or 15 min was applied. The results showed the highest total phenolic content (TPC) (259.82 ± 6.87 mg GAE/100g DW) and total flavonoid content (TFC) (287.38 ± 37.37 mg RE/100g DW) for both 70% and 80% ethanol concentration were in the 20:1 ratio with 10 min sonication time. The optimum extraction method which gave the highest TPC and TFC values from both 70% and 80% ethanol concentration was then used to analyse the antioxidant capacity using DPPH free radical scavenging and ferric reducing ability plasma (FRAP) assays.

Keywords: *Ostodes pauciflora*; ultrasound-assisted extraction; total phenolic content; total flavonoid content; antioxidant study

POSTER PRESENTER 020

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Photosensitizer-doped nanofibers for antimicrobial photodynamic therapy

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The ubiquitous microorganisms are closely related to human life, especially the serious infections and various diseases caused by pathogenic microorganisms. Nowadays, the abuse of antibiotics has led to the gradual emergence of drug-resistant microbes that have spawned medical problems. Therefore, establishment of new and alternative antimicrobial therapy is an important issue. Antimicrobial photodynamic therapy (APDT) is a promising alternative approach that induces toxic singlet oxygen to kill microbes through photodynamic pathway. In this study, we fabricated photosensitizer-doped nanofibers by combination of electrospinning technique with photoactive property of photosensitizers to study the antimicrobial effects by doping two different photosensitizers. A series of copolymers based on hydrophilic 2-hydroxyethyl methacrylate (HEMA) and thermally cross-linked *N*-methylol acrylamide (NMA) were synthesized via free radical polymerization for fabrication of electrospun nanofibers doped with hydrophilic photosensitizer methylene blue (MB) or the hydrophobic photosensitizer zinc tetraphenylporphyrin (ZnTPP). The optimum process parameters for fabrication of photosensitizer-doped nanofibers have been developed. Singlet oxygen generation was monitored by the fluorescence intensity change of $^1O_2$ indicator (SOSG) upon irradiation with halogen lamp. The higher singlet oxygen generation efficiency of MB-doped nanofibers might be due to the diffusion of methylene blue from nanofibers. The antibacterial activity of photosensitizer-doped nanofibers was determined by the inhibition zone against *E. coli* (Gram- negative bacteria). The results showed the MB-doped nanofibers had a significant antibacterial effect under light irradiation.

Keywords: Electrospinning; photosensitizer; photodynamic therapy; antimicrobial

POSTER PRESENTER 021

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Complete genome sequence of *Gordonia ajoucoccus A2T*, a n-alkane degrading bacterium

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Gordonia ajoucoccus $A2^T$, which was isolated from oil-contaminated soil, is a bacterium capable of degrading *n*-alkanes of varying chain length. Based on analysis of the complete genome sequence of *G. ajoucoccus* $A2^T$, putative genes encoding alkane hydroxylases including alkane-1- monooxygenase, rubredoxins, and rubredoxin reductase were present. Alkane hydroxylases are known to catalyse the oxidation reaction in the initial step of the terminal oxidation of *n*-alkanes. To confirm the inducible expression of the alkane hydroxylases, *G. ajoucoccus* $A2^T$ was cultured in media supplemented with 1% (v/v) hexane, 0.1% (v/v) hexadecane, and 0.5% (w/v) fructose as the sole carbon source and then mRNA expression was monitored by reverse transcription polymerase chain reaction (RT-PCR). The RT-PCR result showed that alkane hydroxylase genes were induced in the presence of *n*-hexane and *n*-hexadecane, but not when fructose was used as the sole carbon source. This result suggests that *G. ajoucoccus* $A2^T$ is able to degrade both of short and long chain alkanes by a terminal oxidation pathway. The result shows that *G. ajoucoccus* $A2^T$ can be a good model for understanding of the *n*-alkanes degradation mechanism in microorganisms and also, a potential bacterium in green biotechnologies.

