EMPOWERING RESEARCH THROUGH MULTI-DISCIPLINARY APPROACH

SBS INTERNATIONAL POSTGRADUATE CONFERENCE 2022

PROGRAMME & ABSTRACT E-BOOK

11-12th OCTOBER 2022

SCHOOL OF BIOLOGICAL SCIENCES

UNIVERSITI SAINS MALAYSIA

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Preface

This e-book includes all the abstracts presented at the SBS International Postgraduate Conference 2022 (SBS IPGC 2022), 11-12th October 2022 organized by the School of Biological Sciences, Universiti Sains Malaysia. In total, there were 39 abstracts presented by local and international participants of which 26 abstracts were presented physically, while the rest were presented virtually. All the abstracts belong to five different subthemes namely Biodiversity and Natural Resources (n=13), Crop Management (n=4), Microbial Biotechnology (n=9), Environment and Conservation (n=6), and Entomology and Ecology (n=7). The SBS IPGC 2022 provides various interdisciplinary platforms for the postgraduate students to present and discuss the most recent innovations, trends, and concerns as well as practical challenges encountered, and solutions adopted in the field of biology. This international event is also intended to create networking and exchange of information on research and technology, in line with the theme 'Empowering research through multidisciplinary approach'. Through this conference, participants have gained multidisciplinary knowledge, the opportunity to exchange ideas on their research, and discussed the future developments in their respective disciplines.

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Message from Dean of School of Biological Sciences

Assalamualaikum w.b.t. and greetings.

I would like to welcome all the participants who have joined this conference. We are indeed very honoured to have all of you here with us in School of Biological Sciences (SBS), Universiti Sains Malaysia. This conference has been organized for the second time to provide a platform for postgraduate researchers to both present and showcase their research works. I hope this conference will also serve as a platform for all to widen their professional contact, share and exchange ideas, discuss challenges in their respective fields and create new opportunities.

The theme of the conference, "Empowering Research through Multidisciplinary Approach" is very relevant and pertinent with the current SBS research challenges. A multidisciplinary approach involves drawing appropriately from multiple disciplines to redefine problems outside of normal boundaries and reach solutions based on a new understanding of complex situations. Therefore, this conference was held to encourage postgraduate researchers and scientists to think about the opportunities waiting for them at the interface with the life sciences through a multidisciplinary approach.

Herewith, I would like to state my utmost appreciation and sincerest gratitude to all participants who have presented and shared their findings and experiences. Likewise, my deepest appreciation to the members of the organizing committee for their tremendous efforts and excellent planning in organizing this conference and hope this success will continue in the years to come.

I wish all the participants an enjoyable and successful conference.

Thank you.

Professor Dato' Dr. Amirul Al-Ashraf Abdullah
Dean
School of Biological Sciences
Universiti Sains Malaysia

Message from SBS International Postgraduate Conference 2022 Advisor

Assalamualaikum and Salam Sejahtera**.**

Welcome to the SBS International Postgraduate Conference 2022.

The conference's main objectives are to grant postgraduate students the opportunity to present their findings and provide a platform to engage in discussion with fellow researchers in their respective fields. The struggles in making science and research culture in USM is challenging. In line with that, a theme for this conference was created to reflect the research theme in USM, "Empowering Research through Multidisciplinary Approach".

Multidisciplinary approach in research is a pursuit of knowledge and innovation with the aid of numerous specialized disciplines. Multidisciplinary approach also enables researchers to integrate various disciplines to gain diverse a perspective of their subjects. Being multidisciplinary has its own challenges and rewards but it opens the door to diverse career path and opportunity to venture in research that requires multiple scientific disciplines.

Finally, I would like to congratulate the organizing committee and to thank everyone who have contributed in so many ways to ensure the smooth running of this conference. I would also like to express my sincere appreciation to all invited speakers and participants for their participations, and with very interesting presentations that create a very good atmosphere for discussion and networking.

I wish everyone an enjoyable day full of knowledge.

Thank you.

Professor Dr. Latiffah Zakaria
Advisor
SBS International Postgraduate Conference 2022
School of Biological Sciences
Universiti Sains Malaysia

Message from SBS International Postgraduate Conference 2022 Chairman

Assalamualaikum w.b.t. and greetings.

On behalf of the organizing committee, I would like to extend our warmest welcome to all participants of the School of Biological Sciences International Postgraduate Conference 2022 (SBS IPGC 2022). The theme of the conference is "Empowering Research through Multidisciplinary Approach", which highlighted research in the aspects of biodiversity and natural resources, microbial and biotechnology, environment and conservation, crop management as well as entomology and ecology.

This is the second conference organized by the School of Biological Sciences and is offered to all postgraduate students from universities across the world and it is conducted in both physical and virtual presentations. I hope this conference will enhance a spirit of innovation, research skills, creativity and discovery among the participants.

I would like to thank all the committee members of School of Biological Sciences, especially postgraduate students and fellow lecturers for their tremendous commitment, support and time to ensure the smooth running of this conference. My deepest appreciation to the Dean of School of Biological Sciences, keynote speakers and sponsors who have contributed in various ways to make the conference successful. I hope all participants will have a fruitful and pleasant time during this conference.

Thank you.

Dr. Amira Suriaty Yaakop
Chairman
SBS International Postgraduate Conference 2022
School of Biological Sciences
Universiti Sains Malaysia

SBS INTERNATIONAL POSTGRADUATE CONFERENCE 2022
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Conference programme

School of Biological Sciences, Universiti Sains Malaysia
11-12th October 2022

DATE	TIME	EVENT		VENUE
11 October 2022 (Day 1)	8:00 – 8:15 am	**Registration and arrival of participants**		Foyer
	8:15 – 8:30 am	**Arrival of VIPs**		
	8:30 – 8:40 am	**Welcoming speech by Chairman of SBS IPGC 2022, Dr. Amira Suriaty Yaakop**		Conference Room 107
	8:40 – 9:00 am	**Opening ceremony & officiation speech by Prof. Dr. Azlan Abdul Aziz, Dean IPS**		
	9:00 – 9:30 am	Keynote speech by **PROF. DATO' DR. AILEEN TAN SHAU HWAI** **Moderator**: Assoc. Prof. Dr. Wan Fatma Zuharah Wan Musthapa		
	9:30 – 10:00 am	Keynote speech by **DR. NADINE RUPPERT** **Moderator:** Assoc. Prof. Dr. Wan Fatma Zuharah Wan Musthapa		
	10:00 – 10:10 am	**Photography session**		
	10:10 – 10:20 am	**Tea break**		Foyer
		Physical oral presentation		
		Session 1 **Conference Room 107** **(Biodiversity and Natural Resources)** Chairperson: Assoc. Prof. Dr. Darlina Md. Naim Panel: 1. Dr. Hadura Abu Hasan 2. Dr. Farah Alia Nordin	**Session 2** **Room 101** **(Biodiversity and Natural Resources & Crop Management)** Chairperson: Dr. Shuhaida Shuib Panel: 1. Dr. Hasber Salim 2. Dr. Mohamad Fadhli Mad' Atari	
	10:20 – 10:40 am	**The influence of tidal on saltwater intrusion in Sungai Semerak, Kelantan** Muhammad Fikri Samsudin	**Comparative study of the herpetofauna between pristine and anthropogenically-modified habitats at Cameron Highlands, Fraser's Hill and Genting Highlands** Hong Zijia	
	10:40 – 11:00 am	**Effects of 2,4-Dichlorophenoxyacetic acid, kinetin and sucrose on callus induction from cotyledon explants of butterfly pea (*Clitoria ternatea*)** Teoh Siew Chin	**Morphological characteristics of *Taenia* sp. found in the wild rodent from Penang Island, Malaysia** Aoha Yamamoto	
	11:00 – 11:20 am	**The incorporation of vermicast solution in the regeneration of *in vitro* explants of *Ficus carica* cv. Japanese BTM 6** Lee Yong Jun	**The systematics and biogeography of the *Linmonectes hascheanus-limborgi* complex in Peninsular Malaysia** Zou Bei	
	11:20 – 11:40 am	**Induction and proliferation of callus from cotyledon explant of *Clitorea ternatea*** Tengku Nurul Amira Aqma Tengku Zakaria	**Occurrence of sooty blotch and flyspeck disease on mango in Malaysia** Tham Khai Xin	

Conference programme

School of Biological Sciences, Universiti Sains Malaysia
11-12th October 2022

DATE	TIME	EVENT		VENUE
	11:40 – 12:00 pm	**Diversity assessment on the limestone orchids of Northern Peninsular Malaysia** Shahrul Nizam Abu Bakar	**Morphological and molecular identification of fungi associated with crown rot of banana (*Musa paradisiaca*) in Peninsular Malaysia** Aisha Mohammed Inuwa	
	12:00 – 12:20 pm	**Optimization of asymbiotic seed germination, callus induction and proliferation in Tongkat Ali (*Eurycoma longifolia* Jack.)** Sani Saleh	**Pathogenicity of *Ganoderma boninense* onmineral and peat soils** Ike Virdiana	
	12:20 – 12:40 pm	**Prevalance of gastrointestinal parasites from wild rodents in Penang, Malaysia** Putri Wulan		
	12:40 – 2:20 pm	**Lunch break**		Foyer
		Virtual oral presentation		Room 101
		Session 3 Chairperson: Dr. Foong Swee Yeok Panel: 1. Dr. Hazzeman Haris 2. Dr. Yazmin Bustami		
	2:20 – 2:40 pm	***In vitro* analysis of *Sphingobacterium* sp. lipase with LEA K peptide as co-expression** Ibrahim Muhammad		
	2:40 – 3:00 pm	***In silico* analysis of T and B-cells epitopes: candidate for universal dengue vaccine** Dhaniah Mohamad		
	3:00 – 3:20 pm	**The decomposition and succession pattern of forensically important flies associated with organophosphate-intoxicated rat carcasses** Marlini Othman		
	3:20 – 3:40 pm	**Analysis of biodiversity in the Orangutan habitat in Rawa Singkil Wildlife Reserve, Aceh Singkil, Indonesia** Subhan		
	3:40 – 4:00 pm	**Evaluation of antibacterial and antifungal activity of methanolic and ethanolic extracts of three varieties of *Nerium oleander* flowers** Ayman Dardona		
	4:00 – 4:20 pm	**Unveiling the origin of *Cryptocoryne ×jambiensis* Bastmeijer, a newly described plant using molecular markers** Nurul Shakinah Mohd Talkah		
	4:20 – 4:40 pm	**Environmental friendly technique for removal of phenol from aqueous solution via titanium nanoparticle** Muhammad Farhan Hanafi		
	4:40 – 5:00 pm	**Tea break**		Foyer

Conference programme

School of Biological Sciences, Universiti Sains Malaysia
11-12th October 2022

DATE	TIME	EVENT		VENUE
12 October 2022 (Day 2)	8:30 – 9:00 am	**Breakfast**		Foyer
	9:00 – 9:30 am	Keynote speech by **ASSOC. PROF. TS. DR. VIGNESWARI SEVAKUMARAN** Moderator: Assoc. Prof. Dr. Rashidah Abdul Rahim		Conference Room 107
	9:30 – 10:00 am	Keynote speech by **DR. GBENGA FESTUS AKOMOLAFE** Moderator: Assoc. Prof. Dr. Rashidah Abdul Rahim		
	10:00 – 10:20 am	**Tea break**		Foyer
		Physical oral presentation		
		Session 4 **Conference room 107** **(Microbial Biotechnology)** Chairperson: Dr. Kamarul Zaman Zarkasi Panel: 1. Assoc. Prof. Dr. Amir Hamzah Ahmad Ghazali 2. Dr. Nur Asshifa Md Noh	**Session 5** **Room 101** **(Environment and Conservation & Entomology and Ecology)** Chairperson: Dr. Nik Ahmad Irwan Izzauddin Nik Him Panel: 1. Assoc. Prof. Dr. Suhaila Ab. Hamid 2. Dr. Faradina Merican Mohd Sidik Merican	
	10:20 – 10:40 am	**RAP1B and PAK6 as potential targets to co-inhibit with anti-apoptotic protein MCL-1 for nasopharyngeal carcinoma (NPC) therapy** Teh Jia Lin	**Insecticide resistance status in Kedah and Penang populations of the mosquito *Culex tritaeniorhynchus*** Shitta Kefas Babale	
	10:40 – 11:00 am	**Microbial community diversity associated with wild and captive tropical barn owl** Mohd Hasif Ahmad Kamal	**Genetic diversity and phylogenetic relationship of bed bugs infestation in Iraq** Hussein Ali Baqir	
	11:00 – 11:20 am	**Co-expression of protease from *Bacillus toyonensis* with Late Embryogenesis Abundant (LEA)-like peptides** Nurul Ain Syukriyah Ahmad Muhamud	**Behavioral responses of *Cimex hemipterus* (Hemiptera: Cimicidae) to colored harborages** Abd Hafis Abd Rahim	
	11:20 – 11:40 am	**Identification of hydrocarbon degrading bacteria from marine seawater** Anis Fathima Abdul Kareem	**Oviposition preferences of house fly, *Musca domestica* towards substrate treated by black soldier fly larvae, *Hermetia illucens*** Mohamad Ibrahim Mohamad Isa	
	11:40 – 12:00 pm	**Integration of microbial fuel cell (MFC) in secondary school: A needs analysis report** Siti Rohana bt Man	**Differential studies of zinc oxide (ZnO) nanoparticles toxicity toward different mosquito species** Hsieh Ting Chuan	
	12:00 – 12:20 pm	**Biosynthesis of terpolymer P(3HB-co-3HV-co-4HB) using glycerine pitch as sole carbon source**	**Effects of beneficial bacteria in arsenic detoxification and its hyperaccumulation by *Pteris vittata* in contaminated soils**	

Conference programme

School of Biological Sciences, Universiti Sains Malaysia
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DATE	TIME	EVENT		VENUE
		Musa Ibn Abbas	Aminu Salisu Muazu	
	12:20 – 12:40 pm		**Potential of ground cover plant as arbuscular mycorrhizal fungi (AMF) trap plant and efficacy of propagated AMF inoculums on growth of okra (*Abelmoschus esculentus* L.).** Nurul Aziera Hassan	
	12.40 – 2:20 pm	**Lunch break**		Foyer
		Virtual oral presentation		Room 101
		Session 6 Chairperson: Dr. Hasnuri Mat Hassan Panel: 1. Dr. Intan Haslina Ishak 2. Dr. Azma Hanim Ismail		
	2:20 – 2:40 pm	**Potential leguminous cover crop, *Vigna marina*, on different soil conditions for soil improvement and crop productivity** Ahmad Talha Mohamad Yunus		
	2:40 – 3:00 pm	**Characterisation and pathogenicity of fungi associated with grey and brown blight diseases of tea (*Camellia sinensis*) in Malaysia** Saleh Ahmed Shahriar		
	3:00 – 3:20 pm	**Continuous cropping of black morels manipulate microbial composition and co-occurring patterns of the soil microbiome** Zhang Yan		
	3:20 – 3:40 pm	**Seasonal assessment of pupal productivity of malaria vector, *Anopheles gambiae* s.l. as influenced by physico-chemical conditions at selected breeding habitats in Niger, Nigeria** Shehu Ibrahim Kura		
	3:40 – 4:00 pm	**Mitigation opportunities to reduce the impact of artificial smooth surfaces on bats** Nor Amira Abdul Rahman		
	4:00 – 4:20 pm	**Genetic diversity of *Blastocystis* sp. in captive wild birds in Malaysia** Sanggari Anamalai		
	4:20 – 4:40 pm	**Tea break**		Foyer
	4:40 – 4:50 pm	**Lucky draw**		Conference Room 107
	4:50 – 5:00 pm	**Closing ceremony**		

Keynote speaker

Blue Food Transformation: Sustainable Aquaculture & SDGs

Ocean serves as the key to future food security. The ocean has great, untapped potential to feed the world with lower environmental footprints than many other food sources. However due to the challenges in climate change, overfishing and unsustainable fishing practices, which are currently the biggest threats to our ocean. Sustainably scaling of blue food could unlock huge health, environmental and economic opportunities. It is urgent to implement the science we need for the blue transformation for blue food to provide healthy diets within environmental boundaries, as well as connecting both science with policy and business and to ensure that the ocean and blue food is embedded into the global sustainable food system agenda.

