COMPARATIVE STUDY OF LEAF ANATOMY AND MICROMORPHOLOGY OF SELECTED JUSTICIA SPECIES FROM PENINSULAR MALAYSIA

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INTRODUCTION

Acanthaceae is known one of 24 families in the new order (Lamiales) of flowering plants, which the largest genus in this family is belongs to Justicia.

This family also have the economic value and useful as traditional medicinal remedies.

Plant anatomy part is included in this research as it can support the taxonomist and botanist to complete their study.

❖The three selected plant species are *Justicia adathoda* (L.), *Justicia gendarussa* (Burm. f.) and *Justicia procumbens* (L.).

❖.

PROBLEM STATEMENT

- **Without complete samples, the data of the plants might be lacking and this will lead to incomplete and unsuccessful plants identification.**

- **Anatomical research on the Acanthaceae family, mostly species of the genus Justicia, is still limited.**

- **The study of plant anatomy is very crucial to help taxonomist and botanist to differentiate the plants especially the morphological parts of two different species are almost the same.**

OBJECTIVES

a)To investigate and listed the common and variations in the leaf anatomical and leaf micromorphology characteristics in species studied.

b)To investigate and listed the diagnostics leaf anatomical and leaf micromorphology characteristics in species studied.

HYPOTHESIS

- The three selected plant species of *Justicia* are expected to have different leaf anatomical and micromorphology characteristics.

- The data and information from this research are important to help taxonomist to complete the plant classification and identification on these species.

THREE SPECIES STUDIED

JUSTICIA ADATHODA

JUSTICIA GENDARUSSA

JUSTICIA PROCUMBENS

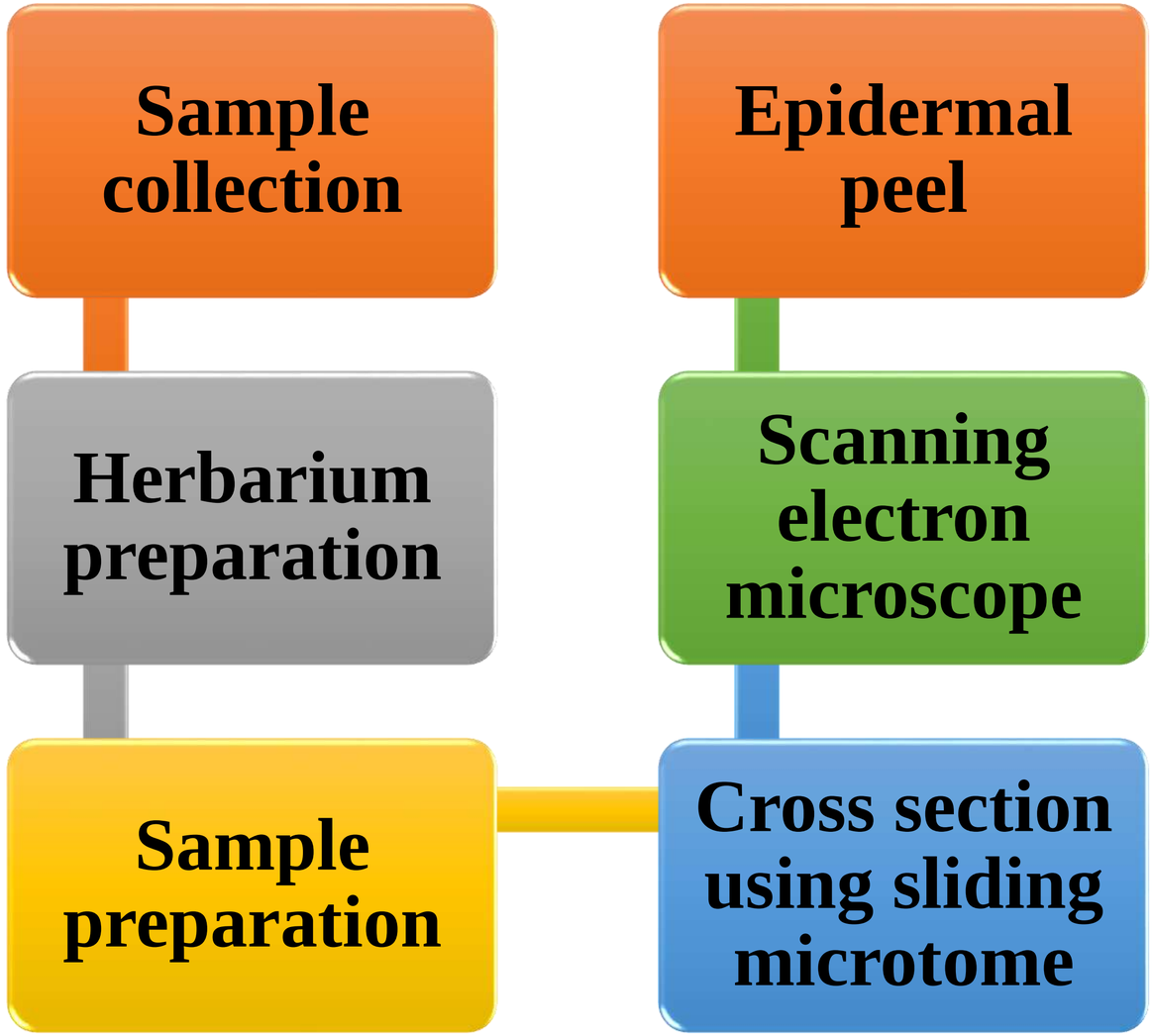
ORIGIN AND DISTRIBUTION

PLANT SPECIES	ORIGIN AND DISTRIBUTION	REFERENCES
J. adathoda	• Native to Pakistan • Southeast Asia's tropical regions	(Ken Fern, 2021).
J. gendarussa	• Native to China. • It is often found throughout the greater part of Southern India and Andaman Islands	(Sangeetha et al., 2014)
J. procumbens	• Native to India	(Ken Fern, 2021).