Keywords: *Gordonia ajoucoccus A2T;* Complete genome sequence; *n*-alkane

POSTER PRESENTER 022

Assoc Prof Dr Madihah Md Salleh
Universiti Teknologi Malaysia

Production of fermentable sugar from oil palm trunk by *Aspergillus fumigatus SK1* in solid state fermentation

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Oil palm industry produces high amount of lignobiomass waste that has potential in fermentable sugar production. Oil palm trunk (OPT), which is one of abundant lignobiomass waste consist of 37.47% cellulose, 25.99% hemicellulose, and 9.93% lignin. Having a high C: N ratio content, the OPT is potentially good to act as a substrate for fermentable sugar production through solid state fermentation (SSF). In the study, OPT without chemical pre-treatment was utilized for optimization of fermentable sugar production in SSF using flask and 5L rotary drum bioreactor. *Aspergillus fumigatus* SK1 produce 24.40 mg/g fermentable sugar under limited nitrogen content. The application of mycelium as an inoculum gave significant impact to fermentable sugar production as compared to spore suspension. OPT particle size of 250 µm produced up to 39.46 mg/g of fermentable sugar. The optimization of fermentable sugar production using Central Composite Design (CCD) showed combination of initial pH (5.96), initial moisture (67.97%), temperature (39.77 °C), and incubation time (11 days) enhanced fermentable sugar production up to 262 mg/g, which was 9.74 fold improvement as compared to un-optimized condition (24.40 mg/g). The CCD optimized condition was applied to 5 L rotary drum bioreactor with agitation of 2 rpm/day and aeration of 2 L/min increased fermentable sugar production to 270.83 mg/g which is 10.09 fold as compared to unoptimized condition in flask. The findings of this project demonstrated the potential used of OPT as an alternative substrate for fermentable sugar production through green biorefinery processing.

Keywords: *Aspergillus fumigatus*; solid state fermentation; fermentable sugar; central composite Design

POSTER PRESENTER 023
Dr Hui Suan Ng
UCSI Education Sdn. Bhd.

Extractive disruption of *Gordonia terrae* for recovery of carotenoids with alcohol/salt aqueous biphasic system

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Microbial carotenoids are gaining huge attention over the past decade with the increasing market demands of natural pigments. Natural plant sources of carotenoids are not sustainable because they are very susceptible to environmental changes. The downstream purification processes of the pigments often coupled with high cost and multi-steps unit operation. Therefore, aqueous biphasic system (ABS) comprised of alcohol and salt were introduced in this study for carotenoids extraction and recovery from *Gordonia terrae* fermentation. Different types of alcohols (ethanol, prop-1-ol, prop-2-ol) and salts (sulphate, citrate and phosphate) were used to develop the ABS. The effects of concentration of alcohols and salts, pH, amount of crude load, addition of additives, concentration of additives and the sonication time were evaluated for the optimum recovery yield of the carotenoids. Results showed that carotenoids partitioned to the alcohol-rich phase with a relatively high recovery at 86% using prop-1-ol and trisodium citrate system. The optimum recovery of carotenoids was obtained with 20%(w/w) 1-propanol and 20%(w/w) trisodium citrate salt of pH 9. A total of 10% (w/w) of bacterial cells was loaded into the optimum system with the addition of 4% (w/w) of NaCl and 60 mins of sonication. Extractive disruption of *Gordonia terrae* for recovery of intracellular carotenoids with an alcohol/salt ABS has been successfully demonstrated. The high-water content and cost-effective one- step ABS allow the integration of extraction and separation of carotenoids from *Gordonia terrae* fermentation. Therefore, the overall production cost can be reduced with the simplification of the carotenoid's recovery processes.

Keywords: Carotenoid; aqueous biphasic system; alcohol; sonication; extractive disruption

POSTER PRESENTER 024
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Pineapple biorefinery as a new source of wealth for Malaysia

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Pineapple (*Ananas comosus*) is widely planted in our country and the by-products generated from the agro-industry and plantation fields would turn into bulky wastes. Malaysian consumption of pineapples had seen encouraging growth as the ratio of consumer to pineapple consumption increased from 1:10 five years ago to 1:14 now. In 2012, the harvested area was around 15,611 hectares, which produces 21.42 tonnes of pineapple fruits per hectare and a lot of agro-waste was produced during harvesting activities. This is due to selection and elimination of certain components of pineapple, leaving behind undesired parts that are unsuitable for human consumption. These components include the crown, stem, peel, leaves and wastes from flesh trimming. Appropriate methods in handling these residues are needed as they are bulky and prone to microbial spoilage. One of the possible ways to manage the pineapple waste without harming the environment is by converting these residues into value-added products by which this could reduce the amount of agro-waste produced in the pineapple plantation fields.