Prof. Dato' Dr. Aileen Tan Shau Hwai

BIODATA

Aileen Tan is the Director of Centre for Marine and Coastal Studies (CEMACS) in Universiti Sains Malaysia; Fellow of Academy Science Malaysia; Executive Director of the Asia-Pacific University-Community Engagement Network (APUCEN) and Vice Chair of UNESCO IOC of Western Pacific. She is also a Board member of Partnership for Observations of the Global Oceans (POGO). She serves as international steering committee in several organisations such as CoastPredict, Global Ocean Corps and EquiSea.

Her field of expertise is in marine science, specializing in mariculture and conservation of molluscs, promoting “green aquaculture”, to create an impactful sustainable income for the local communities as well as protecting the environment. She has been elected as the first and only woman President of the 60-years old UNITAS Malacologica, which is based in Belgium, from 2013-2016.

She is also the first Malaysian scientist who has successfully cultured the oysters from eggs and sperms through artificial spawning. She is now actively encouraging the rural coastal communities in several states in Malaysia to culture oysters to promote “green aquaculture” as well as to create a sustainable income for the local communities, besides creating a balance between profit and environment protection. In 2020, she was awarded the Top Research Scientist Award in Malaysia for her expertise in "Mariculture and Marine Ecology, Biodiversity & Conservation". She is the Best Women Scientist for her work in guiding the women-folks in Johore Islands in earning their own income through the giant clam conservation programme. She has initiated several Malaysia Book of Records for her contribution in molluscan studies.

Keynote speaker

PrimateProjects@USM – Fostering Sustainability through Wildlife Conservation and Community Engagement

Non-human primates are humans' closest cousins. In fact, as humans (genus *Homo*), we are ourselves a member of the diverse order of primates. Now, humankind has entered a new epoch commonly referred to as the "Anthropocene", the era of humans, a term synonymous with human impacts on the planet, which also significantly threaten global biodiversity. Many experts argue that humans are the major cause of biodiversity loss that is now between 100 to 1000 times higher than the normal background rate of extinction. Malaysia is a global biodiversity hotspot and with 26 species in the wild, has the second highest primate diversity in SE-Asia, most of them listed as threatened species in the IUCN Red List. However, concerted national efforts to conserve our charismatic cousins are still lacking.

Dr. Nadine Brigitte Ruppert

BIODATA

Dr. Nadine Ruppert is a Senior Lecturer at School of Biological Sciences, Universiti Sains Malaysia and leads her Primate Research & Conservation Lab. With a MSc in Tropical Biology & Animal Ecology from Wuerzburg University Germany, and a PhD in Mammalogy from USM, Nadine has been long involved in zoological research in Malaysia. Nadine is leading a passionate team of postgraduate students in primatology, and together with international collaborators, they have established numerous novel studies on Malaysian primates.

With a strong focus on conservation, both in her academic work on Malaysian primates, as well as her NGO work, Nadine's focus is to educate and empower local communities to protect Malaysia's unique biodiversity heritage and to facilitate feasible conservation measures for wildlife affected by human impacts.

Under the headline PrimateProject@USM, Dr. Nadine Ruppert is facilitating diverse studies and conservation efforts to better understand and conserve Malaysian primates. Since every species faces slightly different challenges and has different abilities to cope with the impending challenges of the Anthropocene, there is no simple one fits all solution. But by connecting and protecting primate habitats, and by connecting and engaging the public and other stakeholders, these projects contribute to the better protection of Malaysian primates through research, environmental education and applied conservation efforts.

Keynote speaker

Bacterial-derived Polyhydroxyalkanoates Bioplastic: An Eco-friendly Substitute for Medical Plastic Waste and Promising Next Generation Biomaterial

Bacterial plastics are plastics which are produced by microorganisms under specific conditions. Polyhydroxyalkonoates (PHAs) are a bacterial plastic that bacteria produce under conditions of low concentrations of important nutrients. This bacterial derived biopolymer is highly sought after by researcher's world over due to its high levels of biocompatibility and inert *in-vivo* degradation products. This makes it a desirable candidate to be tailored as scaffolds for tissue engineering and regenerative medicine. Therefore, PHAs are being extensively innovated for biomedical applications. The wide range of biomedical applications includes drug delivery systems, implants, tissue engineering, scaffolds and artificial organ constructs. Among the various types of PHAs, P(3HB-co-4HB) had gained much attention due to their biodegradability, biocompatibility and non-cytotoxicity. In order to increase the cellscaffold interactions and to enhance the cell proliferation, surface modification of the PHA copolymer was carried out. PHAs in various forms are being extensively researched for biomedical applications so as to bring about the future vision for PHAs as biomaterials for the advancement of research and technology. Various surface modification methods such as nanofabrication, and chemical modification are employed to develop this bacterial polymer for potential biomedical application.

Assoc. Prof. Ts. Dr. Vigneswari Sevakumaran

BIODATA

Assoc. Prof. Ts. Dr Vigneswari Sevakumaran is a senior lecturer at Universiti Malaysia Terengganu (UMT) at School of Fundamental Science (PPSA). She holds BSc (Microbiology), MSc (Industrial Microbiology), and PhD in Healthcare Biotechnology from Universiti Sains Malaysia. Her main research interest is the production of biomaterials for biomedical and pharmaceutical applications. The surface is carried out to promote increased cell-biomaterial interaction for better cell proliferation. Biodegradable polymers such as microbial polymer known as polyhydroxyalkanoate with biocompatible properties are widely studied for application in tissue engineering.

She is on the editorial board of Material Circular Economy Editors and Malaysian Applied Biology Journal. She received Academic Fellow from Universiti Sains Malaysia from June 2021 until May 2022. Her research project are supported by industrial partners such as Progene Link and CIMB Foundation. During her early career, she was awarded the prestigious Young Scientist Medal by International Association of Advanced Material. Currently, she is a member of Malaysian Board of Technologist.

Keynote speaker

Engaging Multidisciplinary Tools in Plant Science: Prospects for Young Researchers

Modern scientific research is mostly multidisciplinary, involving scientists or incorporating techniques from two or more backgrounds. A multidisciplinary approach to plant science research is necessary to advance our holistic knowledge in this field. It is generally believed that higher interdisciplinarity is associated with higher research impact. As a well-trained plant scientist, I have been engaged in several integrative, collaborative and multidisciplinary researches for the past 10 years. In this presentation, I shall be exploring some of the integrative scientific tools which I have utilized in achieving research excellence as a Plant Scientist/Ecologist. Their prospects for upcoming Life Science Researchers shall also be highlighted.

Dr. Gbenga Festus Akomolafe

BIODATA

Dr. Akomolafe Gbenga Festus is a lecturer in the Department of Plant Science and Biotechnology at the Federal University of Lafia, Nigeria. He holds BSc and MSc degrees in Botany from Obafemi Awolowo University, Ile-Ife, Nigeria. He was awarded the Nigerian Government Postgraduate Scholarship for an MSc. degree in 2011. He also obtained his PhD. degree in Botany at the Universiti Sains Malaysia through the TETFund Academic Staff Training and Development (ASTD) Scholarship Grant.

His researches include pteridology, assessment of plant diversities, plant community ecology, spatial ecology, phytoremediation potentials of plants, invasion ecology, and astrobotany. Dr. Akomolafe is highly skilled in GIS, spatial analysis using ArcGIS and QGIS, species distribution modeling, statistical data analysis using several packages.

He is also well-grounded in the application of molecular techniques in solving ecological and taxonomical problems. He has exceptional ability to initiate, manage and provide research leadership and direction to projects across national and international borders. He has published several peer-reviewed articles in reputable journals both home and abroad and contributed papers to national and international conferences. Since 2017, Dr. Akomolafe has been serving as a Volunteer Mentor, Biodiversity Information for Development (BID) funded projects, Global Biodiversity Information Facility (GBIF). Also, he has been a Visiting Researcher and an Academic Fellow of the Universiti Sains Malaysia.

Abstract

- Biodiversity and Natural Resources
- Crop Management
- Microbial Biotechnology
- Environment and Conservation
- Entomology and Ecology

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The theme of the conference, "Empowering Research through Multidisciplinary Approach" is very relevant and pertinent with the current SBS research challenges. A multidisciplinary approach involves drawing appropriately from multiple disciplines to redefine problems outside of normal boundaries and reach solutions based on a new understanding of complex situations. Therefore, this conference was held to encourage postgraduate researchers and scientists to think about the opportunities waiting for them at the interface with the life sciences through a multidisciplinary approach.

Herewith, I would like to state my utmost appreciation and sincerest gratitude to all participants who have presented and shared their findings and experiences. Likewise, my deepest appreciation to the members of the organizing committee for their tremendous efforts and excellent planning in organizing this conference and hope this success will continue in the years to come.

I wish all the participants an enjoyable and successful conference.

Thank you.

Professor Dato' Dr. Amirul Al-Ashraf Abdullah
Dean
School of Biological Sciences
Universiti Sains Malaysia

Message from SBS International Postgraduate Conference 2022 Advisor

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Welcome to the SBS International Postgraduate Conference 2022.

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I wish everyone an enjoyable day full of knowledge.

Thank you.

Professor Dr. Latiffah Zakaria
Advisor
SBS International Postgraduate Conference 2022
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Message from SBS International Postgraduate Conference 2022 Chairman

Assalamualaikum w.b.t. and greetings.

On behalf of the organizing committee, I would like to extend our warmest welcome to all participants of the School of Biological Sciences International Postgraduate Conference 2022 (SBS IPGC 2022). The theme of the conference is "Empowering Research through Multidisciplinary Approach", which highlighted research in the aspects of biodiversity and natural resources, microbial and biotechnology, environment and conservation, crop management as well as entomology and ecology.

This is the second conference organized by the School of Biological Sciences and is offered to all postgraduate students from universities across the world and it is conducted in both physical and virtual presentations. I hope this conference will enhance a spirit of innovation, research skills, creativity and discovery among the participants.

I would like to thank all the committee members of School of Biological Sciences, especially postgraduate students and fellow lecturers for their tremendous commitment, support and time to ensure the smooth running of this conference. My deepest appreciation to the Dean of School of Biological Sciences, keynote speakers and sponsors who have contributed in various ways to make the conference successful. I hope all participants will have a fruitful and pleasant time during this conference.

Thank you.

Dr. Amira Suriaty Yaakop
Chairman
SBS International Postgraduate Conference 2022
School of Biological Sciences
Universiti Sains Malaysia

SBS INTERNATIONAL POSTGRADUATE CONFERENCE 2022
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Conference programme

School of Biological Sciences, Universiti Sains Malaysia
11-12th October 2022

DATE	TIME	EVENT		VENUE
11 October 2022 (Day 1)	8:00 – 8:15 am	**Registration and arrival of participants**		Foyer
	8:15 – 8:30 am	**Arrival of VIPs**		
	8:30 – 8:40 am	**Welcoming speech by Chairman of SBS IPGC 2022, Dr. Amira Suriaty Yaakop**		Conference Room 107
	8:40 – 9:00 am	**Opening ceremony & officiation speech by Prof. Dr. Azlan Abdul Aziz, Dean IPS**		
	9:00 – 9:30 am	Keynote speech by **PROF. DATO' DR. AILEEN TAN SHAU HWAI** **Moderator**: Assoc. Prof. Dr. Wan Fatma Zuharah Wan Musthapa		
	9:30 – 10:00 am	Keynote speech by **DR. NADINE RUPPERT** **Moderator:** Assoc. Prof. Dr. Wan Fatma Zuharah Wan Musthapa		
	10:00 – 10:10 am	**Photography session**		
	10:10 – 10:20 am	**Tea break**		Foyer
		Physical oral presentation		
		Session 1 **Conference Room 107** **(Biodiversity and Natural Resources)** Chairperson: Assoc. Prof. Dr. Darlina Md. Naim Panel: 1. Dr. Hadura Abu Hasan 2. Dr. Farah Alia Nordin	**Session 2** **Room 101** **(Biodiversity and Natural Resources & Crop Management)** Chairperson: Dr. Shuhaida Shuib Panel: 1. Dr. Hasber Salim 2. Dr. Mohamad Fadhli Mad' Atari	
	10:20 – 10:40 am	**The influence of tidal on saltwater intrusion in Sungai Semerak, Kelantan** Muhammad Fikri Samsudin	**Comparative study of the herpetofauna between pristine and anthropogenically-modified habitats at Cameron Highlands, Fraser's Hill and Genting Highlands** Hong Zijia	
	10:40 – 11:00 am	**Effects of 2,4-Dichlorophenoxyacetic acid, kinetin and sucrose on callus induction from cotyledon explants of butterfly pea (*Clitoria ternatea*)** Teoh Siew Chin	**Morphological characteristics of *Taenia* sp. found in the wild rodent from Penang Island, Malaysia** Aoha Yamamoto	
	11:00 – 11:20 am	**The incorporation of vermicast solution in the regeneration of *in vitro* explants of *Ficus carica* cv. Japanese BTM 6** Lee Yong Jun	**The systematics and biogeography of the *Linmonectes hascheanus-limborgi* complex in Peninsular Malaysia** Zou Bei	
	11:20 – 11:40 am	**Induction and proliferation of callus from cotyledon explant of *Clitorea ternatea*** Tengku Nurul Amira Aqma Tengku Zakaria	**Occurrence of sooty blotch and flyspeck disease on mango in Malaysia** Tham Khai Xin	