MORPHOLOGY

PLANT SPECIES	MORPHOLOGY	REFERENCE
J. adathoda	• **Habit** : Shrub • **Leaf** : lance-shaped leaves 8-9 centimeters in length by four wide. • **Flower** : Usually white and the inflorescence shows large, dense, axillary spikes.	(Kumar et al., 2013)
J. gendarussa	• **Habit**: Erect undershrub which can grow up to 0.6 to 1.2 m in height with subterete branches. • **Leaf**: The foliage is simple and lanceolate or linear to lanceolate in shape. • **Flower**: The flowers are white coloured, spotted with purple and clustered in the interrupted spikes.	(Yadav et al., 2017)
J. procumbens	• **Habit** : Herbs, profusely branched. • **Leaf** : Ovate, acute at both ends, hispid, nerves 5 pairs • **Flower** : Many; calyx lobes 3.5 mm long, lanceolate, ciliate; corolla 7 mm long, hairy with pink lines.	(Hemanth Tripathi, n.d)

METHODOLOGY



SAMPLE COLLECTION

J. adathoda
(Bangi, Selangor)

J. gendarussa
(Sungai Besar, Kedah)

J. procumbens
(Bangi, Selangor)

HERBARIUM PREPARATION

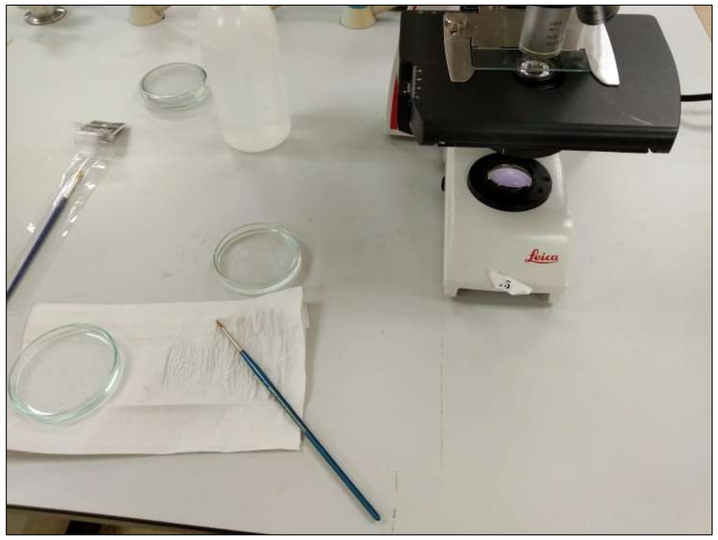
Sample collected, *J. gendarussa* at Sungai Besar, Kedah.

Sample being put between 2 newspaper and covered with the cardboard.

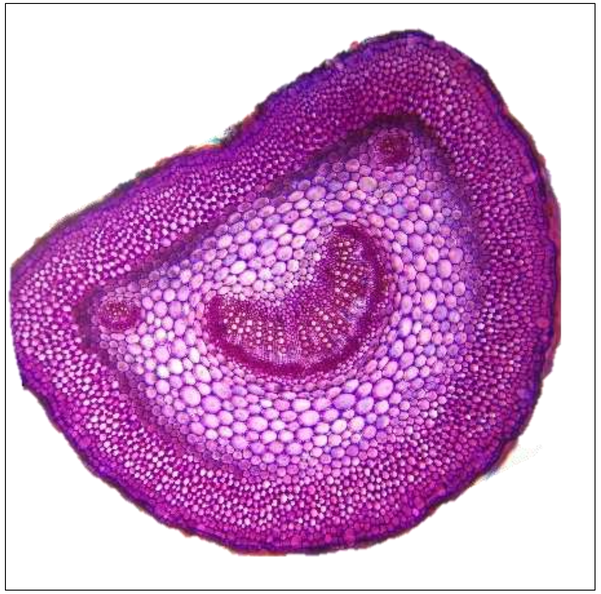
Sample compressed with pressing set and ready to over-dried in the oven.

SAMPLE PREPARATION

Cross section using sliding microtome



The sample was cross sectioned using sliding microtome. → **The sample was stained under the fume hood.** → **The sample was viewed under the microscope.**

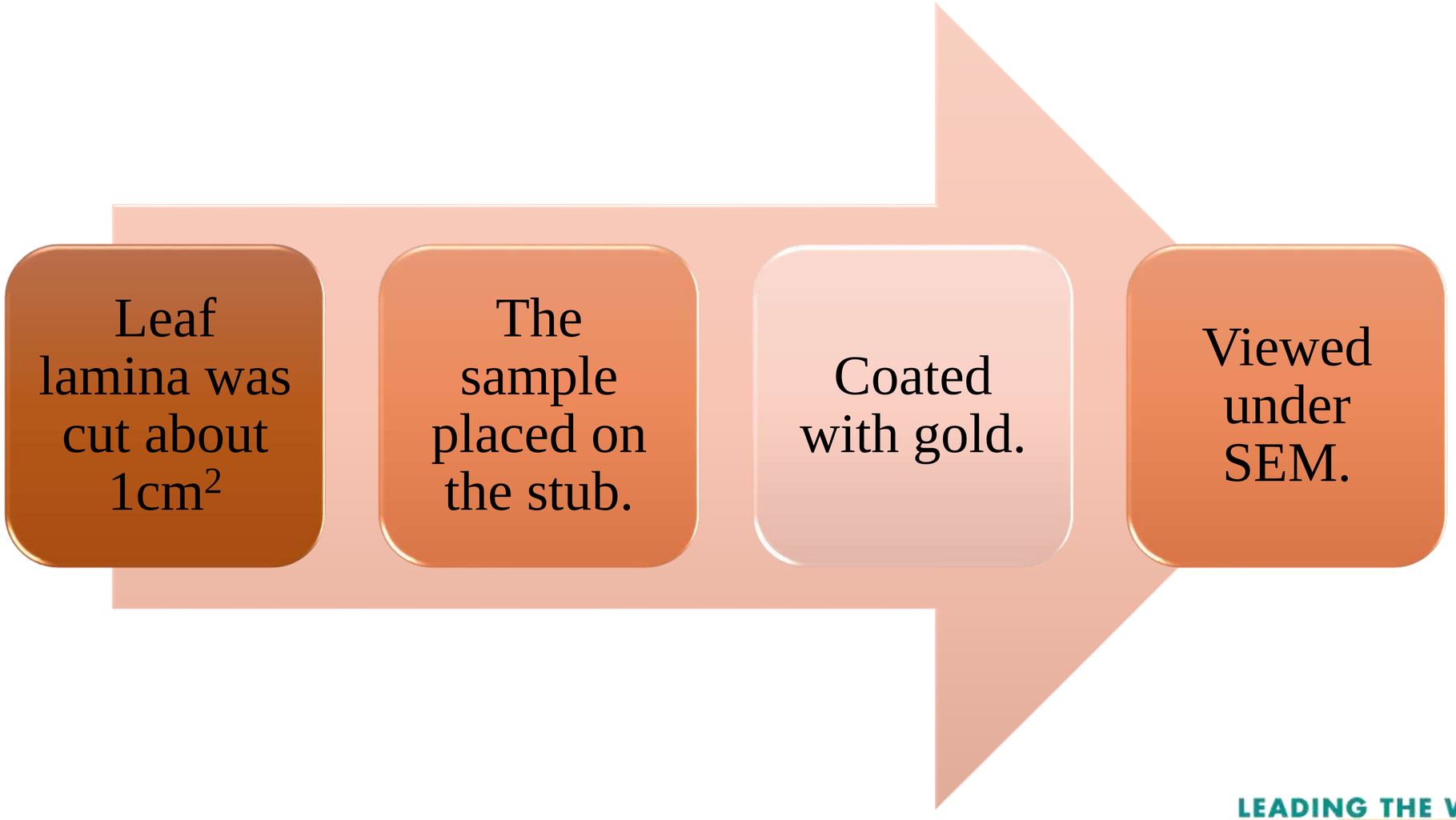


The slide was put in the oven for 2 weeks.