Keywords: Pineapple wastes; biorefinery; value-added products, zero wastes, wealth

POSTER PRESENTER 025
Dr Mohamad Faizal Ibrahim
Universiti Putra Malaysia

Simultaneous saccharification and fermentation with delayed yeast extract feeding and in-situ recovery for biobutanol production from oil palm empty fruit bunch

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Oil palm empty fruit bunch (OPEFB) contributes about one-quarter of oil palm biomass generated, which equivalent to 23 million tonnes per year. The abundance of this lignocellulosic biomass has good potential as biomass feedstock for biofuel production such as biobutanol. However, utilising OPEFB as raw material for biobutanol production has several challenges including multiple processing steps, low biobutanol concentration and yield which lead to inefficient biobutanol production and recovery. In order to overcome these problems, simultaneous saccharification and fermentation (SSF) process was applied to reduce the processing steps in single operation and in the same reactor. From this study, approximately 2.88 g/L of biobutanol produced from SSF was compared to 2.86 g/L of biobutanol produced from separate hydrolysis and fermentation (SHF). Although the biobutanol concentration is almost similar, SSF shows better process in term of process duration, and reduce the cost of materials, apparatus, and labour. The process was further improved using delayed yeast extract feeding (DYEF) that functions to reduce acids and enhance biobutanol concentration. DYEF was conducted by introducing yeast extract after 39 h SSF was operated instead of pouring the yeast extract at the initial of fermentation. This resulted 46% increase of biobutanol titre. The process was enhanced to 26% by implementing *in-situ* recovery using a gas stripping. It also recovered 20 g/L of biobutanol with 83% purity.

Keywords: Biobutanol; ABE fermentation; Simultaneous saccharification and fermentation; lignocellulosic biomass

POSTER PRESENTER 026
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Production of biochar from landscape waste under self-sustained carbonization using a pilot scale steel oil drum reactor

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An appropriate technology especially carbonization reactor is important in producing high yield of biochar from huge abundant of landscape waste. This study presents a self-sustained carbonization of biomass, whereby landscape waste was combusted by itself to provide the heat for carbonization without an electrical heater. The self- sustained carbonization was carried out using a pilot-scale modified used steel oil drum reactor. In this study, three different landscape biomass waste, i.e leaves, branches and woods were collected within UiTM Sarawak Branch campus area. The temperature of the reactor was monitored using three k-type thermocouples positioned at different heights from the bottom of the reactor. The biochar yield for all three biomass waste were determined, including its C/N elemental composition using CHNS elemental analyser. The results show that maximum carbonization temperature profile was found in the range of 250- 417, 250- 276 and 250-261 °C for wood, leaves and branches, respectively. Meanwhile, the biochar yield were found in the range of 11.00-11.11 % for leaves, 30.12- 31.33 % for branches and 30.89-32.52 % for woods. The elemental composition indicated average C and N values of branch biochar were 52.740 and 3.570 respectively. Based on these values, the C/N ratio calculated was 14.773, which is 41.89% less than pine wood biochar. The biochar yield of branches and woods obtained in this study is acceptable and comparable to other studies under self-sustained carbonization that uses simple technology and low-cost reactor.

Keywords: Biochar; landscape waste; self-sustained carbonization

POSTER PRESENTER 027

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Method for detecting target RNA utilizing the nicking/extension chain reaction system-based isothermal nucleic acid amplification (NESBA)

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Herein we develop a new method for detecting target RNA utilizing nicking/extension chain reaction system-based isothermal nucleic acid amplification (NESBA). In this study, we employed a nicking primer which contained a promoter and nicking enzyme recognition sequence. As the target RNA binds to the complementary sequence of the nicking primer and is extended and degraded by reverse transcriptase and RNase H. Then second primer binds to a synthetic single stranded (ss) DNA and extends it to make a double stranded (ds) DNA containing promoter sequence. The nicking enzyme recognizes the specific sequence and nicks the ds DNA, which can induce exponential amplification of ds DNA containing promoter sequence. Subsequently, the produced ds DNA is also used to induce another cycle of the reaction system leading to the production of numerous antisense RNA product. Finally, the high fluorescent signal is generated from the molecular beacon which has same sequence with as the target RNA. By employing this amplification principle, the target RNA was sensitively detected down to 0.68 fM with high specificity over other subtypes of influenza virus. In addition, the practical utility of this strategy was also proved by detecting target RNA in virus lysate samples. These results suggest that the developed NESBA reaction system could serve as a universal platform of the POCT system.