Conference programme

School of Biological Sciences, Universiti Sains Malaysia
11-12th October 2022

DATE	TIME	EVENT		VENUE
	11:40 – 12:00 pm	**Diversity assessment on the limestone orchids of Northern Peninsular Malaysia** Shahrul Nizam Abu Bakar	**Morphological and molecular identification of fungi associated with crown rot of banana (*Musa paradisiaca*) in Peninsular Malaysia** Aisha Mohammed Inuwa	
	12:00 – 12:20 pm	**Optimization of asymbiotic seed germination, callus induction and proliferation in Tongkat Ali (*Eurycoma longifolia* Jack.)** Sani Saleh	**Pathogenicity of *Ganoderma boninense* onmineral and peat soils** Ike Virdiana	
	12:20 – 12:40 pm	**Prevalance of gastrointestinal parasites from wild rodents in Penang, Malaysia** Putri Wulan		
	12:40 – 2:20 pm	**Lunch break**		Foyer
		Virtual oral presentation		Room 101
		Session 3 Chairperson: Dr. Foong Swee Yeok Panel: 1. Dr. Hazzeman Haris 2. Dr. Yazmin Bustami		
	2:20 – 2:40 pm	***In vitro* analysis of *Sphingobacterium* sp. lipase with LEA K peptide as co-expression** Ibrahim Muhammad		
	2:40 – 3:00 pm	***In silico* analysis of T and B-cells epitopes: candidate for universal dengue vaccine** Dhaniah Mohamad		
	3:00 – 3:20 pm	**The decomposition and succession pattern of forensically important flies associated with organophosphate-intoxicated rat carcasses** Marlini Othman		
	3:20 – 3:40 pm	**Analysis of biodiversity in the Orangutan habitat in Rawa Singkil Wildlife Reserve, Aceh Singkil, Indonesia** Subhan		
	3:40 – 4:00 pm	**Evaluation of antibacterial and antifungal activity of methanolic and ethanolic extracts of three varieties of *Nerium oleander* flowers** Ayman Dardona		
	4:00 – 4:20 pm	**Unveiling the origin of *Cryptocoryne ×jambiensis* Bastmeijer, a newly described plant using molecular markers** Nurul Shakinah Mohd Talkah		
	4:20 – 4:40 pm	**Environmental friendly technique for removal of phenol from aqueous solution via titanium nanoparticle** Muhammad Farhan Hanafi		
	4:40 – 5:00 pm	**Tea break**		Foyer

Conference programme

School of Biological Sciences, Universiti Sains Malaysia
11-12th October 2022

DATE	TIME	EVENT		VENUE
12 October 2022 (Day 2)	8:30 – 9:00 am	**Breakfast**		Foyer
	9:00 – 9:30 am	Keynote speech by **ASSOC. PROF. TS. DR. VIGNESWARI SEVAKUMARAN** Moderator: Assoc. Prof. Dr. Rashidah Abdul Rahim		Conference Room 107
	9:30 – 10:00 am	Keynote speech by **DR. GBENGA FESTUS AKOMOLAFE** Moderator: Assoc. Prof. Dr. Rashidah Abdul Rahim		
	10:00 – 10:20 am	**Tea break**		Foyer
		Physical oral presentation		
		Session 4 **Conference room 107** **(Microbial Biotechnology)** Chairperson: Dr. Kamarul Zaman Zarkasi Panel: 1. Assoc. Prof. Dr. Amir Hamzah Ahmad Ghazali 2. Dr. Nur Asshifa Md Noh	**Session 5** **Room 101** **(Environment and Conservation & Entomology and Ecology)** Chairperson: Dr. Nik Ahmad Irwan Izzauddin Nik Him Panel: 1. Assoc. Prof. Dr. Suhaila Ab. Hamid 2. Dr. Faradina Merican Mohd Sidik Merican	
	10:20 – 10:40 am	**RAP1B and PAK6 as potential targets to co-inhibit with anti-apoptotic protein MCL-1 for nasopharyngeal carcinoma (NPC) therapy** Teh Jia Lin	**Insecticide resistance status in Kedah and Penang populations of the mosquito *Culex tritaeniorhynchus*** Shitta Kefas Babale	
	10:40 – 11:00 am	**Microbial community diversity associated with wild and captive tropical barn owl** Mohd Hasif Ahmad Kamal	**Genetic diversity and phylogenetic relationship of bed bugs infestation in Iraq** Hussein Ali Baqir	
	11:00 – 11:20 am	**Co-expression of protease from *Bacillus toyonensis* with Late Embryogenesis Abundant (LEA)-like peptides** Nurul Ain Syukriyah Ahmad Muhamud	**Behavioral responses of *Cimex hemipterus* (Hemiptera: Cimicidae) to colored harborages** Abd Hafis Abd Rahim	
	11:20 – 11:40 am	**Identification of hydrocarbon degrading bacteria from marine seawater** Anis Fathima Abdul Kareem	**Oviposition preferences of house fly, *Musca domestica* towards substrate treated by black soldier fly larvae, *Hermetia illucens*** Mohamad Ibrahim Mohamad Isa	
	11:40 – 12:00 pm	**Integration of microbial fuel cell (MFC) in secondary school: A needs analysis report** Siti Rohana bt Man	**Differential studies of zinc oxide (ZnO) nanoparticles toxicity toward different mosquito species** Hsieh Ting Chuan	
	12:00 – 12:20 pm	**Biosynthesis of terpolymer P(3HB-co-3HV-co-4HB) using glycerine pitch as sole carbon source**	**Effects of beneficial bacteria in arsenic detoxification and its hyperaccumulation by *Pteris vittata* in contaminated soils**	

Conference programme

School of Biological Sciences, Universiti Sains Malaysia
11-12th October 2022

DATE	TIME	EVENT		VENUE
		Musa Ibn Abbas	Aminu Salisu Muazu	
	12:20 – 12:40 pm		**Potential of ground cover plant as arbuscular mycorrhizal fungi (AMF) trap plant and efficacy of propagated AMF inoculums on growth of okra (*Abelmoschus esculentus* L.).** Nurul Aziera Hassan	
	12.40 – 2:20 pm	**Lunch break**		Foyer
		Virtual oral presentation		Room 101
		Session 6 Chairperson: Dr. Hasnuri Mat Hassan Panel: 1. Dr. Intan Haslina Ishak 2. Dr. Azma Hanim Ismail		
	2:20 – 2:40 pm	**Potential leguminous cover crop, *Vigna marina*, on different soil conditions for soil improvement and crop productivity** Ahmad Talha Mohamad Yunus		
	2:40 – 3:00 pm	**Characterisation and pathogenicity of fungi associated with grey and brown blight diseases of tea (*Camellia sinensis*) in Malaysia** Saleh Ahmed Shahriar		
	3:00 – 3:20 pm	**Continuous cropping of black morels manipulate microbial composition and co-occurring patterns of the soil microbiome** Zhang Yan		
	3:20 – 3:40 pm	**Seasonal assessment of pupal productivity of malaria vector, *Anopheles gambiae* s.l. as influenced by physico-chemical conditions at selected breeding habitats in Niger, Nigeria** Shehu Ibrahim Kura		
	3:40 – 4:00 pm	**Mitigation opportunities to reduce the impact of artificial smooth surfaces on bats** Nor Amira Abdul Rahman		
	4:00 – 4:20 pm	**Genetic diversity of *Blastocystis* sp. in captive wild birds in Malaysia** Sanggari Anamalai		
	4:20 – 4:40 pm	**Tea break**		Foyer
	4:40 – 4:50 pm	**Lucky draw**		Conference Room 107
	4:50 – 5:00 pm	**Closing ceremony**		

Keynote speaker

Blue Food Transformation: Sustainable Aquaculture & SDGs

Ocean serves as the key to future food security. The ocean has great, untapped potential to feed the world with lower environmental footprints than many other food sources. However due to the challenges in climate change, overfishing and unsustainable fishing practices, which are currently the biggest threats to our ocean. Sustainably scaling of blue food could unlock huge health, environmental and economic opportunities. It is urgent to implement the science we need for the blue transformation for blue food to provide healthy diets within environmental boundaries, as well as connecting both science with policy and business and to ensure that the ocean and blue food is embedded into the global sustainable food system agenda.

Prof. Dato' Dr. Aileen Tan Shau Hwai

BIODATA

Aileen Tan is the Director of Centre for Marine and Coastal Studies (CEMACS) in Universiti Sains Malaysia; Fellow of Academy Science Malaysia; Executive Director of the Asia-Pacific University-Community Engagement Network (APUCEN) and Vice Chair of UNESCO IOC of Western Pacific. She is also a Board member of Partnership for Observations of the Global Oceans (POGO). She serves as international steering committee in several organisations such as CoastPredict, Global Ocean Corps and EquiSea.

Her field of expertise is in marine science, specializing in mariculture and conservation of molluscs, promoting “green aquaculture”, to create an impactful sustainable income for the local communities as well as protecting the environment. She has been elected as the first and only woman President of the 60-years old UNITAS Malacologica, which is based in Belgium, from 2013-2016.

She is also the first Malaysian scientist who has successfully cultured the oysters from eggs and sperms through artificial spawning. She is now actively encouraging the rural coastal communities in several states in Malaysia to culture oysters to promote “green aquaculture” as well as to create a sustainable income for the local communities, besides creating a balance between profit and environment protection. In 2020, she was awarded the Top Research Scientist Award in Malaysia for her expertise in "Mariculture and Marine Ecology, Biodiversity & Conservation". She is the Best Women Scientist for her work in guiding the women-folks in Johore Islands in earning their own income through the giant clam conservation programme. She has initiated several Malaysia Book of Records for her contribution in molluscan studies.

Keynote speaker

PrimateProjects@USM – Fostering Sustainability through Wildlife Conservation and Community Engagement

Non-human primates are humans' closest cousins. In fact, as humans (genus *Homo*), we are ourselves a member of the diverse order of primates. Now, humankind has entered a new epoch commonly referred to as the "Anthropocene", the era of humans, a term synonymous with human impacts on the planet, which also significantly threaten global biodiversity. Many experts argue that humans are the major cause of biodiversity loss that is now between 100 to 1000 times higher than the normal background rate of extinction. Malaysia is a global biodiversity hotspot and with 26 species in the wild, has the second highest primate diversity in SE-Asia, most of them listed as threatened species in the IUCN Red List. However, concerted national efforts to conserve our charismatic cousins are still lacking.

Dr. Nadine Brigitte Ruppert

BIODATA

Dr. Nadine Ruppert is a Senior Lecturer at School of Biological Sciences, Universiti Sains Malaysia and leads her Primate Research & Conservation Lab. With a MSc in Tropical Biology & Animal Ecology from Wuerzburg University Germany, and a PhD in Mammalogy from USM, Nadine has been long involved in zoological research in Malaysia. Nadine is leading a passionate team of postgraduate students in primatology, and together with international collaborators, they have established numerous novel studies on Malaysian primates.

With a strong focus on conservation, both in her academic work on Malaysian primates, as well as her NGO work, Nadine's focus is to educate and empower local communities to protect Malaysia's unique biodiversity heritage and to facilitate feasible conservation measures for wildlife affected by human impacts.

Under the headline PrimateProject@USM, Dr. Nadine Ruppert is facilitating diverse studies and conservation efforts to better understand and conserve Malaysian primates. Since every species faces slightly different challenges and has different abilities to cope with the impending challenges of the Anthropocene, there is no simple one fits all solution. But by connecting and protecting primate habitats, and by connecting and engaging the public and other stakeholders, these projects contribute to the better protection of Malaysian primates through research, environmental education and applied conservation efforts.

Keynote speaker

Bacterial-derived Polyhydroxyalkanoates Bioplastic: An Eco-friendly Substitute for Medical Plastic Waste and Promising Next Generation Biomaterial

Bacterial plastics are plastics which are produced by microorganisms under specific conditions. Polyhydroxyalkonoates (PHAs) are a bacterial plastic that bacteria produce under conditions of low concentrations of important nutrients. This bacterial derived biopolymer is highly sought after by researcher's world over due to its high levels of biocompatibility and inert *in-vivo* degradation products. This makes it a desirable candidate to be tailored as scaffolds for tissue engineering and regenerative medicine. Therefore, PHAs are being extensively innovated for biomedical applications. The wide range of biomedical applications includes drug delivery systems, implants, tissue engineering, scaffolds and artificial organ constructs. Among the various types of PHAs, P(3HB-co-4HB) had gained much attention due to their biodegradability, biocompatibility and non-cytotoxicity. In order to increase the cellscaffold interactions and to enhance the cell proliferation, surface modification of the PHA copolymer was carried out. PHAs in various forms are being extensively researched for biomedical applications so as to bring about the future vision for PHAs as biomaterials for the advancement of research and technology. Various surface modification methods such as nanofabrication, and chemical modification are employed to develop this bacterial polymer for potential biomedical application.

Assoc. Prof. Ts. Dr. Vigneswari Sevakumaran

BIODATA

Assoc. Prof. Ts. Dr Vigneswari Sevakumaran is a senior lecturer at Universiti Malaysia Terengganu (UMT) at School of Fundamental Science (PPSA). She holds BSc (Microbiology), MSc (Industrial Microbiology), and PhD in Healthcare Biotechnology from Universiti Sains Malaysia. Her main research interest is the production of biomaterials for biomedical and pharmaceutical applications. The surface is carried out to promote increased cell-biomaterial interaction for better cell proliferation. Biodegradable polymers such as microbial polymer known as polyhydroxyalkanoate with biocompatible properties are widely studied for application in tissue engineering.

She is on the editorial board of Material Circular Economy Editors and Malaysian Applied Biology Journal. She received Academic Fellow from Universiti Sains Malaysia from June 2021 until May 2022. Her research project are supported by industrial partners such as Progene Link and CIMB Foundation. During her early career, she was awarded the prestigious Young Scientist Medal by International Association of Advanced Material. Currently, she is a member of Malaysian Board of Technologist.