→

The slide was viewed under the microscope.

SEM


Leaf lamina was cut about 1cm²
The sample placed on the stub.
Coated with gold.
Viewed under SEM.

EPIDERMAL PEEL

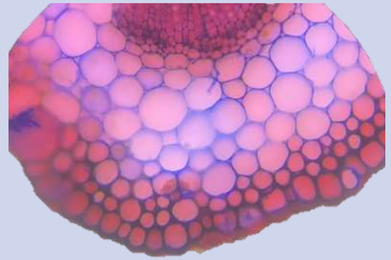
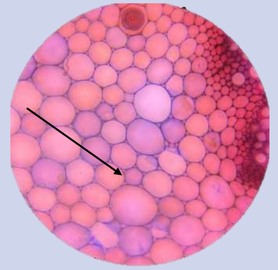
The epidermal of the leaf sample was scraped off using blade before staining into the safranin for 8 minutes.

Then, the sample was put on the microscopic slide and viewed under the microscope.

i. Common and variation characteristics

ii. Diagnostic characteristics

i. COMMON CHARACTERISTICS

Characteristics	Figures
Presence of parenchyma cells	*J. procumbens* 
Presence of sclerenchyma cells	*J. gendarussa* 
Presence of mucilage cells	*J. adathoda* 

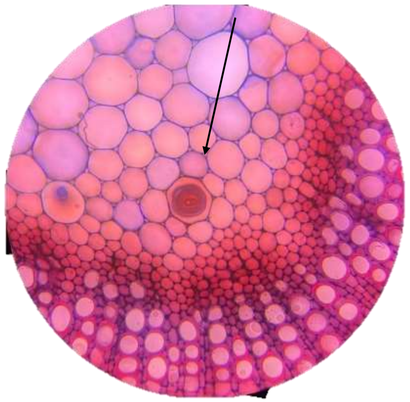
ii. VARIATION CHARACTERISTICS

6 variations in anatomical and micromorphological characteristics:

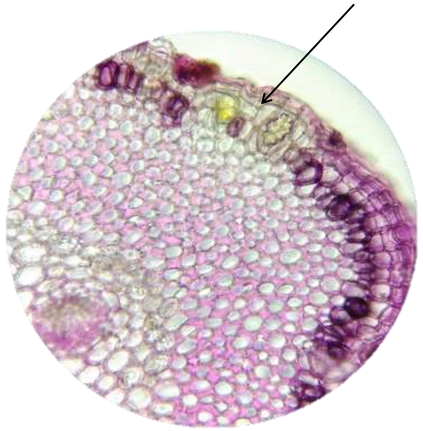
Presence of cystolith
Types of trichomes
Types of waxes
Vascular bundle of petiole and midrib
Cuticle ornamentation
Anticlinal wall

1. PRESENCE OF CYSTOLITH

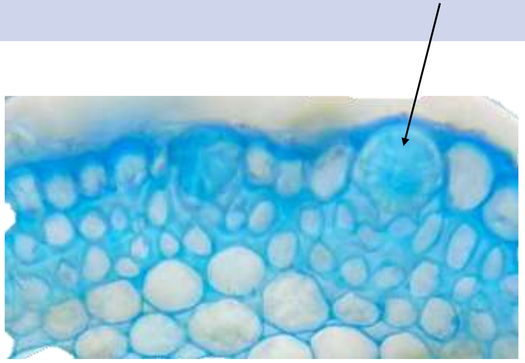
PLANT SPECIES	ROUNDED, SINGLE FORM	OBTUSE, DOUBLED FORM
J. adathoda	√	
J. gendarussa	√	√
J. procumbens	√	



J. adathoda



J. gendarussa



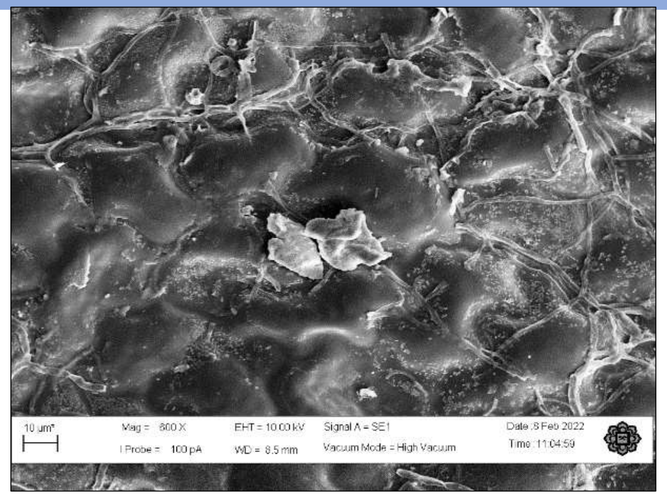
J. procumbens

2. TYPES OF TRICHOMES

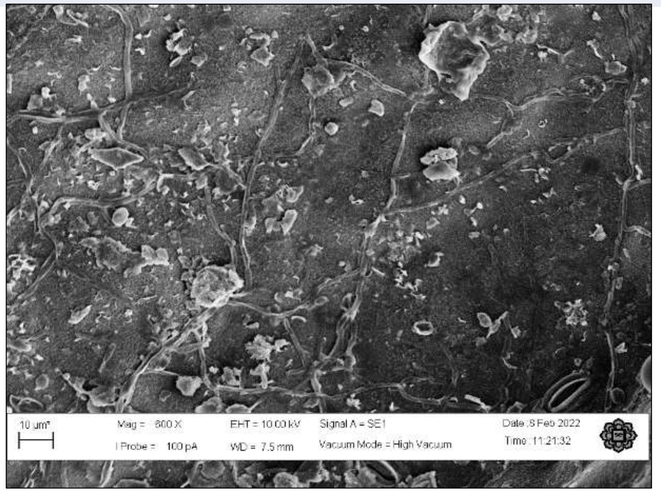
TYPES OF TRICHOMES	PLANT SPECIES			
	J. adathoda	*J. gendarussa*	*J. procumbens*	
Peltate glandular		√	√	
Simple Unicellular (long, tip end)				
Simple Multicellular (long, tip end, echinate ornamentation)	√	√	√	
Simple Multicellular (short, blunt end)			√	
Simple Multicellular (short, tapered end)			√	
Simple Multicellular (short, tip end)			√	