Keywords: RNA detection; isothermal amplification; exponential amplification reaction; nicking primer; nicking endonuclease

POSTER PRESENTER 028
Farah Najwa Nabila Mohd Hatta
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Microbial nanofactories for production of silver nanoparticles utilising a locally isolated Malaysian bacterial strain as an alternative source of antimicrobial agents

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Overconsumption and misuse of antibiotics further increases the development of antimicrobial resistance. As resistant microbes develop measure in inactivating antibiotics, the usage of alternative forms for antimicrobial agents have become pivotal. Recently, silver nanoparticles have been touted as a staple candidate for antimicrobial agents due to its excellent surface-to-volume ratio which exhibit superior antimicrobial properties. However, conventional chemical synthesis routes used for its generation are often not environmental-friendly and hence, biological routes are suggested to overcome the limitations of them. Such nanoparticles also possess similar or superior properties compared to its conventional counterpart. This study reports the development of an extracellular synthesis system for sustainable production of antimicrobial silver nanoparticles produced from a locally isolated bacterial strain. Phylogenetic analysis revealed the bacteria belongs to *Bacillus* genera. UV spectroscopy indicated nanoparticles formation through the occurrence of absorbance peak at 450 nm. Size and polydispersity analysis showed monodispersed silver nanoparticles with an average of 124.644±3.763 nm in diameter and PDI values of 0.211±0.006. Regular spherical shaped silver nanoparticles morphology with the range size 14-20 nm was recorded from Transmission Electron Microscopy (TEM). Antimicrobial activity of bacterial synthesised silver nanoparticles towards *Escherichia coli* DH5-α strain showed_inhibition rings formed by silver nanoparticles were 0.867±0.115 cm in diameter size. In summary, the bacterial-synthesised silver nanoparticles possessed good antimicrobial effect comparable to chemical methods and hence are potential alternatives as antimicrobial agents. Therefore, the isolated bacteria is an excellent bio factory to produce silver nanoparticles due to fast reducing and extracellular synthesis in aerobic conditions.

Keywords: Silver nanoparticles; bacterial synthesis; extracellular synthesis; antimicrobial activity; bio factory

POSTER PRESENTER 029
Ruqayyah A. Bashirah
Universiti Putra Malaysia

Fluorescently-labelled & hydrophobically-modified chitosan nanoparticles as a delivery system for increased accumulation and in vitro intracellular trafficking of chlorogenic acid

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Encapsulation of therapeutic compounds into nanoparticles has been shown to be able to increase intracellular its uptake into cancer cells, partly due to its nano dimensions and a high surface-to-volume ratio. Particle size and distribution are crucial characteristics of nanoparticles system as it determines the uptake, drug-loading efficiency, release, as well as stability of the nanoparticle system itself. Tracking of intracellular accumulation is crucial in treated cells to show its localization at the targeted site. Conventional chitosan nanoparticles (CNPs), while being a robust system for delivery of biomolecules, has proven to be less efficient for delivery of amphoteric compounds due to lack of hydrophobic modification within the system. Therefore, therein lies a need for innovation of current CNPs systems. The utilization of hydrophobically-modified chitosan nanoparticles (pCNPs) has better efficiency for drug delivery, as it increases the encapsulation efficiency of poorly-soluble compounds. This study reports the increased encapsulation, delivery and intracellular accumulation of chlorogenic acid, a phenolic compound with low water solubility using a fluorescently-modified pCNPs system. Homogenously distributed pCNPs with diameters as small as 72 nm and a PDI of 0.1 were synthesized, and results from electron microscopy and light scattering analyses showed an increase in particle size when pCNPs were loaded with chlorogenic acid. The formation of nanoparticles was verified via TNBS assay through fraction of free primary amino groups in the pCNPs and its role in nanoparticles formation. In summary, synthesize of pCNPs as a carrier for amphoteric compound is crucial in many research areas.

Keywords: Chitosan nanoparticles, hydrophobically-modified nanoparticles, chlorogenic acid, drug delivery, nanoparticle

POSTER PRESENTER 030
Prof Dr Jung-Yao Chen
National Chung Cheng University

Non-volatile perovskite-based photomemory with a multi-level memory behaviour

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Solution-processable organic-inorganic hybrid perovskite materials with a wealth of exotic semiconducting properties have appeared as the promising front-runners for next-generation electronic devices. Furthermore, regarding its well photo-responsibility, various perovskite-based photo-sensing devices have been prosperously developed in recent years. However, most exploited devices to date only transiently transduce the optical signals into electrical circuits while under illumination, which necessitates using additional converters to further store the output signals for recording the occurrence of light stimulation. Herein, we first demonstrate a non-volatile perovskite-based floating-gate photomemory with a multi-level memory behavior, forwhich a floating gate comprising a polymer matrix impregnated with perovskite nanoparticles was employed. Owing to the well photo-responsibility introduced by the embedded nanoparticles, the device was enabled to access multiple wavelength response and the functionalities of recording power/time-dependent illumination under no vertical electrical field. Intriguingly, a non-volatility of photo-recording exceeding 3 months with a high on/off current ratio over 10^4 can be achieved.