Keynote speaker

Engaging Multidisciplinary Tools in Plant Science: Prospects for Young Researchers

Modern scientific research is mostly multidisciplinary, involving scientists or incorporating techniques from two or more backgrounds. A multidisciplinary approach to plant science research is necessary to advance our holistic knowledge in this field. It is generally believed that higher interdisciplinarity is associated with higher research impact. As a well-trained plant scientist, I have been engaged in several integrative, collaborative and multidisciplinary researches for the past 10 years. In this presentation, I shall be exploring some of the integrative scientific tools which I have utilized in achieving research excellence as a Plant Scientist/Ecologist. Their prospects for upcoming Life Science Researchers shall also be highlighted.

Dr. Gbenga Festus Akomolafe

BIODATA

Dr. Akomolafe Gbenga Festus is a lecturer in the Department of Plant Science and Biotechnology at the Federal University of Lafia, Nigeria. He holds BSc and MSc degrees in Botany from Obafemi Awolowo University, Ile-Ife, Nigeria. He was awarded the Nigerian Government Postgraduate Scholarship for an MSc. degree in 2011. He also obtained his PhD. degree in Botany at the Universiti Sains Malaysia through the TETFund Academic Staff Training and Development (ASTD) Scholarship Grant.

His researches include pteridology, assessment of plant diversities, plant community ecology, spatial ecology, phytoremediation potentials of plants, invasion ecology, and astrobotany. Dr. Akomolafe is highly skilled in GIS, spatial analysis using ArcGIS and QGIS, species distribution modeling, statistical data analysis using several packages.

He is also well-grounded in the application of molecular techniques in solving ecological and taxonomical problems. He has exceptional ability to initiate, manage and provide research leadership and direction to projects across national and international borders. He has published several peer-reviewed articles in reputable journals both home and abroad and contributed papers to national and international conferences. Since 2017, Dr. Akomolafe has been serving as a Volunteer Mentor, Biodiversity Information for Development (BID) funded projects, Global Biodiversity Information Facility (GBIF). Also, he has been a Visiting Researcher and an Academic Fellow of the Universiti Sains Malaysia.

Abstract

- Biodiversity and Natural Resources
- Crop Management
- Microbial Biotechnology
- Environment and Conservation
- Entomology and Ecology

SESSION 1

Subtheme: Biodiversity and Natural Resources

THE INFLUENCE OF TIDAL ON SALTWATER INTRUSION IN SUNGAI SEMERAK, KELANTAN

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ABSTRACT

Saltwater intrusion is a situation that may occur naturally, and it may be influenced by human activity when seawater comes into freshwater bodies such as rivers from the estuary and groundwater. The saltwater intrusion was a major concern for most people that depend on freshwater, especially near coastal areas, because this phenomenon can contaminate the water resources in rivers as well as groundwater, affect drinking water, and may cause negative impacts on the agricultural area. Sungai Semerak was one of the busiest rivers in Kelantan for the time being. Many impacts were faced by Sungai Semerak to make way for developments. In this study, a set of data was collected and is still ongoing until December 2022. This data covered the effect of seasonal and tidal fluctuation within this area. From the data gathered since July 2022, the tidal fluctuation influenced the water quality of Sungai Semerak as well as salinity. During neap tide and ebbs, salinity was slightly lower compared to spring tide, and flooding was due to seawater entering the river up to 12 km from the estuary. Seawater may go further than that point if the tidal gate fails to close. But groundwater may still be polluted by salt water over time. This study will continue with a comparative study on the effect of seasonal change on water quality and biodiversity of macrofauna.

Keywords: saltwater, saltwater intrusion, water quality, tide, macrofauna

Subtheme: Biodiversity and Natural Resources

EFFECTS OF 2,4-DICHLOROPHENOXYACETIC ACID, KINETIN AND SUCROSE ON CALLUS INDUCTION FROM COTYLEDON EXPLANTS OF BUTTERFLY PEA (*Clitoria ternatea*)

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ABSTRACT

Clitoria ternatea (Butterfly pea), or locally known as "bunga telang" is a tropical medicinal plant from the Fabaceae family. The abundance of phytochemical compounds especially taraxerol and taraxerone linked to the mammalian neuroprotective mechanism further increased the value of this medicinal plant. However, direct harvesting of this plant for its phytochemical compounds would subsequently lead to depletion in abundance while the quantity and quality of the phytochemical compounds may be varied due to cultivation factors. Hence, *in vitro* culture techniques such as callus and cell suspension cultures are the alternative and efficient approach in harnessing the valuable phytochemical compounds from this medicinal plant. This study therefore, aims to induce callus from cotyledon explants of *C. ternatea* for the establishment of cell suspension cultures. Two-weeks-old cotyledon explants of *C. ternatea* were subjected to the combination treatments of 2,4-dichlorophenoxyacetic acid (2,4-D) (0.25 mg/L and 0.5 mg/L) and kinetin (0 mg/L, 0.25 mg/L, 0.50 mg/L, 0.75 mg/L and 1.00 mg/L) in half-strength Murashige and Skoog media to evaluate the effect of these plant growth regulators on callus induction. Results revealed that the treatment of 0.5 mg/L 2,4-D in combination with 0.75 mg/L kinetin resulted in the highest callus fresh weight (0.0724 ± 0.0268 g) in comparison to the other treatments with the callus being friable in morphology. Meanwhile, the effect of sucrose concentrations (15 g/L and 30 g/L) on callus induction from cotyledon explants of C. *ternatea* were evaluated using half-strength MS media supplemented with 2,4-D (0 mg/L, 0.2 mg/L, 0.4 mg/L, 0.6 mg/L, 0.8 mg/L and 1.0 mg/L). The results showed that sucrose concentration of 15 g/L was optimum in inducing friable callus for this plant species with the highest callus fresh weight achieved in the treatment of 0.4 mg/L 2,4-D with 15 g/L sucrose. This study thereby revealed that 2,4-D alone was adequate to induce friable callus while 15 g/L of sucrose was the optima sucrose concentration for callus induction of *C. ternatea*. Future work involves media optimization for callus proliferation and cell suspension culture to produce valuable phytochemical compounds from *C. ternatea*.

Keywords: 2,4-D, callus, *Clitoria ternatea*, cotyledon, kinetin, sucrose

Subtheme: Biodiversity and Natural Resources

THE INCORPORATION OF VERMICAST SOLUTION IN THE REGENERATION OF *IN VITRO* EXPLANTS OF *Ficus carica* CV. JAPANESE BTM 6

Lee Yong Jun[1*], Sreeramanan Subramaniam[1], Hasnuri Mat Hassan[1] and Chew Bee Lynn[1]

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ABSTRACT

Fig *(Ficus carica* L.) from the Moraceae family is widely cultivated in the subtropical and Mediterranean regions of the world. The fig fruit contains high levels of natural fiber, minerals and vitamins. Current conventional propagation methods of this plant such as grafting, hardwood cutting and air layering are not efficient in yielding viable plant stocks for farm establishments in Malaysia. This is mainly due to the low rooting efficiency as a result of such propagation methods. Vermicast is the product of the degradation of organic matter by earthworm and is known to have beneficial effects on plant growth in agriculture. The aim of this study is to assess the regeneration effects of vermicast solution on *in vitro* shoot cultures of *Ficus carica* cv. Japanese BTM 6. Sterile nodal segment explants were subjected to treatments in different concentration of cytokinin which are meta-topolin, 6-Benzylaminopurine (BAP), 6-(γ,γ-Dimethylallylamino) purine (2iP), Zeatin and Thidiazuron (TDZ); different concentration of auxin which are Indole-3-acetic acid (IAA), Indole-3-butyric acid (IBA) and 1-Naphthaleneacetic acid (NAA); different concentration of vermicast solution (5%, 10%, 15%, 20%, 25% and 30%) for explant regeneration. Result indicated that the highest number of multiple shoots (6.39 ± 0.59 shoots) was observed in Murashige and Skoog (MS) medium supplemented with 1.0 mg/L meta-topolin whereas the highest increment of explant shoot height (3.43 ± 0.16 cm) was observed in MS medium supplemented 0.5 mg/L Zeatin. The treatment of 1.5 mg/L IAA was found to induce the highest number of roots (1.78 ± 0.48 roots) in comparison to all single treatments of auxins. On the other hand, MS medium supplemented with 20% vermicast solution resulted in the highest number of roots (3.93 ± 0.60 roots) with average shoot length of 3.16 ± 0.59 cm as compared to other concentrations of vermicast solution and auxin treatments assessed. The utilization of vermicast solution did not stimulate the regeneration of multiple shoots as compared to the cytokinin treatments but significantly boosted the regeneration of roots for the *in vitro* cultures in comparison to the auxin treatments tested. The investigation demonstrated the potential root stimulating effects of vermicast solution on *in vitro* cultures. Future studies include the combination effect of the meta-topolin and vermicast solution in the micropropagation of *F. carica* cv. Japanese BTM 6 and the application of vermicast in the acclimatization step.

Keywords: Meta-topolin, Zeatin, vermicast solution, *Ficus carica*

Subtheme: Biodiversity and Natural Resources

INDUCTION AND PROLIFERATION OF CALLUS FROM COTYLEDON EXPLANT OF *Clitoria ternatea*

Tengku Nurul Amira Aqma Tengku Zakaria[1], Sreeramanan Subramaniam[1] and Chew Bee Lynn[1*]

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ABSTRACT

Clitoria ternatea L. belongs to the Fabaceae family and is commonly known as "bunga telang" in Malaysia. It is widely distributed in tropical Asia and its extract is used as a brain tonic to treat diseases associated with the central nervous system (CNS) due to its potential as an anti-stress, anti-anxiolytic agent, anti-depressant, and anti-inflammatory. The current study aims to initiate and proliferate friable callus from cotyledon explants of *C. ternatea* using plant growth regulators in various concentrations and combinations. Friable callus was induced from sterile cotyledon explants in the half strength Murashige and Skoog medium supplemented with different concentrations and combinations of 2,4-D and Benzylaminopurine (BAP), followed by proliferation of callus using different concentrations 2,4-D. The highest fresh weight of friable callus was induced in half strength MS media supplemented with 0.25 mg/L 2,4-D (0.025 ± 0.016) g. Half strength MS media supplemented with 0.5 mg/L 2,4-D resulted in the highest callus fresh weight for callus proliferation. The morphology of callus has turned compact in 0.25 mg/L 2,4-D whereas 0.5 mg/L 2,4-D retained the morphology of friable that was suitable for subsequent studies. In conclusion, 2,4-D alone without the addition of other cytokinin was adequate and optimal in the induction of friable callus whereas 0.5 mg/L of 2,4-D was optimal to proliferate and retain the friable callus morphology. Future studies involve elicitation and establishment of cell suspension culture to enhance secondary metabolites linked to memory enhancement and ageing.

Keywords: *Clitoria ternatea*, friable callus, induction, proliferation

Subtheme: Biodiversity and Natural Resources

DIVERSITY ASSESSMENT ON THE LIMESTONE ORCHIDS OF NORTHERN PENINSULAR MALAYSIA

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ABSTRACT

To date, documentation on the orchid flora from the limestone hills in Kedah and north Perak is still lacking, with limited literature available. It is an urgent need to fill the knowledge gap, so the proper documentation on the diversity of orchids from this unique limestone habitat can be prepared. In this study, diversity assessment of the limestone orchids has resulted in a total of 55 species from 36 genera, of which nine species were new records to Kedah, and surprisingly, two species were new records to Malaysia (*Bulbophyllum meson* and *Luisia brachystachys*). Findings of other keystone species such as the long-lost *Cheirostylis goldschmidtiana* and the endangered Snow-White slipper orchid, *Paphiopedilum niveum*; have proven the need for a more comprehensive study to unveil the richness and diversity of orchids in the limestone habitat. The lack of attention and immediate conservation action over time would only lead to more habitat loss, and declining populations. The obscure species that could be new to science will be threatened by anthropogenic activities such as quarrying and forest clearing for agriculture. Results from this research will serve as baseline data for future works in documenting and conserving the limestone orchids in northern Peninsular Malaysia.

***Keywords*:** diversity, limestone, northern Peninsular Malaysia, Orchidaceae, conservation

Subtheme: Biodiversity and Natural Resources

OPTIMIZATION OF ASYMBIOTIC SEED GERMINATION, CALLUS INDUCTION AND PROLIFERATION IN TONGKAT ALI (*Eurycoma longifolia* Jack.)

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ABSTRACT

Eurycoma longifolia Jack., commonly known as Tongkat Ali, is a popular medicinal plant of Southeast Asian origin. It belongs to the quassia family (Simaroubaceae) which is known to have abundant quassinoid biochemicals. Some of these biochemicals have been proven to be effective in treating important medical conditions such as cancer. Traditionally, roots are mostly used for the preparation of Tongkat Ali herbal medicine. However, this is not sustainable as the wild population is seriously threatened. To ensure continuous utilization of this important resource, *in vitro* materials have been proposed as a better alternative. In this research, the effects of sodium hypochlorite (NaOCl) on the surface sterilization of Tongkat Ali seeds for asymbiotic germination were tested. The effects of 1-naphthaleneacetic acid (NAA), and 2,4-dichlorophenoxyacetic acid (2,4-D) including their combination with 6-benzylaminopurine (BAP) on callus induction and proliferation were also tested. The surface sterilization of intact fruits with 40% Clorox containing 1.7% NaOCl followed by sterilization of seeds with 8% Clorox containing 0.34% NaOCl demonstrated 19.6% and 27.8% contamination with up to 47.8% and 33.3% germination in purple and red seeds, respectively. As for callus induction, it was observed 1 mg/L NAA produced more yellow-friable calli on both leaves and petiole/internodes explants while a combination of 1 mg/L 2,4-D and 0.5 mg/L BAP produced more compact calli on both leaves and petiole explants. In addition, the results of callus proliferation showed that 2.0 mg/L NAA produced significantly higher biomass (67.67 mg) than other treatments. As conclusion, concentrations of 1.7% and 0.34% NaOCl are effective in sterilizing the seeds while still maintaining their viability. In addition, 1.0 mg/L NAA and 2.0 mg/L NAA are efficient for callus induction and proliferation in *E. longifolia* seeds, respectively.