3. TYPES OF WAXES

PLANT SPECIES	TYPE OF CUTICULAR WAXES	
	Adaxial	Abaxial
J. adathoda	Verrucate, crust and granules found on adaxial and abaxial surfaces	
J. gendarussa	Film-layer, crust, verrucate and granules	
J. procumbens	Film-like layer, crust, flakes, verrucate and granules found on adaxial and abaxial surfaces	



J. adathoda



J. procumbens

4. VASCULAR BUNDLE OF PETIOLE AND MIDRIB

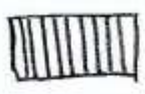
VASCULAR BUNDLE OF PETIOLE

Type of pattern	Illustration	Description	Species
Type 1		Opened system, continous rings of vascular bundle, two additional vascular bundles	*J. adathoda* *J. gendarussa* *J. Procumbens*

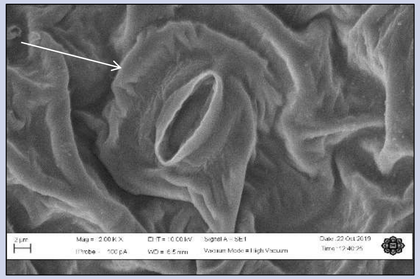
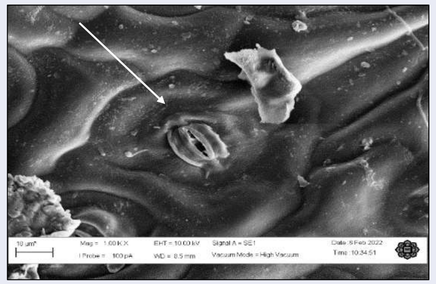
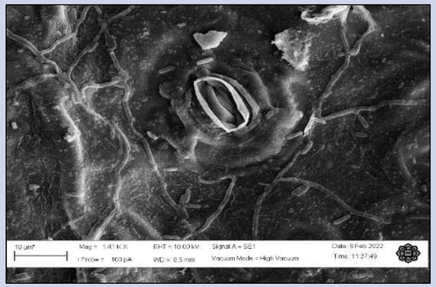
VASCULAR BUNDLE OF MIDRIB

Type of pattern	Illustration	Description	Species
Type 1		Opened system, non-continuous rings of vascular bundle, two additional vascular bundle	*J. adathoda*
Type 2		Opened-system, non-continous rings of vascular bundle	*J. gendarussa*
Type 3		Opened system, continuous rings of vascular bundle, two additional vascular bundle	*J. procumbens*

 **Phloem**

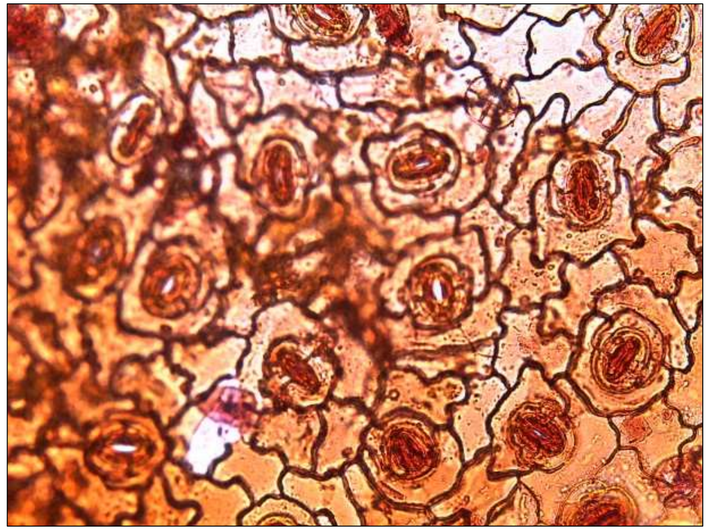
 **Xylem**

5. Cuticle ornamentation

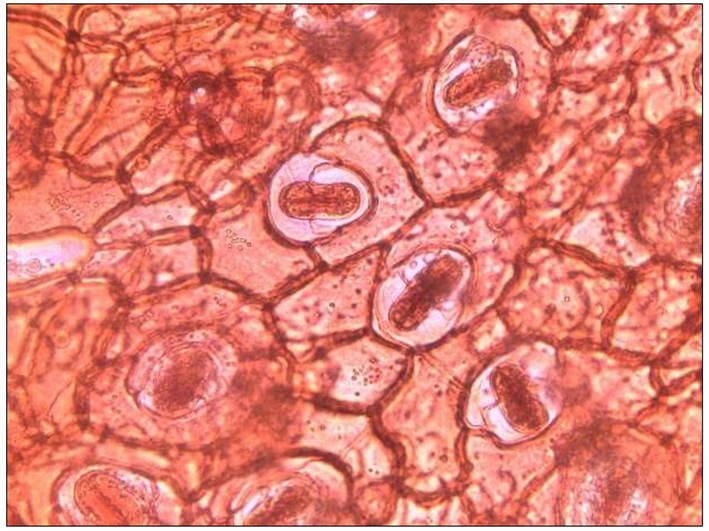
Types	Figures	Plant Species
Anticlinal wall slightly raised into ridges		*J. gendarussa*
Periclinal wall slightly raised into ridges.		*J. adathoda*
Anticlinal wall and periclinal wall cannot be distinguishable.		*J. procumbens*

6. Anticlinal wall

PLANT SPECIES	STRAIGHT TO WAVY	SINUOUS
J. adathoda		√
J. gendarussa	√	
J. procumbens		√



J. adathoda



J. gendarussa

DIAGNOSTIC CHARACTERISTICS

SPECIES	DIAGNOSTIC CHARACTERISTICS
J. adathoda	Vascular bundle: Open system and non-continuous vascular bundle at the midrib part
J. gendarussa	Cystolith: Double form and oval shape of cystolith
J. procumbens	Stomata: Amphistomatic stomata

CONCLUSION

- There are three common features that all species studied can be identified.

- This research also described many variants of the studied species characteristics that can be used to differentiate between them.

- In conclusion, leaf anatomy and micromorphology characteristics are useful for identification of species in peninsular, Malaysia. This may provide additional information for species classification.

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THANK YOU

IABC 2022

INTERNATIONAL APPLIED BIOLOGY CONFERENCE 2022

INTERNATIONAL APPLIED BIOLOGY CONFERENCE 2022 (IABC2022)

3rd - 5th June 2022

Hatten Hotel, Melaka, Malaysia

Sustainable Development Goals through Applied Biology

PROGRAMME BOOK

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Co-organized By: Universiti Kebangsaan Malaysia National University of Malaysia; International Islamic University Malaysia; UMT; NAHRIM

Programme Book

Sustainable Development Goals through Applied Biology

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3rd June – 5th June 2022

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WELCOME MESSAGE
FROM THE PRESIDENT OF MSAB

Assalamualaikum and Greetings to all participants of the International Applied Biology Conference 2022 (IABC2022).