Keywords: Floating-gate photomemory; perovskite nanoparticle; multi-level memory; photosensitivity

POSTER PRESENTER 031
Huszalina Hussin
Universiti Teknologi Malaysia

Biostructural analysis of extracellular enzymes responsible for one-step bioconversion of ferulic acid to biovanillin: Evidence role in fungi

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Vanillin is used worldwide in food production. Though widely studied in bacteria, the role of fungi in bioconversion of plant material into vanillin is relatively less studied. Extracellular enzymes expressed during vanillin production optimization were partially characterized by 1-D gel electrophoresis and mass spectrometry (MS). The study was conducted in a one-step conversion of biovanilin from lemongrass leaves hydrolysate by *Phanerochaete chrysosporium*. The majority of the proteins identified were involved with hydrolytic functions in the metabolism of carbon and energy sources, stress response and defense mechanisms. This discovery shows the complexity of protein interactions and distinct components involved in the production of a polyaromatic degrading extracellular enzyme. Using *in-silico* approaches, a specific catalytic residue that interacts with the substrate (ferulic acid) in vanillin production both in bacteria and fungi was identified. This residue could be used as a possible target in enzyme engineering.

Keywords: Vanillin; extracellular enzymes; *Phanerochaete chrysosporium*; docking; biostructural analysis

POSTER PRESENTER 032
Assoc Prof Dr Shaza Eva Mohamed
Malaysia-Japan International Institute of Technology,
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Study of potential microalgae for fatty acid methyl esters production

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Fossil fuels is a finite source of energy which is crucial in supplying energy to the world. Each year, the price of fossil fuels is getting more expensive due to increasing demands and emerging of renewable technology and nuclear energy. Fossil fuels have its downside where burning them off emit harmful gases into the atmosphere such as carbon dioxide, methane, sulphur dioxide etc. The surge of this greenhouse gases in the atmosphere has led to global warming and depletion of ozone layer. This will not only affect mother nature, but it will affect both human and animal lives as well. This led to the push of finding alternative ways that are renewable and more environmentally friendly. Microalgae has gained popularity as the potential source to replace fossil fuels to produce fuels (biofuels). It is a breakthrough in science world to combat decrement of fossil fuels and environmental problems. In this study, the best microalgae species from freshwater and marine (*Chlorella vulgaris* and *Tetraselmis* sp*)* was investigated for biodiesel production based on its lipid production. Parameters studied in this work include pH, nitrogen source and aeration. The growth rate as well as the lipid content of the microalgae observed by measuring the optical density at 750 nm and using fluorescence intensity of Nile Red at 480 nm and 550 nm. Based on the lipid reading obtained, the most suitable microalgal strain for biodiesel production based on lipid study is marine microalgae, *Tetraselmis* sp. The optimum growth of *Tetraselmis* sp. is on day 20 without aeration source at pH 7 with KNO_3 medium. Weight of lipid obtained was found to be in the range of 0.13-0.14g. In this study, *Tetraselmis sp.* produced fatty acid methyl esters (FAME) which include linoleic acid, oleic acid, stearic acid and elaidic acid at optimized condition. The most suitable FAME for biodiesel is possibly stearic acid as it is a saturated fatty acid with long carbon chain.

Keywords: Potential microalgae; fatty acid methyl esters production; Chlorella *vulgaris*; *Tetraselmis* sp*;* biodiesel production

POSTER PRESENTER 033
Dr Nozieana Khairuddin
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Physicochemical and thermal characterization of hydroxyethyl cellulose - wheat based films incorporated thymol intended for active food packaging

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The present work aimed to develop the formulation of hydroxyethyl cellulose (HEC)/wheat-starch based film in which the active compound, thymol (0.5, 1, 1.5, 2, and 2.5% w/w) were incorporated into the polymeric material. A solution casting method was used in the film preparation while thymol was incorporated prior to casting. In order to determine the film characteristics, physical (scanning electron microscopy (SEM) and tensile test), chemical (Fourier transform infrared (FTIR)), and thermal properties (thermogravimetric analysis, differential scanning calorimetry) tests were carried out. The inhibitory effect of the film was determined towards different types of microbial contamination. The mechanical properties of the films were improved by 60.3% with an optimum tensile strength at thymol concentration of 1.5% w/w. It can be concluded that the film properties are retained chemically whereas mechanical properties, strength, flexibility and function of the film are being enhanced remarkably by the incorporation of thymol.

Keywords: Active food packaging; thymol; hydroxyethyl cellulose; physicochemical

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