Keywords: *Eurycoma longifolia*, Tongkat Ali, sterilization, tissue culture, callus

Subtheme: Biodiversity and Natural Resources

PREVALENCE OF GASTROINTESTINAL PARASITES FROM WILD RODENTS IN PENANG, MALAYSIA

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ABSTRACT

Rodent species are well known for their ability to serve as reservoir hosts and disease carriers. Rodents had successfully adapted to a wide range of ecosystems and habitats, including urban areas. The urban environment is a major source of concern for the spread of zoonotic diseases because large cities provide optimal habitats for certain wild animals, resulting in increasing contact with humans daily. To determine the prevalence of gastrointestinal parasites found in wild rodents a study was conducted with the collaboration of Seberang Perai city council (MBSP) and Pulau Pinang city council (MPPP). A total of 37 wild rodents were trapped by using wire traps in commercial and residential areas of Seberang Perai and Penang Island. The host species were identified as *Rattus rattus, R. norvegicus* and *Bandicota indica.* Meanwhile, the dominant species captured was *R. norvegicus* with 81.08 %. Out of 37 wild rodents, 19 (51.35%) of the host were infected with gastrointestinal parasites. The gastrointestinal parasites found in this study were *Hymenolepis* sp., *Heterakis spumosa*, *Taenia* sp., *Gongylonema neoplasticum, Thelazia* sp., *Echinostoma revolutum, Blastocystis* sp., and *Tritrichomonas* sp. The highest prevalence of gastrointestinal parasites found was *Blastocystis* sp. and the following parasites have potential medical importance: *Hymenolesis* sp., *Taenia* sp., *G. neoplasticum*, *E. revolutum,* and *Blastocystis* sp. It is crucial to plan for the emergence of rodent-borne zoonoses to ensure public health and safety. Information on the host parasitic infection provides valuable insights into the transmission of the disease and will aid in future prevention and control measures for public health.

Keywords: rodents, gastrointestinal infection, helminth, zoonoses

SESSION 2

Subtheme: Biodiversity and Natural Resources

COMPARATIVE STUDY OF THE HERPETOFAUNA BETWEEN PRISTINE AND ANTHROPOGENICALLY-MODIFIED HABITATS AT CAMERON HIGHLANDS, FRASER'S HILL AND GENTING HIGHLANDS

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ABSTRACT

Habitat destruction and modification have been some of the major threats affecting biodiversity worldwide. Some upland regions of Peninsular Malaysia, namely Cameron Highlands (CH), Fraser's Hill (FH) and Genting Highlands (GH) are amongst the most heavily damaged due to agriculture, tourism and recreational activities. This study represents the first comparative study on herpetofauna in upland regions of Peninsular Malaysia in opposing habitats. The study was conducted at two pristine (PS) and two anthropogenically-modified sites (MS) each at CH, FH and GH from December 2020 to September 2022. A total of 1750 individuals from 60 species of herpetofauna (33 frogs, 15 lizards and 12 snakes) were recorded. Out of these numbers, 18 species were found only from PS, 16 species only from MS, and 26 species from both PS and MS. The highest number of species observed was from Girdle Road at FH (MS, 19 species), followed by Riverview Apartment at GH (MS, 18 species). The highest number of individuals observed was from Strawberry Park Trail at CH (322 individuals), followed by Riverview Apartment at GH (310 individuals), and Girdle Road at FH (178 individuals). Pine Tree Trail (PS) at FH had both the lowest number of species and individuals recorded (eight species, 36 individuals). The number of species and individuals recorded at each site were highly affected by the altitude and the presence of water bodies respectively. The number of species and individuals recorded were high in moderately disturbed MS which was still surrounded by large areas of undisturbed forest. The species that were observed from these sites were the most common and wide-ranging species. The most disturbed sites, such as at MARDI and vegetable farms of CH, had the lowest species richness as their habitats were completely cleared for agriculture activities. Endemic upland species that have highly restricted geographical ranges such as *Leptobrachella kecil* and *Pseudocalotes drogon* were observed only from PS. Logging and habitat destruction of upland areas of Peninsular Malaysia were still ongoing and becoming more extensive, especially at CH and GH. More studies on the ecology and impacts of habitat destruction and modification on herpetofauna species should be conducted in order to develop effective strategies for conserving them before it is too late.

Keywords: amphibians, reptiles, habitat modification, upland, Banjaran Titiwangsa

Subtheme: Biodiversity and Natural Resources

MORPHOLOGICAL CHARACTERISTICS OF *Taenia* sp. FOUND IN THE WILD RODENT FROM PENANG ISLAND, MALAYSIA

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ABSTRACT

Taenia sp. is a tapeworm which causes reduction in weight, vomiting, malnutrition and intestinal obstruction to feline and canine. Murid and cricetid rodents serve as intermediate hosts for *Taenia* sp. and contribute to the transmission of infectious diseases in the urban environment. This study aims to identify *Taenia* sp. in rodent liver based on its morphological characteristics. Wild rodents were sampled from several urban settings in Penang from May 2022 to September 2022. Cage trapping with various baits was used to attract the rodents. Dissection was carried out and the parasite was carefully observed under a light microscope followed by observation under the scanning electron microscope (SEM). Out of 36 rodents, *Taenia* sp. was found in six wild rats which were *Rattus rattus diardii* (*n* = 4) and *Rattus norvegicus* (*n* = 2). White cysts (4.0 - 4.6 mm in diameter) were embedded in the liver of rodents. The cyst contains coiled *Taenia* sp. in the larval stage. Large scolices, the rostellum with four suckers, and two rows of taenoid - type hooks were observed under a light microscope. The electron micrographs revealed that the worm comprises 33 hooks at the anterior crown and posterior crown. The lengths of each hook were approximately 248 µm (outer) and 121 µm (inner). Moreover, the length of the tail bud was 7.4 mm in diameter. Based on the morphological features, the worm was suspected to be *Taenia taeniaeformis*.

Keywords: light microscope, scanning electron microscope, *Taenia* sp., wild rodent

Subtheme: Biodiversity and Natural Resources

THE SYSTEMATICS AND BIOGEOGRAPHY OF THE *Linmonectes hascheanus-limborgi* COMPLEX IN PENINSULAR MALAYSIA

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ABSTRACT

This study presents a systematic revision of the South Asian species *Limnonectes haschesnus-limborgi* complex in Peninsular Malaysia. The species delimitation and diagnostic characters were determined by integrating biogeographic, molecular and bioacoustics approaches. Based on phylogenetic analyses using mtDNA 16s rRNA and nuDNA tyrosinase genes, the study was confirmed that *L. limborgi* did not exist in Peninsular Malaysia and it has been erroneously identified as *L. hascheanus* for a very long time. New voucher material collected from Fraser's Hill and Genting Highlands that have not been previously sampled have provided a more complete geographic coverage of the species distribution. Besides that, the bioacoustics recordings were reported for the first time since their original descriptions in this study and they showed a significant difference in the male advertisement call characters. Further analysis on phylogenetic and bioacoustics analysis are needed to further support and provide more substantial evidence of their differences.

Keywords: amphibians, cryptic species, integrative taxonomy, biogeographic, molecular phylogeny, bioacoustics

Subtheme: Crop Management

OCCURRENCE OF SOOTY BLOTCH AND FLYSPECK DISEASE ON MANGO IN MALAYSIA

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ABSTRACT

Sooty blotch and flyspeck (SBFS) is a disease complex caused by multiple fungal species. The disease is commonly reported previously on pome fruits, such as apples causing pigmented blemishes on fruit surfaces upon colonization thus reducing the fresh fruit quality. Similar disease symptoms of SBFS were observed on mango in several orchards in Perak during field visits in 2018 and 2019. The present study was carried out to assess the SBFS disease on mango through morphological, molecular and pathogenicity analyses. A total of 27 mango fruits showing SBFS disease symptoms were collected from several mango orchards in Perak. Fungal colonies were described on fruits and pure isolates were obtained for morphological observation, DNA extraction for sequencing, and phylogenetic analysis using two loci namely the internal transcribed spacer (ITS) and large subunit (LSU) regions of ribosomal DNA. Two inoculation methods, *in planta* and *in vitro* inoculations were done on healthy mango fruits (cv. Chok Anan). Morphological characters, DNA sequencing, and phylogenetic analyses using the maximum likelihood and the maximum parsimony revealed that the two representative isolates used in the present study were *Peltaster* sp., a common SBFS fungus. Healthy mango fruits inoculated with the two isolates showed similar disease symptoms of SBFS as initially observed, and the isolates were successfully reisolated and reidentified, fulfilling Koch's postulates. This is the first report of *Peltaster* sp. causing SBFS on mango in Malaysia. Further studies unraveling the pathogens associated with SBFS disease complex of mango in Malaysia are necessary before an effective SBFS disease management can be proposed.

Keywords**:** mango, Malaysia, *Peltaster* sp., sooty blotch and flyspeck

Subtheme: Crop Management

MORPHOLOGICAL AND MOLECULAR IDENTIFICATION OF FUNGI ASSOCIATED WITH CROWN ROT OF BANANA (*Musa paradisiaca*) IN PENINSULAR MALAYSIA

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ABSTRACT

Crown rot is a main fruit rot disease of banana with significant impact on fruit quality at postharvest period. The disease is due to the activity of several fungal pathogens. In the present study, a total of 96 fungal isolates were recovered from symptomatic banana crowns obtained from various states in Peninsular Malaysia. Morphological characteristics were used to tentatively identify the isolates to genus levels and for some isolates to species levels. Depending on the genus, different sets of regions/genes were applied for molecular identification and phylogenetic analysis for representative isolates. Based on the translation elongation factor (TEF-1α) and β-tubulin (TUB), isolates from the genus *Fusarium* were identified as *F. incarnatum* (n=45), *F. proliferatum* (n=4), *F. solani* (n=10), and *F. verticillioides* (n=3). The internal transcribed spacer (ITS) region, TUB, and glyceraldehyde-3-phosphate dehydrogenase (GAPDH) genes were used to identify *Colletotrichum siamense* (n=12). Species identified using ITS, TEF-1α, and TUB sequences were *Lasiodiplodia theobromae* (n=4) and *Nigrospora sphaerica* (n=4). *Curvularia lunata* (n=3) was identified using ITS and large subunit (LSU) regions as well as the TEF-1α gene. Sequencing of ITS, TUB, and Calmodulin (CaM) confirmed the identification of *Penicillium citrinum* (n=2), *Aspergillus tamarii* (n=2), and *A. niger* (n=2). Species identification of *Pestalotiopsis microspora* (n=4) was based on ITS and TUB sequences. The results of the study provided knowledge on the occurrence of various fungal species associated with banana crown rot.

Keywords: banana, crown rot, fungi, *Musa paradisiaca*

Subtheme: Crop Management

PATHOGENICITY OF *Ganoderma boninense* ISOLATES FROM MINERAL AND PEAT SOILS

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ABSTRACT

Basal stem rot (BSR) caused by *Ganoderma boninense* is the most serious disease of oil palm, leading to low yield. In Indonesia, incidence of BSR was reported in both mineral and peat soils. In order to control BSR in peat and mineral soils, an understanding of the pathogenicity of *G. boninense* and observations of disease development are necessary. Pathogenicity testing was conducted in nursery trials at two oil palm estates in North Sumatra, representing mineral and peat soil estates. Rubber wood blocks inoculated with various isolates of *G. boninense* provided the source of disease infection. The pathogenicity tests on oil palm seedlings were set up in a randomized block design and assessed by the percentage of seedlings showing BSR symptoms. Oil palm seedlings inoculated with *G. boninense* isolated from mineral soil plantations (and planted in mineral soil) showed early BSR symptoms (third month after treatment), whereas those planted in peat soil and treated with *G. boninense* isolates from peat soil showed symptoms later (sixth month after treatment). After 24 months, the highest incidence of BSR in mineral soils was 77.8% while in peat soils, 55.6%. The pathogenicity tests indicated that *Ganoderma* isolates from mineral soils are more pathogenic than those from peat soils.

Keywords: oil palm, *Ganoderma*, basal stem rot, BSR, pathogenicity

SESSION 3

Subtheme: Microbial Biotechnology

IN VITRO ANALYSIS OF *Sphingobacterium* sp. LIPASE WITH LEA K PEPTIDE AS CO-EXPRESSION

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ABSTRACT

A yellowish Gram-negative bacterium known as *Sphingobacterium* sp. is typically distinguished by a high concentration of sphingophospholipids in its lipid composition. Due to the recent increase in demand for the use of microbial enzymes in industrial fields, this research aims to elucidate lipase activity of *Sphingobacterium* sp. from a cold-adapted soil environmental sample. The recombinant *Sphingobacterium* sp. lipase with LEA K (Ab3) sample and the amino acids sequence was obtained from Lab 406 to study the substrate's specificity, function, and mechanism that contribute to the co-expression. The recombinant *Sphingobacterium* sp. sample was extracted using plasmid followed by transformation via heat shock and then expressed. The optimum expression conditions were determined to be at 25 ºC for 24 hours of incubation with 0.5 mM IPTG. The His-tagged Ab3 lipase was purified and achieved 40.2 folds with a 7.91% yield and specific activity of 480.53 U/mg using one-step affinity purification technique. The enzymatic activity was carried out at 15 ºC and under pH 7. Substrate specificity study indicated that Ab3 lipase has the highest affinity towards olive oil with the K_m at 0.2353 mM, V_{max} at 98.04 µmol min^{-1} mg^{1}, and K_{cat} at 3,624.13 min^{-1}. The amino acid sequence showed 100% similarity with *Sphingobacterium* sp. lipase in the NCBI database. This is due to 32.03% sequence identity of this lipase with the solved structure of esterase (PDB ID 4ypv).

Keywords: Lipase, LEA, substrate, His-tag, recombinant

Subtheme: Microbial Biotechnology

IN SILICO ANALYSIS OF T AND B-CELLS EPITOPES: CANDIDATE FOR UNIVERSAL DENGUE VACCINE

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ABSTRACT

Dengue is the most widespread arthropod-borne viral disease worldwide and is considered life-threatening because sequential heterologous dengue infections can lead to severe illness. This study presents several conserved and immunogenic epitopes ensemble vaccines for dengue infection targeting the global population using the immunoinformatics approach. The predicted epitopes were allelic restricted to $CD4^+$ and $CD8^+$ T-cells with high immunogenicity. This study discovered the combination of these T-cell epitopes could cover more than 99% of the population protection coverage (PPC) worldwide. The predicted multiple epitope vaccines showed high epitope recovery and could confer B-cell epitopes. These epitopes also exhibited stable specific epitope-receptor complexes. Therefore, this vaccination strategy should be able to elicit both the cellular and the humoral responses that might later provide protection against all four dengue serotypes.