First and foremost, on behalf of the Malaysian Society of Applied Biology, I would like to welcome all participants to the beautiful city of Malacca for IABC2022. The theme for this conference is "Sustainable Development Goals Through Applied Biology". As such, this conference is designed to provide an ideal platform for professors, researchers, scientists, industrial specialists, students, and stakeholders in applied biology to share their ideas and advance innovations in order to support the United Nation's Sustainable Development Goals (SDGs) effort.In recent years, many reports have revealed that global research is increasingly being redirected towards addressing SDGs such as Zero Hunger, Good Health & Well-Being, Clean Water & Sanitation, Affordable & Clean Energy, Responsible Consumption & Production, Climate Action, Life Below Water Life and Life on Land. I'm hoping with the participation of renowned local and international experts, fruitful conversations and discussions will spark new ideas for converting new achievements in applied biology into improved practice and application in order to meet the SDG targets.

The society would also like to thank the organising team for their hard work in putting this conference together. Due to the COVID19 epidemic, this conference, which was intended to take place in June 2020, had to be postponed several times. After two years of attempting, the group finally succeeded this year. I hope that this meeting will serve as a springboard for us to get together and talk science more openly again, as we did before the pandemic.

Lastly, I would like to wish all participants a productive and fruitful conference as well as a pleasant stay in the historic city of Malacca.

Assoc. Prof. Dr. Abdul Munir Abdul Murad
President
Malaysian Society of Applied Biology
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FOREWORD
FROM THE CHAIRMAN OF THE ORGANISING COMMITTEE

السَّلَامُ عَلَيْكُمْ وَرَحْمَةُ اللهِ وَبَرَكَاتُهُ and salam sejahtera to all participants of International Applied Biology Conference 2022 (IABC2022). It gives me great pleasure to welcome all the distinguished guests and participants of the IABC2022.

First and foremost, I would like to thank and congratulate the Organising Committee of the IABC2022 who have worked so hard to organise this conference initially planned in 2020. Now, we are in the post COVID-19 era with new norms to be practised. We are happy that the hard work that has been poured by each member of the working committee, we will witness the conference to be held in physical and online mode for our international participants.

As time goes on, we also recognise that many researchers and scientists around the world are beginning to focus and emphasise the element of sustainable development goals (SDGs) in their research. This has opened the eyes of world leaders that the SDGs should not be underestimated because these are the elements that shape the sustainability of human beings, environment and the entire creatures on the planet in which these elements directly will create the prospectus of the nation in future. Therefore, we take this opportunity to mediate the importance of SDGs elements as a scope of conference through the themes that coincides with the field of applied biology such as good health and wellbeing, life below water, life on land, affordable and clean energy, and many more. Hence our conference theme this year "Sustainable Development Goal through Applied Biology" seems very appropriate and timely in responding to the importance of the SDGs to all participants for this year's session.

And to all participants who I believe come from all over Malaysia, I hope you can enjoy the beauty and uniqueness of the Historic City of Malacca. I strongly believe this might be your first experience of attending a conference physically after over two years as we are prohibited to do so and only go through a conference virtually. To our international participants, please be patiently following IABC2022 behind your screens, we hope to have you together with us here in Malaysia next time. Finally, I am strongly confident that this event will be a great success as the platform or medium for scientific exchange of ideas and new knowledge, as well as to build a research collaboration and strengthen the linkage between research institutes or universities. So, enjoy your three days staycation here in Melaka.

With Best Regards

DR. MOHD SHUKRI BABA
Chairperson of IABC2022 Organising Committee

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CONFERENCE SCHEDULE

Friday, 3rd June 2022

Time	Event
1700 – 1830 2000 – 2200	Registration/Secretariat Room (Hatten 1) and Poster/Booth Setup (Grand Ballroom 1)

Saturday, 4th June 2022

Time	Event		
0800 – 0815	Registration (Hatten 1) and Poster/Booth Setup (Foyer Grand Ballroom 1)		
0815 – 0900	Opening Ceremony (Grand Ballroom 1)		
0900 – 0945	Keynote Address Prof. Emeritus Tan Sri Dato' Dzulkifli Abdul Razak (Grand Ballroom 1)		
0945 – 1010	Photography Session & Coffee Break		
1010 – 1040	Plenary 1 (SDG 15- Life on Land) Prof. Emeritus Dato' Dr. Abdul Latiff Mohamad, MSAB Patron (Grand Ballroom 1)		
1045 – 1230	Parallel Session 1		
	Management & Conservation Biology (Grand Ballroom 1)	Food and Agricultural Sciences (Hatten 2)	Medical & Health Sciences (Hatten 3)
1230 – 1300	Poster Viewing & Evaluation (Foyer Grand Ballroom 1)		
1300 – 1410	Lunch Break		
1410 – 1440	Plenary 2 (SDG 2- Zero Hunger) Prof. Dr. Aziz Ahmad, Universiti Malaysia Terengganu (Grand Ballroom 1)		
1445 – 1630	Parallel Session 2		
	Marine and Freshwater Sciences (Grand Ballroom 1)	Food and Agricultural Sciences (Hatten 2)	Natural Products (Hatten 3)
1630 – 1700	Tea Break, Poster Viewing & Evaluation (Foyer Grand Ballroom 1)		
1700 – 1800	The 45th MSAB Annual General Meeting (MSAB Members) (Hatten 2)		
1930 – 2200	IABC2022 Gala Dinner (Grand Ballroom 1)		

Sunday, 5th June 2022

Time	Event	
0830 – 0900	Plenary 3 (SDG 14- Life Underwater) Mr. Giva Kuppusamy, CEO of GK Aqua Sdn. Bhd (Grand Ballroom 1)	
0905 – 1020	Parallel Session 3	
	Marine and Freshwater Sciences (Grand Ballroom 1)	Management & Conservation Biology (Hatten 2)
1020 – 1110	Coffee Break, Poster Viewing & Evaluation (Foyer Grand Ballroom 1)	
1110 – 1140	Plenary 4 (SDG 3- Good Health) Prof. Dr. Geoffrey Cordell, University of Florida, USA (Grand Ballroom 1)	
1145 – 1315	Parallel Session 4	
	Medical & Health Sciences (Grand Ballroom 1)	Food and Agricultural Sciences (Hatten 2)
1315 – 1430	Lunch Break	
1430 – 1500	Plenary 5 (SDG 7- Clean Energy) Prof. Dr. Sung Ok Han, Korea University (Grand Ballroom 1)	
1505 – 1650	Parallel Session 5	
	Green Technology (Grand Ballroom 1)	Food and Agricultural Sciences (Hatten 2)
1650 – 1700	Tea Break	
1700 – 1800	AWARD PRESENTATION & CLOSING CEREMONY (Grand Ballroom 1)	
1800	CONFERENCE END	

TECHNICAL SESSIONS

Saturday, 4th June 2022

Keynote Address (Grand Ballroom 1)

0900	Title: Sustainable Development in the Age of Bio-disruption Speaker: Prof. Emeritus Tan Sri Dato' Dzulkifli Abdul Razak Chairperson: Dr. Mohd Syukri Baba (IIUM)
0945	Photography Session & Coffee Break

Plenary 1 (Grand Ballroom 1)

1010	Title: Malaysian Biological Resources and Sustainable Development Goals : An appraisal Speaker: Prof. Emeritus Dato' Dr. Abdul Latiff Mohamad, MSAB Patron Chairperson: Assoc. Prof. Dr. Abdul Munir Abdul Murad (UKM)

Parallel Session 1

Time	PaperID	Ballroom 1 Management Conservation & Biology Chairperson: Dr. Mohd Syukri Baba	
1045	O-MC-01	Adibah bt Abu Bakar (Phd)	Detection of invasive peacock bass species in Malaysia using environmental DNA technique.
1100	O-MC-02	Haja Maideen bin Kader Maideen (Phd)	Ferns of Peninsular Malaysia
1115	O-MC-03	Nurul Nadhirah Bt Othman (Ms)	Optimizing In vitro surface sterilization of Cyathea latebrosa
1130	O-MC-04	Nurul Nabilah Huda Bt Mohd Hisham (Ms)	Leaf anatomical characteristics of Nepenthes species in Western Sarawak, Borneo.
1145	O-MC-05	Aidatul Aifa Mohd Tajudin (Ms)	Comparative study of leaf anatomy and micromorphology of selected Justicia sp from Peninsular Malaysia.
1200	O-MC-06	Nik Norhazrina bt Nik Mohd Kamil (Phd)	Mosses of Pulau Perhentian, a small resort island off the coast of Terengganu in Peninsular Malaysia

Time	PaperID	Hatten 2 Food and Agricultural Sciences Chairperson: Dr. Pauline Liew Woan Ying	
1045	O-FA-01	Dhiya Dalila Zawawi (Phd)	Identification and prevention of microbial contaminants in Musa paradisiaca tissue culture.
1100	O-FA-02	Nor Hayati Ibrahim (Phd)	Optimization of mixing parameters on techno-functional properties of fenugreek gum-soy protein isolate dispersion.
1115	O-FA-03	Wong Li Yin (Ms)	Enzymatic hydrolysis of edible bird's nest (EBN) and anion exchange chromatography (AEC) fractionation: Physicochemical properties and antioxidant activities.
1130	O-FA-04	Wan Zaliha Wan Sembok (Phd)	The impact of different drying temperatures on Black Ginger rhizome Slices in relation to different application of growing media
1145	O-FA-05	Chuah Hui Qian (Ms)	Exploration of Antioxidant and Anti-inflammatory Potential of Jicama Skin
1200	O-FA-06	Khairunnisa Hanisah bt Mohd Daud (Ms)	Gene knockdown via RNA interference in oil palm pathogen, Ganoderma boninense
1215	O-FA-07	Rafidah bt Badrun (Mrs)	Dual RNA-sequencing of Ralstonia syzygii subs. celebensis, a pathogen causing Banana Blood Disease.

Time	PaperID	Hatten 3 Medical & Health Sciences Chairperson: Dr. Shevin Rizal Feroz	
1045	O-MH-01	Shevin Rizal Feroz (Phd)	Albumin- based drug delivery systems: Recent advancements
1100	O-MH-02	Hayati Mohd Yusof (Phd)	Knowledge, attitude and practice (KAP) on complementary and alternative medicine (CAM) associated with Covid-19
1115	O-MH-03	M.Pirehma A/P Marimuthu (Ms)	Rapid desloughing using sterile maggots of Lucilia cuprina
1130	O-MH-04	Nurrul Shaqinah Nasruddin (Phd)	Expression of proinflammatory cytokines (IL-1**β**, IL-6, and TNF-α) in the gingival, heart and kidney tissues after experimental periodontitis induction
1145	O-MH-05	Norhazniza bt Aziz (Ms)	Chemical profile and antiviral activity of fermented Jackfruit (Artocarpus heterophyllus) extract against Herpes simplex virus type 1 (HSV-1)
1200	O-MH-06	Nirmell Satthiyasilan (Mr)	Proto-enzymes during the origins of life on earth.

Poster Evaluation (1215 - 1300) (Foyer Grand Ballroom 1)

PaperID	Theme: Food and Agricultural Sciences	
P-FA-01	Mohd Asyraf Kassim	Phycoremediation of organochlorine pesticide by *Chlorella* sp. microalgae
P-FA-02	Mohd Shahril Firdaus Bin Ab Razak	Identification of aromatic rice from genetic landrace resource using molecular marker integrated with chemical assessment
P-FA-03	Intan Nur Ainni Binti Mohamed Azni	Pathogenicity assessment of fungi isolated from leaf blotches in tenera variety of oil palm in malaysia
P-FA-04	Nur Diyana Roslan	Inoculation of monomeric and dimeric coconut cadang-cadang viroid (cccvd) using pressure injector in oil palm seedling: symptomatology and accumulation of viroid
P-FA-05	Suhaila Sulaiman	Omics approach in oil palm research- Bioinformatics perspective
P-FA-06	Farah Nini Binti Othman	In silico genome-wide profiling of non-coding RNA in oil palm *Elaeis guineensis* and its fungal pathogen Ganoderma boninense
P-FA-07	Norsyahima Binti Azizi	A systematic database for microbial data collection management
P-FA-08	Hazlina Ahamad Zakeri	Potential of eco-enzymes from sugarcane bagasse and banana peel as natural insecticides against the red palm weevil, *Rhynchophorus ferrugineus*
P-FA-09	Muhamad Hafiz Che Othman	Identification of miRNAs and Their Target Genes in *Mitragyna speciosa* using computational approaches
P-FA-10	Nurulhikma Md Isa	Stress associated protein family: potential target gene for rice improvement against abiotic stress
P-FA-11	Nor Helwa Ezzah Binti Nor Azman	Molecular characterization of liberica coffee using ssr marker
P-FA-12	Nurhafizhoh Zainuddin	Transcriptome profiling of bagworm *Metisa plana* from untreated oil palm estate in Perak and identification of genes relevant to insecticides resistance
P-FA-13	Jong Bor Chyan	Bacterial pha irradiation mutants by gamma irradiation
P-FA-14	Hing Jan Nie	Gamma radiation dose response of gram-positive and gram-negative bacteria
P-FA-15	Arnida Hani Teh	Effects of temperature and polyethylene plastic packaging on physicochemical changes and antioxidant properties of tomato during storage

P-FA-16	Nurul Asyikin Binti Mohd Zim	Generation of CRISPR/Cas9 vectors as a potential tool for rice improvement against drought via golden gate cloning method