Keywords**:** dengue, T-cell, B-cell, epitope, immunoinformat

Subtheme: Entomology and Ecology

THE DECOMPOSITION AND SUCCESSION PATTERN OF FORENSICALLY IMPORTANT FLIES ASSOCIATED WITH ORGANOPHOSPHATE-INTOXICATED RAT CARCASSES

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ABSTRACT

The flies (order: Diptera) that can be found on decomposing bodies are an important tool to estimate the post-mortem interval in crime investigation. The presence of chemical substances such as pesticide can alter the succession of forensically important flies and the process of decomposition. Therefore, this research aims to study the influence of two organophosphate pesticides which are glyphosate (herbicide) and chlorpyrifos (insecticide) in the decomposition process and the succession of flies infesting intoxicated rat carcasses at secondary forest in Kuching, Sarawak. Albino rats (*Rattus norvegicus* var. *Wistar*) were used as an animal model, weighing around 180-200 g. The rats were assigned as T1 (glyphosate) and T2 (chlorpyrifos) groups, respectively. LD50 dosage of glyphosate (7.4 g/kg) and chlorpyrifos (0.2 g/kg) were given via oral administration, whereas the control groups were given distilled water. Sixty minutes after oral administration, the rats were euthanized and brought to the study site. The rat carcass decomposition was monitored daily, with photographic record and flies were collected from fresh until dry phase of decomposition process. Five trials of the experiment were conducted from November 2020 until November 2021. A total of 1454 individual flies were collected, which consisted of 10 species from three families namely Calliphoridae, Sarcophagidae, and Muscidae. The most abundant fly species caught was *Chrysomya rufifacies* which accounts for 75% of total individual flies collected. This blowfly species was the earliest fly to arrive on carcasses, together with *Chrysomya megacephala*. Although the time of arrival of flies are similar, there was no egg present, hence there was no larvae infesting the T2 carcasses. The number of fly species and their frequency was also the least in T2 carcasses if compared to control and T1 groups. Data showed that the intoxicated carcasses displayed a longer decomposition process compared to the control group. Decomposition of T1 carrion took 8.20 ± 1.88 (mean ± SD), while T2 carrion took 17.4 ± 0.89 days to complete which was longer than the control group carrion which took only 7.60 ± 1.52 days. In conclusion, the pesticides have caused changes in the duration of decomposition process and the frequency of flies infesting the carcasses especially on carcasses treated with insecticides (chlorpyrifos). This work provides relevant information regarding the flies' succession pattern and the changes in decomposition period associated with glyphosate and chlorpyrifos intoxication. This may assist in determination of post mortem interval time in future investigation processes when organophosphate poisoning is suspected.

Keywords: forensic entomology, flies, organophosphate, decomposition

Subtheme: Biodiversity and Natural Resources

ANALYSIS OF BIODIVERSITY IN THE ORANGUTAN HABITAT IN RAWA SINGKIL WILDLIFE RESERVE, ACEH SINGKIL, INDONESIA

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ABSTRACT

Indonesia is a country with a high level of biodiversity. Wildlife Reserve Rawa Singkil is a conservation area in Aceh Province that encompasses 81,799.79 hectares and is a component of the Leuser Ecosystem Area (LEA). As part of the LEA, Rawa Singkil boasts an exceptional diversity of life and Indonesia's highest orangutan (*Pongo abelli)* population density. However, as a natural habitat for orangutans, there is not much information about the biodiversity of the Singkil swamp area. This is important to study, considering that orangutan species depend on food sources for various types of forage trees found in this area. As a peat swamp forest ecosystem, Rawa Singkil is home to a variety of intriguing plant species, including pencil orchids (*Papilionanthe hookerina*), swamp lilies (*Crinum asiaticum*), and lecture bags (*Nepenthes*). In addition, there are commercial tree species, such as Meranti (*Shorea* spp.) Because Rawa Singkil is a natural habitat for orangutans, which are listed as endangered, its existence must be conserved and preserved. The objective of this study is to estimate the amount of biodiversity in the Singkil Wildlife Reserve region, Singkil resort. This research employed the vegetation analysis approach with the sample plot system. The plot points were determined by first employing the purposive sampling method and, subsequently, the path method. The Shannon Wiener requirements were used to calculate the diversity index value, with the following categories: 1 indicates little diversity, 1-3 indicates medium diversity, and > 3 indicates high diversity. The results indicated that the diversity index value (H') for seedlings was 0.35; for saplings, it was 0.24; for poles, it was 0.30, and for trees it was 0.33. In this Wildlife Reserve area, it is anticipated that the loss of food tree sources may threaten the existence of the orangutan.

Keywords: biodiversity, vegetation analysis, orangutan, Rawa Singkil, Aceh

Subtheme: Biodiversity and Natural Resources

EVALUATION OF ANTIBACTERIAL AND ANTIFUNGAL ACTIVITY OF METHANOLIC AND ETHANOLIC EXTRACTS OF THREE VARIETIES OF *Nerium oleander* FLOWERS

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ABSTRACT

Herbal medicine has been utilized for healing and health care since ancient times, and crude extracts of various parts of medical plants have been widely employed for the treatment of human diseases. The medicinal plants' therapeutic potential is related to the presence of various compounds with antibacterial and antifungal characteristics. Numerous plant species have been extensively studied for their antimicrobial properties. This study aims to assess the antibacterial and antifungal activities of three *Nerium oleander* flower varieties (red, pink, and white). Plant samples from the three flower varieties were collected from various locations in Gaza City, Palestine. Then, the samples were extracted in 250 ml of ethanol and methanol using the Soxhlet apparatus. Dimethyl sulfoxide (DMSO) stock solutions were utilized to create concentrations of 50, 100, 200, 300, and 500 mg/ml. The antibacterial and antifungal activities of flower extracts against Gram-positive (*Staphylococcus* sp. and *Streptococcus* sp.) and Gram-negative (*Escherichia coli*) bacteria as well as *Candida* sp. were determined using the agar well diffusion technique. The Chi-square (χ^2) test was employed to determine a statistical relationship between antimicrobial activity of the extracts and solvent types. The results showed that all flower extracts (red, white, and pink) did not show any antibacterial activity against *E. coli* at all concentrations tested utilizing both ethanolic and methanolic solvents. On the other hand, the ethanolic extracts of the red flower variety showed inhibition against *Streptococcus* sp. with inhibition zones of 5 mm and 7 mm at 100mg/ml and 300 mg/ml, respectively. The methanolic extracts of the red and pink variants showed inhibition against *Staphylococcus* sp., but the white variety did not show any effect in all concentrations, even at 500 mg/ml. Using ethanolic extracts at a concentration of 300 mg/ml, all flower varieties demonstrated inhibition against *Staphylococcus* sp. The pink and white flower varieties showed antifungal activity against *Candida* sp. at a concentration of 300 mg/ml using the methanolic extract, but the red variety showed antifungal activity in the ethanolic extract. Statistically, there was a significant relationship between antibacterial and antifungal activity and extract types. The present study revealed the potential of methanolic and ethanolic extracts of three varieties of *N. oleander* flowers as antibacterial and antifungal agents.

Keywords: *Nerium oleander*, antibacterial, antifungal, methanolic and ethanolic extracts

Subtheme: Biodiversity and Natural Resources

UNVEILING THE ORIGIN OF *Cryptocoryne* ×*jambiensis* Bastmeijer, A NEWLY DESCRIBED PLANT USING MOLECULAR MARKERS

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ABSTRACT

Several expeditions in Sumatera and adjacent islands have resulted in identifications of new *Cryptocoryne* species and interspecific hybrids within the genus. Some of the suspected hybrids were described based on morphological and cytological information. Few *Cryptocoryne* individuals involved in this study are suspected hybrids due to a mixture of complex characteristics in their morphology. The relationships of these hybrids to other *Cryptocoryne* species are vague due to close resemblance in their morphology. For newly described species, molecular studies were proven to give useful insight in defining the historical background of these natural hybrids. Nuclear genes were known to be biparentally inherited from both pollen donor and receiver, whereas chloroplast genes were known to be only inherited directly from the maternal parent. In this study, one newly described *Cryptocoryne* hybrid was analyzed using nuclear and chloroplast markers. *Cryptocoryne* ×*jambiensis* Bastmeijer was collected from Jambi province in Sumatera. The putative parents for this hybrid were *C. nurii* and *C. bangkaensis*. Based on molecular data interpretations, *C.* ×*jambiensis* origin is most likely to be bidirectional in which both of its parents can become pollen donors and pollen receivers.

Keywords: *Cryptocoryne*, Sumatera, natural hybrids, molecular, nuclear, chloroplast

Subtheme: Environmental and Conservation

ENVIRONMENTAL FRIENDLY TECHNIQUE FOR REMOVAL OF PHENOL FROM AQUEOUS SOLUTION VIA TITANIUM NANOPARTICLE

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ABSTRACT

Water pollution is a major problem in the developing country due to rapid growth of industrialization nowadays. Discharging of organic effluents especially phenolic compounds into natural streams and rivers eventually causes serious environmental effects, aquatic or non-aquatic due to its properties which are mostly toxic, mutagenic, and carcinogenic. Phenol is an aromatic compound that is discarded in the ecosystem mostly from waste water produced in the manufacturing of pharmaceuticals, weaponry, paper, textiles, and insecticides, and also in the petroleum processing sectors. People's attentiveness in phenol degradation has increased recently due to their highly toxicity as well as detrimental towards living things and ecosystem. Therefore, in this study, an environmental friendly technique namely photocatalytic reaction was introduced for removal of phenol from aqueous solution using titanium nanoparticles catalyst which then resulted toward clean water.

Keywords: environmentally friendly, titanium nanoparticles, organic pollutant, phenol, photocatalytic reaction, clean water

SESSION 4

Subtheme: Microbial Biotechnology

RAP1B AND PAK6 AS POTENTIAL TARGETS TO CO-INHIBIT WITH ANTI-APOPTOTIC PROTEIN MCL-1 FOR NASOPHARYNGEAL CARCINOMA (NPC) THERAPY

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ABSTRACT

The anti-apoptotic protein MCL-1 is found highly expressed in the nasopharyngeal carcinoma (NPC) cell lines. Although crucial for cell survival, targeting MCL-1 alone was ineffective, suggesting the need to discover potential targets to co-inhibit with MCL-1. In order to identify potential targets, gene expression microarray was employed to reveal the changes in global transcriptomics in NPC *MCL-1* knockout cell lines. Moderated t-test was applied to statistically compare the following groups: (1) HK-1 *MCL-1* knockout cell line vs HK-1 parental cell line and (2) C666-1 *MCL-1* knockout cell vs C666-1 parental cell line. The differentially expressed genes (DEGs) were determined at adjusted $p < 0.05$ (corrected by Benjamini Hochberg's method) and fold-change > 2. Hub genes analysis and pathway enrichment analysis were performed to identify the crucial pathways associated with the DEGs. The results showed that the deletion of *MCL-1* in both NPC cell lines commonly modulated the upstream signalling of the MAPK signalling pathway, namely the Rap1 signalling and focal adhesion pathways. The *RAP1B* and *PAK6* oncogenes from the respective pathways were found upregulated in both the *MCL-1* knockout NPC cell lines. Collectively, based on the bioinformatic analysis, RAP1B and PAK6 could be potential targets that could be co-inhibited with MCL-1, for the treatment of NPC. Moving forward, the qPCR analysis will be conducted to study the expressions of these identified targets in the MCL-1 knockout NPC cell lines.

Keywords: nasopharyngeal carcinoma, targeted therapy, anti-apoptotic protein MCL-1, knockout

Subtheme: ***Microbial Biotechnology***

MICROBIAL COMMUNITY DIVERSITY ASSOCIATED WITH WILD AND CAPTIVE TROPICAL BARN OWL

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ABSTRACT

The diversity of microbes associated with tropical barn owls is indeed diverse in general. The aim of this study is to identify microbes associated with the gut of wild tropical barn owls and captive tropical barn owls. Identification of microbes in the owls involved sampling collection of owl pellets, isolation and enumeration of bacteria from the pellet. The detail identification of bacteria through their morphology observation, Gram staining and biochemical test and 16S rRNA amplicon sequencing was also done toward the chosen colonies. Result of this study showed the diversity of microbes associated with wild tropical barn owls was dominated by *Staphylococcus* sp.*, Escherichia coli, Bacillus* sp. and *Micrococcus* sp., whereas *Staphylococcus* sp.*, Escherichia coli, Bacillus* sp.*, Acinetobacter* sp.*, Chromobacterium* sp. and *Haemophilus* sp. were found to be able to coexist in captive tropical barn owls. This study provides some valuable information about the diversity of microbial communities in the owls. Various factors can contribute to the diversity of microbes in the owl and one of the important factors is the owl's diet. Overall, the diversity and abundance of microbes in the owl were expected to be discovered and identified through culture dependent by Gram staining and biochemical test, along with molecular method by 16S rRNA amplicon sequencing.

Keywords: diversity, wild and captive barn owl, *Staphylococcus* sp., diet, 16S rRNA amplicon sequencing

Subtheme: Microbial Biotechnology

CO-EXPRESSION OF PROTEASE FROM *Bacillus toyonensis* WITH LATE EMBRYOGENESIS ABUNDANT (LEA)-LIKE PEPTIDES

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ABSTRACT

Recombinant protein expression has been developed as an alternative method in producing a better yield of microbial enzymes to support the industrial demand. However, the expression of certain proteins resulted in lower production and quality. Therefore, Late Embryogenesis Abundant (LEA)-like peptide co-expression system has been introduced as an alternative to enhance and improve the quality of protein. In this work, the protease gene from *Bacillus toyonensis* was amplified using Polymerase Chain Reaction (PCR) with specific designed primers. The protease genes were sub-cloned and expressed using pRSFDUET-LEA 1 and pRSFDUET-LEA K vectors in the highly expressed *Escherichia coli* strain BL21(DE3) respectively. The expression of recombinant protease was successful; thus the purification process was done through Immobilized Metal Affinity Chromatography (IMAC) using Talon Disposable Gravity Column and the molecular weight of purified protease was determined to be at expected size of 28.81kDa using Sodium Dodecyl Sulphate-Polyacrylamide gel electrophoresis (SDS-PAGE).

Keywords: LEA-like peptide, co-expression system, purification, protease

Subtheme: Microbial Biotechnology

IDENTIFICATION OF HYDROCARBON DEGRADING BACTERIA FROM MARINE SEAWATER

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ABSTRACT

One of the most significant sources of water pollution today is oil spills. This happened due to oil leakage and accidental spills during the exploration, refining, transport, production, incomplete combustion of fossil fuels, and human activities. The effects of hydrocarbon contamination on terrestrial, aquatic, and atmospheric ecosystems are broad and pose severe toxic effects. Biocatalysis introduces new ways to improve the development of bioremediation strategies using microorganisms to degrade the hydrocarbon compounds such as petrol and diesel. In this study, hydrocarbon degrading bacteria were isolated from an oil contaminated marine site at sea area in Queensbay, Penang using nutrient agar, Tributyrin agar and Rhodamine B olive oil agar to screen for its lipase activity. Two isolates were found to produce the lipase enzyme which were isolates Ani-9 and Ani-4. Further analyses were done on both isolates using biochemical test such as oxidase, catalase, Methyl Red and Voges-Proskauer, and 16s rRNA sequencing resulting in identifying the isolates as *Bacillus cereus* (Ani-9) and *Serratia marcescens* (Ani-4). Hydrocarbon degrading abilities were then observed for both isolates using Bushnell-Haas broth medium supplemented with 2%, 5%, 10%, 15%, 20%, 50% (v/v) hydrocarbon substrate (petrol & diesel) for 12 days. The results showed that isolate Ani-4 can degrade petrol and diesel starting within 24 hours until more than 10 days. Isolate Ani-9 can degrade petrol and diesel after 24 hours to 48 hours until more than 10 days.