1230	Poster Evaluation (Foyer Grand Ballroom 1)

1300	Lunch Break

Plenary 2 (Grand Ballroom 1)

1415	Title: The Utilisation of Microbes for Sustainable Agri-Food Production Speaker: Prof. Dr. Aziz Ahmad (UMT) Chairperson: Assoc Prof Dr Wahizatul Afzan Azmi

Parallel Session 2

Time	PaperID	Grand Ballroom 1 Marine and Freshwater Sciences Chairperson: Dr. Noor Haza Fazlin Bt Hashim	
1445	O-MF-01	Noor Haza Fazlin binti Hashim (Phd)	Surveillance on the emergence of extended spectrum beta lactamase producing Escherichia coli in water bodies in Selangor
1500	O-MF-02	Kok Xin Fang (Mr)	Bacteriophages as candidates for environmental pathogens biocontrol
1515	O-MF-03	Muhammad Arif Samshuri (Mr)	Thiol-containing protein as biomarkers on oxidative stress ecology of Acropora digitifer
1530	O-MF-04	Nur Athirah Yusof (Phd)	Safeguarding the future of seaweed aquaculture in Malaysia: Development of endophytic bacteria possessing biocontrol potential against ice-ice disease in Kappaphycus alvarezii

Time	PaperID	Hatten 2 Food and Agricultural Sciences Chairperson: Dr. Malinna Jusoh	
1445	O-FA-08	Izwan Bharudin (Phd)	Multi-omics studies on oil palm pathogen, Ganoderma boninense
1500	O-FA-09	Chew Huei Chin (Ms)	Cellulase pretreatment to enhance antioxidant, anti-inflammatory and hypoglycemic activities of Mulberry leaf extract.
1515	O-FA-10	Nur Hidayah Jamar (Phd)	Challenges in applying probiotics in freshwater fish aquaculture.
1530	O-FA-11	Ng Xin Yie (Ms)	Identification of cerato-platanin genes involved during infection of Ganoderma boninense on oil palm via bioinformatics analysis.
1545	O-FA-12	Muhammad Asyraff Abdul Samad (Mr)	Identification of antifungal compounds from soil microbes capable of inhibiting the growth of Ganoderma boninense

1600	O-FA-13	Madihah Ahmad Zairun (Mrs)	Potential of mating genes as biological markers for Ganoderma boninense detection
1615	O-FA-14	Shazilah Kamaruddin (Phd)	Protein engineering of Glaciazyma antarctica proline iminopeptidase for enhanced cold adaptive performance

Time	PaperID	Hatten 3 Natural Products Chairperson: Dr. Sylvia Chieng	
1445	O-NP-01	Khairul Azreena binti Bakar (Ms)	Interaction characteristics of Mitragynine with human serum albumin and **α**1-acid glycoprotein
1500	O-NP-02	Nazlina Ibrahim (Phd)	Potential of Goniothalamin as Antiviral Drug Against Acyclovir-Resistant Herpes Simplex Virus Type-1
1515	O-NP-03	Siti Nurulhuda Mastuki (Mrs)	Inhibitory effects of Melastoma malabathricum against Candida albicans: A preliminary report
1530	O-NP-04	Siti Nor Amira Mohd Azli (Ms)	Malaysian herbal product labels: Does it guide the consumers for reasonable and safe use?
1545	O-NP-05	Arifah Adlina binti Rashahan (Ms)	Medicinal postpartum products: Insufficient labels and misleading advertisements.
1600	O-NP-06	Nazlina Haiza binti Mohd Yasin (Phd)	The effects of co-cultivation of Chlorella sp. (UKM2) and Scenedesmus sp. (UKM9) on growth and biochemical compounds.

Poster Evaluation (1630 - 1700) (Foyer Grand Ballroom 1)

PaperID	Theme: Food and Agricultural Sciences	
P-MH-17	Nur Aminah Binti Mohd Hazbir	Genome wide analysis of stress associated protein (sap) family in *Oryza sativa*
P-FA-18	Sitti 'Aisyah Binti Mohd Roszelin	Effect of abiotic stress at vegetative and inflorescence stage on Arabidopsis transgenic overexpression osSAP8
P-FA-19	Sujitra Raj Genga Raj	Comprehensive meta-analysis of cereal QTLs associated with growth and yield traits under drought conditions
P-FA-20	Nur Atiqah Binti Mohd Khari	Rice stem borer infestation in two different planting seasons in North Malaysia
P-FA-21	Noor Liyana Sukiran	The effect of submergence on selected Malaysian rice varieties

PaperID	Theme: Medical & Health Science	
P-MH-01	Normah Awang	Cytotoxicity and Mode of Cell Death Assessment of Acute Lymphoblastic Leukemia Cell Lines, CCRF CEM (CCL-119) Induced by Triphenyltin(IV) Dithiocarbamate Compounds
P-MH-02	Noraziah Mohamad Zin	Potential of dimeric sesquiterpene compound derived from basidiomycete fungus against MRSA

P-MH-03	Nurul Farahana Kamaludin	Triphenyltin(iv) diisopropyl dithiocarbamate induces mitochondrial mediated-apoptosis in jurkat t lymphoblastic leukemia cells
P-MH-04	Afzan Mat Yusof	Effectiveness of counselling among parents in managing children with disabilities at rehabilitation center, esenyurt, istanbul during pandemic
P-MH-05	Siti Junaidah Binti Ahmad	In-vitro anti-plasmodial of endophytic streptomyces sp. and elucidation of bioactive metabolite by metabolomics approaches
P-MH-06	Sylvia Chieng	Computational analyses of epitope-spanning peptides from *Burkholderia pseudomallei* immunogenic proteins
P-MH-07	How Shu Sian	Functional and Structural Analysis of BPSS0140-BPSS0142 ABC Transporter that Mediates Fructose Import in *Burkholderia pseudomallei*.
P-MH-08	Nurul Hanun Ahmad Raston	Site-directed mutagenesis and production of catalytically-inactive cas13 (dcas13) from *Leptotrichia wadei*
P-MH-09	Yap Yin Xin	*Lipid metabolon in non-oleaginous fungus of Aspergillus niger*

1630	Tea Break, Poster Viewing and Evaluation (Foyer Grand Ballroom 1)

1700	The 45th MSAB Annual General Meeting (MSAB Members) (Hatten 2)

1930	IABC2022 Gala Dinner (Grand Ballroom 1)

Sunday, 5th June 2022

Plenary 3 (Grand Ballroom 1)

0830	Title: Towards The Circular Green Economy of Freshwater Prawn Farming Speaker: Mr. Giva Kuppusamy (CEO of GK Aqua Sdn. Bhd) Chairperson: Dr. Lisa Ong Gaik Ai