Keywords: marine bacteria, hydrocarbon degradation, lipase, bioremediation

Subtheme: Microbial Biotechnology

INTEGRATION OF MICROBIAL FUEL CELL (MFC) IN SECONDARY SCHOOL: A NEEDS ANALYSIS REPORT

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ABSTRACT

Green technology is one of the environmental education approaches that can be implemented among students in secondary school. In addition, green technology can be applied in the science curriculum to encourage students' interest in appreciating the environment. It is also useful in curbing the negative human involvement in nature. This preliminary research looked at the need to implement a green technology module by integrating microbial fuel cell in Biology syllabus. This research assessed the current understanding of Biology form five students about Microbial Fuel Cell (MFC) in Kulim, Kedah. A survey was done on 40 students. Data obtained were analysed descriptively using mean and standard deviation. The results showed a moderate level of understanding about MFC among form five students. Additionally, the needs for implementing microbial fuel cell (MFC) in Biology syllabus were investigated by conducting interviews among experts in MFC and Biology teachers. By using thematic analysis, opinions of teachers and experts in MFC were grouped into several categories: 1) Inadequate Content Related to Environmental Education and Green Technology in Biology Syllabus; 2) Level of Teachers' Knowledge of Green Technology in Biology Subject Need to Be Improved; 3) Level of Teachers' Knowledge on Pedagogical Methods Need to Be Improved. Therefore, the results of this study suggest that utilising the green technology approach is very important to improve the level of understanding about the environment among secondary school students.

Keywords: green technology, Microbial Fuel Cell (MFC), environmental education, Biology curriculum

Subtheme: Microbial Biotechnology

BIOSYNTHESIS OF TERPOLYMER P(3HB-*co*-3HV-*co*-4HB) USING GLYCERINE PITCH AS SOLE CARBON SOURCE

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ABSTRACT

Plastics have become a vital commodity in our life resulting in a wide range of items that combine comfort and quality. The most utilized plastics today are petroleum-based plastics such as polyethylene and polyethylene terephthalate. These plastics have unique features, including being lightweight, thermostable, crystalline, easy-to-mould, and are utilized in packaging, medical, agricultural, and pharmaceutical industries. Biobased plastics such as polyhydroxyalkanoates (PHAs) have proven to be an alternative material to replace petroleum-based plastics. PHAs are biodegradable and biocompatible microbial biopolymers produced by several bacterial species such as *Cupriavidus, Ralstonia, Burkholderia, Bacillus, Allochromatium, Pseudomonas*, and *Methylobacterium.* The most commonly used carbon sources for PHA production are sugars and oils where their utilization is deemed uneconomical and unsustainable. This research aims to screen suitable conditions for synthesizing biodegradable terpolymer P(3HB-*co*-3HV-*co*-4HB) through a single-step cultivation process using a renewable carbon source by *Cupriavidus malaysiensis* (USMAA1020). In this study, terpolymer synthesis was accomplished using shake flask production. PHA production was conducted at 30 °C, 200 rpm for 72 hours. The cells were harvested and analyzed using Gas chromatography (GC). Preliminary experiments showed the ability of the bacteria to produce PHA (terpolymer) in different concentrations of glycerine pitch. Oleic acid, 1-pentanol, and 1-4 butanediol were the precursors for terpolymer production. The effects of different concentrations of glycerin pitch, 1-pentanol, 1-4 butanediol, and oleic acid were studied and the highest PHA content was observed in 15 g/L glycerine pitch, 0.06 wt% C of 1-pentanol, 0.25 wt% C of 1-4 butanediol and oleic acid yielded the highest PHA content of 79 wt % and cell dry weight (CDW) of 5.82 g/L**.** The suitable condition for terpolymer P(3HB-*co*-3HV-*co*-4HB) production using glycerine pitch as the sole carbon source and certain precursors has been established. The result of this work showed the *C. malaysiensis* (USMAA1020) able to convert complex waste to wealth involving glycerine pitch. This provides an alternative carbon substrate to lower the production cost, boost global PHA (bioplastic) production and control environmental pollution.

Keywords: renewable carbon source, biodegradable polymer, glycerine pitch, biopolymer, polyhydroxyalkanoates, biobased plastics, terpolymer

SESSION 5

Subtheme: Entomology and Ecology

INSECTICIDE RESISTANCE STATUS IN KEDAH AND PENANG POPULATIONS OF THE MOSQUITO *Culex tritaeniorhynchus*

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ABSTRACT

In many regions of Southeast Asia, including Malaysia, the transmission of Japanese encephalitis is mostly carried out by the mosquito species *Culex tritaeniorhynchus*. Since they are commonly found around rice fields and are thus exposed to agricultural pesticides, it is important to establish their susceptibility status. The insecticide resistance status of both adults and larvae from two sites were investigated. *Culex tritaeniorhynchus*, the most prevalent in the study area at the time of sampling, was collected from the rice fields of Bandar Baharu and Bumbong Lima, and evaluated for the levels of resistance toward three insecticides: 0.25% pirimiphos-methyl, 0.1% propoxur, and 0.25% permethrin. Adult *Cx. tritaeniorhynchus* from both locations exposed to these insecticides could only induce mortality of 23%, 22%, and 76% for propoxur, permethrin, and pirimiphos-methyl, respectively indicating high resistance level. This was carried out using the WHO tube bioassay. The larval bioassay indicated that temephos was effective toward *Cx. tritaeniorhynchus* from all locations which caused 100% mortality after 24 h exposure. A dose response study was conducted using eight concentrations (ranging from 0.0001 ppm to 0.0008 ppm). The LC_{50} and LC_{99} values calculated were 0.00026 and 0.00104, respectively. Since the resistance status of *Cx. tritaeniorhynchus* from the two locations is the first of its kind in the study area, this can serve as a baseline study from which researchers can build their understanding of the resistance status of *Cx. tritaeniorhynchus* in this region. Given the significance to public health, this is essential.

Keywords**:** *Culex tritaeniorhynchus,* Kedah and Penang field mosquito populations, insecticide resistance

Subtheme: Entomology and Ecology

GENETIC DIVERSITY AND PHYLOGENETIC RELATIONSHIP OF BED BUGS INFESTATION IN IRAQ

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ABSTRACT

Due to a rapid rise in bed bug infestations in residential buildings, bed bug worries have grown over the past three decades. The population of bed bugs in Iraq is very poorly known, and no research has been done on their genetic diversity or phylogenetic relationship. Therefore, this study aims to identify and determine the genetic diversity and phylogenetic relationship of bed bugs collected from major cities in Iraq by using partial sequences of cytochrome oxidase I gene (*COI*) and 16S ribosomal RNA (16S rRNA). A total of 1041 bed bug specimens of different stages were collected from 18 infested sites (eight out of 18 governorates) in Iraq. Based on the ratio of width and height of the pronotum, most samples were tentatively identified as *Cimex hemipterus*. Species identity was then determined by parts of the 16S rRNA and *COI* genes which showed high similarity (91.3 to 100%) to *C. hemipterus* sequences on BLAST. The neighbor- joining (NJ) tree also showed that the sequences obtained were clustered together in a monophyletic clade with *C. hemipterus* reference sequences with bootstrap values of 99% for the *COI* and 97% for the 16S, thus confirming the species identity as *C. hemipterus*. DnaSP analysis of both *COI* and 16S rRNA sequences of the bed bug population in Iraq showed low genetic diversity. This study provides information to Iraqi pest control professionals so they may appropriately plan for effective bed bug management in Iraq. It also provides the general public, medical communities, and urban entomologists with molecular demographic knowledge.

***Keywords*:** bed bug, genetic diversity, phylogenetics, infestation dynamics

Subtheme: Entomology and Ecology

BEHAVIORAL RESPONSES OF C*imex hemipterus* (HEMIPTERA: CIMICIDAE) TO COLORED HARBORAGES

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ABSTRACT

Insects employ visual cues for many different actions, such as recognizing hosts, locating mates, ovipositing, and looking for places to hide. Behavioral bioassays (two-choice and three-choice) were conducted to determine whether tropical bed bugs prefer specific-colored harborages. The results indicated that red and black harborages were optimal harborage choices for bed bugs. Male and female preferred red colored harborages while 5th instar preferred black colored harborages. Bed bugs in mixed aggregations (male + female, and male + female + 5th instar) showed similar preference towards both black and red colored harborages. Furthermore, 12 weeks of rearing bed bugs inside container containing red, black and white colored harborage showed that there was no significant difference ($p>0.05$) between the final population size of tropical bed bugs. However, tropical bed bugs reared in container with red paper (600 ± 89.238) had the highest number of individuals (various life stages) followed by black (473 ± 133.841) and white (485 ± 84.234) paper. Bed bug preference towards colored harborages may provide useful information for those developing new bed bug control methods or improving monitoring devices.

***Keywords*:** Tropical bed bug, behavioral response, harborage color, rearing

Subtheme: Entomology and Ecology

OVIPOSITION PREFERENCES OF HOUSE FLY, *Musca domestica* TOWARDS SUBSTRATE TREATED BY BLACK SOLDIER FLY LARVAE, *Hermetia illucens*

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ABSTRACT

House fly (HF), *Musca domestica* is a well-known pest that is often associated with livestock facilities, and it also serves as a mechanical vector for diseases that causes losses to humans and animals. Mechanisms involving the attractant, repellent, and deterrent regarding HF were often related to volatile organic compounds. Thus, this study aims to investigate the oviposition inhibition of HF in the presence of black soldier fly (BSF) larvae. Substrate media treated by 10, 100, and 1000 BSF larvae and control treatment (without BSF larvae) were prepared for oviposition preferences of female HF (laboratory and wild strains). A mixture of 200 g mouse pellets and 470 ml water was prepared as a rearing and oviposition substrate. The BSF larvae and rearing substrate were kept inside the rearing trays (20 x 20 x 10 cm) and placed into the rearing cages (30 x 30 x 30 cm). The experiments were conducted under constant laboratory conditions with 30ºC temperature and 70% relative humidity. The treatment includes the occurrence of BSF larvae in rearing substrate after 1 hour and 24 hours. A total of 500 female adult HF were released into the treated cages and the oviposition of HF was recorded after a week. The number of HF pupae (laboratory and wild strains) was significantly lower ($p<0.001$, one-way ANOVA) in the rearing substrate with BSF larvae compared to the substrate without BSF larvae after 1 hour of treatment. For 24 hours of treatment, the number of HF pupae (laboratory and wild strains) in the rearing substrate with 1000 BSF larvae (11.00 ± 1.16 and 12.67 ± 2.03, respectively), was significantly lower ($p<0.001$, one-way ANOVA) compared to the substrate without 1000 BSF larvae (118.00 ± 4.58 and 51.67 ± 5.46, respectively). The low number of HF pupae recorded was possibly due to the exhaustion of resources, consumed by BSF larvae. Interspecific competition inhibits the growth of HF larvae, therefore, resulting in a low number of HF populations.

***Keywords*:** pest, oviposition preferences, deterrent, interspecific competition

Subtheme: Entomology and Ecology

DIFFERENTIAL STUDIES OF ZINC OXIDE (ZnO) NANOPARTICLES TOXICITY TOWARD DIFFERENT MOSQUITO SPECIES

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ABSTRACT

Mosquitoes are main vectors of many important diseases including dengue fever and Chikungunya. In Malaysia, application of larvicides is part of the integrated vector management program. However, for over 40 years, only synthetic chemicals were widely applied. In this study, zinc oxide (ZnO) nanoparticles (NPs) were aimed to be an alternative or supplement substance for mosquito larvae control activity. The toxicity of ZnO NPs was tested against late third and early fourth-instar larvae of *Aedes aegypti*, *Aedes albopictus*, and *Culex quinquefasciatus*. The mode of action was determined based on the results of scanning electron microscope (SEM), energy dispersive x-ray spectroscopy (EDX), and its mapping of zinc and oxygen elements on the treated larvae. Uniform efficacy was observed towards *Ae. aegypti*, *Ae. albopictus*, and *Cx. quinquefasciatus* larvae (LC50 = 47.24 mg/L, 35.48 mg/L, and 56.55 mg/L, respectively). This showed the consistent toxicity of ZnO NPs. Scanning electron microscope images showed shrinkage of the thorax and abdominal segments, as well as damage to the head, abdominal region, thorax region, and siphon. Although EDX confirmed the presence of zinc elements on treated larvae, the mapping did not indicate any obvious concentrations on any parts of the body. This could be due to the colour selected for representative elements that weren't distinctive enough. It was also hypothesised that ZnO NPs enter the body through ingestion, inhalation, and attachment on the body surface, which then damage body cells and cause larval mortality. These results suggested that ZnO NPs has the potential to be used as an alternative in ecofriendly approach for the control of mosquito vectors.

Keywords: mosquito, zinc oxide nanoparticles, toxic

Subtheme: Environment and Conservation

EFFECTS OF BENEFICIAL BACTERIA IN ARSENIC DETOXIFICATION AND ITS HYPERACCUMULATION BY *Pteris vittata* (Pteridaceae) IN CONTAMINATED SOILS

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ABSTRACT

Arsenic (As) is a potentially dangerous chemical derived from natural and anthropogenic environmental sources that can be ingested into the body through contaminated food and or water. Arsenic accumulation in the soil is a global issue usually addressed through phytoremediation techniques. *Pteris vittata* is a herbaceous fern known as the Chinese ladder brake, ladder fern, or Chinese brake fern. It is an arsenic hyperaccumulator that can accumulate up to 22,000 mg kg^{-1} or more of As in its above-ground biomass as dry weight compared to only 40 mg kg^{-1} As accrued by non-hyperaccumulator plants. *Pteris vittata* has a notable capacity for translocating substantial amounts of As to the fronds, with shoot concentrations almost 100 times higher than soil concentrations. It can tolerate a remarkably high amount of As compared to the low amount tolerated by most vascular plants. This study was conducted to determine the effects of *Bacillus paramycoides* 3P20 (CCB-MBL 5013) and *Scandinavium goeteborgense* 3U4 (CCB-MBL 5014) in As detoxification and hyperaccumulation by *P. vittata*. The total content of As in soil and plant samples was determined using the inductively coupled plasma-optical emission spectrometry (ICP-OES) method. The As bio-transformation assay was carried out using the silver nitrate (AgNO3) screening method. The result showed a significant increase in the total arsenic content in the fronds of *P. vittata* inoculated with the bacterial isolates. There was a significant decrease in the dry shoot weight of the plant compared to the control. From the result, there was no significant increase in the SPAD value of the plant in the first and fourth week, but a significant increase was recorded after the eighth week of transplanting. The result of this experiment indicated that the bacterial strains have promoted the plant's growth and significantly increased the arsenic detoxification efficiency and its hyperaccumulation by the plant.

Keywords**:** beneficial bacteria, Arsenic, hyperaccumulation, *Pteris vittata*, detoxification, soil, contamination

Subtheme: Environment and Conservation

POTENTIAL OF GROUND COVER PLANT AS ARBUSCULAR MYCORRHIZAL FUNGI (AMF) TRAP PLANT AND EFFICACY OF PROPAGATED AMF INOCULUMS ON GROWTH OF OKRA (*Abelmoschus esculentus* L.)

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ABSTRACT

Arbuscular mycorrhizal fungi (AMF) remarkably contribute to nutrient uptake particularly P in the plant. The fungi have low host specificity colonizing more than 80% angiosperms plants and 92% plant families. Ground cover plants (GCPs) including grasses and weeds are highly abundant and have potential to be employed as AMF trap plants. In this study, 42 species of GCPs were collected and six species (*Borreria latifolia*, *Mimosa pudica*, *Asystasia gangetica*, *Desmodium triflorum*, *Ischaemum ciliare* and *Axonopus compressus*) were selected based on responsiveness levels by measuring their frequency of plant occurrence and fungi infection percentage. Under greenhouse conditions, four selected trap plants (*M. pudica, A. gangetica, A. compressus* and *Z. mays)* were grown to propagate AMF with or without addition of vermicompost (VC). Propagated AMF inoculums were then further tested on okra (*Abelmoschus esculentus*) to assess their effects on plant growth. The results showed that AMF infection percentage and spore production in all trap plants were significantly higher without addition of VC than with VC addition although the latter had significantly increased all plant growth parameters. AMF inoculums propagated with GCP of *A. gangetica* and *A. compressus* as trap plants induced better performance of okra growth compared to commercial AMF and inoculum propagated by *Z. mays.*

Keywords: ground cover plant, trap plant, propagated arbuscular mycorrhizal fungi inoculum, plant growth

SESSION 6

Subtheme: Environment and Conservation

POTENTIAL LEGUMINOUS COVER CROP, *Vigna marina*, ON DIFFERENT SOIL CONDITIONS FOR SOIL IMPROVEMENT AND CROP PRODUCTIVITY

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ABSTRACT

The saline soil has electrical conductivity (EC) of more than 4dSmL^{-1} (approximately 40 mM NaCl) in the root zone at 25°C and an exchangeable Na concentration of 15%. From an agricultural perspective, the presence of neutral soluble salts may inhibit the development of most crop plants. However, a tropical legume grows in nutrient-deficient, high-salinity sandy soil, known as *Vigna marina*, which has potential as a leguminous cover crop under high salinity soil conditions. The symbiotic connection with root-nodulating bacteria had been established, which was adapted to these hard circumstances and contributed to nitrogen fixation. Thus, these cover crops may contribute to low-input sustainable agriculture. As a potential leguminous cover crop, *V. marina* can reduce soil environmental stress conditions and improve soil fertility and nutritional status. Thus, two experiments were conducted to explore the possibility of *V. marina* as a viable leguminous cover crop under high salinity conditions. Seed germination and growth were optimized in a plant house before being planted in the field. The development and nodulation of *V. marina* were compared to those of established leguminous cover crops, *Pueraria javanica* and *Mucuna bracteata*. Additionally, the impact of commercialized rhizobial compost (CRC) on the growth and nodulation of *V. marina* was also examined. However, the rhizobial compost (CRC) has little effect on the development of *V. marina* under high salinity soil conditions (coastal vs. inland soils). The results also showed that *V. marina* could quickly outgrow *P. javanica* and *M. bracteata*. The facts suggest that *V. marina* was a potential alternative leguminous cover crop, especially for saline soil conditions.

Keywords: soluble salts, legume, *Vigna marina*, nodulation, rhizobial compost

Subtheme: Crop Management

CHARACTERISATION AND PATHOGENICITY OF FUNGI ASSOCIATED WITH GREY AND BROWN BLIGHT DISEASES OF TEA (*Camellia sinensis*) IN MALAYSIA

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ABSTRACT

Tea (*Camellia sinensis*) is an evergreen shrub species that is widely grown to produce a soft drink made from its fresh and younger leaves. Foliar diseases of tea such as grey blight and brown blight are the major threats to tea plants as the diseases can affect the quality of tea produced, thus rendering to major yield loss. From preliminary observation in Cameron Highlands, Pahang showed that several tea plants have been infected with these two fungal diseases. The grey blight symptoms were characterised as circular to irregular grey lesions associated with reddish borders. The lesions were commonly accompanied by black dots. Typical brown blight symptoms appeared as irregular brown to black lesions which tended to expand with age. Therefore, this study aims to isolate and identify the fungi associated with grey and brown blighted leaves of tea based on morphological and molecular characteristics as well as to assess their pathogenic capacity in causing diseases toward the host plant. A total of 90 fungal isolates were isolated from diseased leaves of *C. sinensis* from three different locations in Cameron Highlands, Pahang, Malaysia. To confirm the fungal identity up to species level, DNA sequences and multigene phylogenetic analysis of internal transcribed spacer (ITS), β-tubulin (*tub2*), glyceraldehyde 3-phosphate dehydrogenase (*gapdh*), and translation elongation factor 1-α (*tef1-α*) were adopted. Wound inoculation and mycelial plug were used for pathogenicity tests conducted on healthy leaves of tea. Based on morphological characteristics and molecular identification, the fungal isolates were belonged to three species, namely, *Colletotrichum camelliae* (45 isolates), *Neopestalotiopsis clavispora* (24 isolates), and *Pseudopestalotiopsis camelliae-sinensis* (21 isolates). Pathogenicity tests verified that *C. camelliae* was responsible for causing brown blight while *N. clavispora* and *Ps. camelliae-sinensis* caused the grey blight of *C. sinensis*. To our knowledge, the present study is the first report in Malaysia. The information obtained in the present study can be used for disease monitoring and management of brown and grey blight of *C. sinensis*.

Keywords**:** *Colletotrichum camelliae*, *Neopestalotiopsis clavispora*, *Pseudopestalotiopsis camelliae-sinensis*, grey blight, brown blight, *Camellia sinensis*

Subtheme: Microbial Biotechnology

CONTINUOUS CROPPING OF BLACK MORELS MANIPULATES MICROBIAL COMPOSITION AND CO-OCCURRING PATTERNS OF THE SOIL MICROBIOME

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ABSTRACT

Black morels (*Morchella* spp., Morchellaceae, Pezizales), valuable edible mushroom cultivated in soil, have severe yield reduction in continuous cropping (CC) systems. To investigate the influence of CC systems on soil physicochemical properties and soil microbial communities of black morels and discern whether these physicochemical factors and microbes are related to morel production, this study designed a controllable indoor experiment, involving three cropping systems, namely, non-CC sowed with isolate HX13 (0y), CC sowed with isolate HX13 (2y) and CC sowed with isolate YN05 (2yi), respectively. 16S rDNA and ITS high throughput amplicon sequencing and microbiome analyses were performed to identify changes in the microbial community and screen vital microbial taxa related to primordial yield. Microbial diversity and community composition differed among different cropping systems and black morel developmental stages. The negative correlated microbial taxa might be responsible for the promotion of primordial differentiation and help suppress diseases, while positive ones were thought to be pathogens or involved with increases in nutrient substrate levels and altering specific physicochemical properties in soil. Non-CC was more complex than the CC co-occurring network and has a closer phylogenetic relationship. Bacteria have stronger randomness and a narrower niche. The findings provide a dynamic overview of the microbial community for the soil-cultivated mushrooms, present a clear scope for screening beneficial and adverse microbes, and offer potential thoughts of alleviating the CC obstacles to black morels.

Keywords: black morel, *Morchella*, mushrooms, microbial diversity

Subtheme: Entomology and Ecology

SEASONAL ASSESSMENT OF PUPAL PRODUCTIVITY OF MALARIA VECTOR: *Anopheles gambiae* s.l. AS INFLUENCE BY PHYSICO-CHEMICAL CONDITIONS AT SELECTED BREEDING HABITATS IN NIGER, NIGERIA

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ABSTRACT

Malaria is the most significant protozoan disease in Africa and the principal vector-borne disease (VBD) in Nigeria, which is influenced by the quality of breeding habitats that are reflected through the stage preceding adult. Control of *Anopheles gambiae* s.l. populations through source reduction is still considered the most effective way of prevention and control, although it has proven unsustainable in Niger State. Using physico-chemical properties as indicators for pupae density, the breeding sites such as gutters (GT), swamps (SW), and large water bodies (LW) were investigated. Samples were taken inside and outside each 1 m^2 cage that was placed in each sampling habitats weekly by dipping and agitation techniques from May 2019 to March 2020. The data generated were then subjected to one-way analysis of variance (ANOVA). The findings revealed the means pupae abundance (MPA), were significantly higher in LW (624.50 ± 217.81), followed by GT (436.00 ± 184.2) and SW (285.50 ± 125.06). In terms of productivity, the mean pupae productivity (MPP) following the order of descending rate >GT (717.50 ± 219.38) >LW (677.21 ± 145.10) >SW (530.40 ± 136.97). Regarding the methods used, the result showed that agitation technique (AT) was more sufficient and reliable than dipping technique (DT). Based on the monthly record of MPA and MPP, the peak abundance and productivity of the pupal stage was June, July, and August then declined in March, 2020 for both habitats. However, MPP differed significantly ($p<0.05$) from one another across the months in all the habitat types. Further, the results showed strong statistical main effects for sampling time (months) ($F= 422.879$, $P= 0.000$), habitat ($F= 75.991$, $P= 0.000$); and sampling techniques ($F= 134.698$, $P= 0.000$). The results of partial eta squared showed that 95.5%, 43.4% and 40.5% of the variations were explained by months, habitat and sampling techniques, respectively. Moreover, interaction effects between the three independent variables (months, habitat, and sampling techniques) were also highly significant. The physical and chemical properties of the breeding sites of mosquitoes varied significantly, except in temperature, total hardness, biochemical oxygen demands, conductivity, and pH for all the habitats. This study revealed high utilization of physico-chemical properties for metamorphosis at high pupae densities and the availability of these *Anopheles* pupae poses an increased risk of malaria. Thus, emphasis on the vector management strategies should be given specially on GT and LW as breeding habitats of malaria vectors in Niger State.

Keywords: pupae density, Malaria vector, Niger State

Subtheme: Environment and Conservation

MITIGATION OPPORTUNITIES TO REDUCE THE IMPACT OF ARTIFICIAL SMOOTH SURFACES ON BATS

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ABSTRACT

Previous studies showed how bats were deceived to repeatedly drink from horizontal and collided into vertical smooth surfaces due to the acoustic mirror phenomenon. This could potentially cause injuries to bats when they encounter such situations in urbanized environments. This study aimed to examine the effect of the alteration of the smooth surface to reduce its acoustic mirror property. A field-based experiment was conducted in a botanical garden in Budapest with Kuhl's pipistrelle bats (*Pipistrellus kuhlii*). A 1 m x 2 m of black smooth plastic plate was modified with nine stretched black plastic threads attached on the surface with 20 cm apart. Five different diameters of parallel threads were used (0.25 mm, 0.50 mm, 1.00 mm, 1.50 mm, and 2.50 mm), and one in crossing pattern (0.50 mm). A smooth plastic plate without threads was used as a control situation. The plate was presented horizontally on the water surface with a randomly chosen context for each night, for 33 nights altogether. The behavior of bats around the plate was recorded with infrared cameras and the number of drinking attempts relative to the number of bat passes were calculated. The occurrence of drinking events was significantly lower in all thread contexts than in control situation and decreased with the increasing diameter of threads. The crossed thread pattern was also more effective than the parallel arrangement in the mitigation. Results from this study draw the attention that minimal surface modifications can decrease the acoustic mirror effect and with that we can build safer environments for bats.

Keywords: Chiroptera, Anthropocene, anthropogenic effect, smooth surface, mitigation

Subtheme: Environment and Conservation

GENETIC DIVERSITY OF *Blastocystis* sp. IN CAPTIVE WILD BIRDS IN MALAYSIA

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ABSTRACT

Blastocystis is the most prevalent eukaryotic gastrointestinal symbiont in humans and animals worldwide. Due to its limited host specificity and zoonotic potential, animals may serve as a potential reservoir for human infection transmission. Recently, interest in this *Stramenopile* has grown as the enteric pathogen causes possible infection among animals and humans. The number of linked epidemiology studies has been prudently increased. Currently, the animal host is grouped into 32 well-known subtypes (STs). This study was carried out to determine the prevalence and molecular epidemiology of *Blastocystis* sp. in captivated wild animals in zoological gardens and conservation centres in Malaysia. A total of 142 faecal samples of aves were examined for *Blastocystis* sp. The faecal samples from each animal were cultured in Jones medium supplemented with 10% horse serum. They were subsequently incubated at 37°C for culture samples. The incubation period lasted for about 48-72 hours. Approximately 42.75% (62/142) of positive for *Blastocystis* infection, indicating a high infection level in the bird species that were examined. Among them, a 100% infection was observed in green peafowl (11/11), red bill tree duck (1/1), spotted dove (1/1), whooper swan (1/1), followed by great argus 66.7% (8/12) and Indian peafowl 66.7% (4/6), ostrich 51% (27/53), African grey parrot 50% (1/2), cheer pheasant 50% (2/4) and budgerigar with 33.3% (1/3). The barcoding region of the SSU rRNA gene revealed eight subtypes, including ST1, ST2, ST4, ST5, ST6, ST7, ST8 and ST17. Based on our study predominant *Blastocystis* subtype in aves mainly belong to ST5. Aves shares subtypes commonly seen in humans (ST1 and ST2). This study suggests that the wide distribution of *Blastocystis* sp. in several classes of captive wildlife might serve as natural reservoirs for human infection as the zoonotic infection has been found in animal handlers and may infect visitors to the zoological gardens. This study can be used as a platform to look at the distribution and zoonotic transmission between animals and human hosts.

Keywords: animals, *Blastocystis*, subtypes, prevalence, wildlife

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