Parallel Session 3

Time	PaperID	Grand Ballroom 1 Marine and Freshwater Sciences Chairperson: Dr. Douglas Law	
0905	O-MF-05	Doris Quay Huai Xia (Phd)	Biochemical and biophysical characterisation of an arginase from Glaciozyma antarctica P112
0920	O-MF-06	Malinna Jusoh (Phd)	Lipids induction strategy in microalgae through environmental manipulations
0935	O-MF-07	Nor Omaima Harun (Phd)	The Prevalence of anisakid nematode present in Shortfin Scad, Decapterus macrosoma (Bleeker, 1851) from Terengganu waters, Malaysia
0950	O-MF-08	Douglas Law (Phd)	Live Semi-dry Transportation of wild marble goby (Oxyeleotris marmorata Bleeker, 1852) to in-land stock tank facility
1005	O-MF-09	Kuhan Chandru (Phd)	Astrobiology: An interdisciplinary Science to understand the Origins of Life and Universal Biology

Time	PaperID	Hatten 2 Management and Conservation Biology Chairperson: Dr. Lisa Ong Gaik Ai	
0905	O-MC-07	Lee Gaik Ee (Phd)	Intergrative taxonomy reveals a new species of liverwort from Peninsular Malaysia
0920	O-MC-08	Azi Azeyanty bt Jamaludin (Phd)	Potential ethnomedicinal uses from Adiantum species (Pteridaceae) grown in Malaysia
0935	O-MC-09	Rohani Shahrudin (Phd)	Comparison of micromorphology of terrestrial and epiphytic orchids in the Bris ecosystem
0950	O-MC-10	Khairiatul Mardiana Jansar (Phd)	Morphology of Weedy Rice (Oryza sativa) in Selected Rice Fields of Peninsular Malaysia: Phenotypic Characterization
1005	O-MC-011	Nur 'Aqilah binti Mustafa Bakray (Phd)	Elevated CO2 influence the ectomycorrhizas diversity at Tekam forest reserve, Jerantut, Pahang.

Poster Evaluation (1020 - 1100) (Foyer Grand Ballroom 1)

PaperID	Theme: Management & Conservation Biology	
P-MC-01	Khairiatul Mardiana Jansar	Microplastics Abundance from Pig Farm Effluent and Surface Water in Sungai Tuang, Melaka, Malaysia.
P-MC-02	Md Asek Uddin	Ichthyofaunal Composition in the Pahang River, Pahang, Malaysia: A Review
P-MC-03	Saiful Arif Abdullah	Wildlife ecological connectivity network in Central Forest Spine 2, Peninsular Malaysia

PaperID	Theme: Green Technology	
P-GE-01	Nur Hazlin Hazrin-Chong	Enrichment of glyerol-utilising microbial consortium for bioaugmentation of anaerobic sludge digestion to increase biogas production
P-GE-02	Nurkhalida Binti Mohammad Khalil	Screening of potential polyethylene terephthalate degrading bacteria
P-GE-03	Ariff Haikal Bin Hairil Anuar	Green Synthesis, Characterization and Antibacterial Activity of Silver Nanoparticles-Kaempferol (agnps-K) Against Methicillin-Resistant *Staphylococcus Aureus* (MRSA)
P-GE-04	Pauline Liew Woan Ying	Characterization of bacterial pha treated with electron beam by physicochemical analyses

PaperID	Theme: Natural Products	
P-NP-01	Noor Zarina Binti Abd Wahab	Phytochemical analysis and evaluation of antibacterial efficacy of *Kyllinga nemoralis* plant extracts
P-NP-02	Nur Fatimah Zaharah	Antibacterial Activities of *Salvadora persica* Extracts Against Oral Bacteria From Clinical Strains
P-NP-03	Shaima Abdulfattah Gamal Mohammed	*Chlorella* sp. (UKM8): A local microalgae isolate with antiviral and antioxidant properties
P-NP-04	Fatin Humairah Binti Hj M As'Ari	Comparative Analysis of Short Open Reading Frames (sORFs) in Causative Agents of Melioidosis, *Burkholderia pseudomallei* and other species of *Burkholderia*
P-NP-05	Mahanem Mat Noor	The Testicular Protective Effect of *Moringa oleifera* Leaves Extract Against Streptozotocin-Induced Sprague Dawley Rats
P-NP-06	Khew Chung Yuen	Comparative genomics analysis of small ORFs in human pathogenic and non-pathogenic

		Burkholderia sp. reveals a large proportion of uncharacterized sORF
P-NP-07	Fatin Izzati Binti Abdul Hadi	In silica structural and functional annotation of Glaciozyma antarctica proteome

PaperID	Theme: Marine & Freshwater Sciences	
P-MF-01	Muhammaz Haziq Anwar Bin Azlan	Identification of endophytic fungi from macroalga and antibacterial metabolites
P-MF-02	Siti Alwani Ariffin	Saline tolerant of marine endophytic fungi from Teluk Kemang, Malaysia – a rich source of bioactive material

1020	Tea Break, Poster Viewing and Evaluation (Foyer Grand Ballroom 1)

Plenary 4 (Grand Ballroom 1)

1110	Title: CYBERECOETHNOPHARMACOLOMICS (CEEPO) Speaker: Prof. Dr. Geoffrey Cordell (University of Florida, USA) Chairperson: Assoc. Prof. Dr. Nazlina Ibrahim

Parallel Session 4

Time	PaperID	Ballroom 1 Medical & Health Sciences Chairperson: Dr. Mohd Fareed bin Mohd Sairi	
1145	O-MH-09	Mohd Shukri bin Baba (Phd)	In-vivo antimalarial activity and toxicity evaluation of Trichosanthes cucumerina against the development of Plasmodium berghei NK65 in mice.
1200	O-MH-08	Mohd Fareed bin Mohd Sairi (Phd)	Harnessing Machine-Learning to triangulate antimicrobial and antibiofilm peptide
1215	O-MH-09	Ahmad Ayad Qatran Al-Khdhairawi (Mr)	Collagen-derived cryptides: Machine-learning prediction and molecular dynamic interaction against Klebsiella pneumonia biofilm synthesis precursor
1230	O-MH-010	Abdullah Trad Sh. Al-Fawaz (Phd)	Antibacterial effect of silver nanoparticles synthesized by medicinal plant extracts against some cariogenic pathogens
1245	O-MH-011	Nisreen Jawad Kadhim (Phd)	Molecular Detection of Bacillus cereus in different food samples by Polymerase Chain Reaction
1300	O-MH-012	Su Datt Lam (PhD)	Understanding Host Susceptibility and Sialic-Acid Receptor Binding of SARS-Cov-2

Time	PaperID	Hatten 2 Food & Agricultural Sciences Chairperson: Dr Chew Bee Lynn	
1145	O-FA-15	Yaseer Suhaimi Mohd (Phd)	Effects of substrates on growth and yield of sweet potato cultivated using soilless culture system.
1200	O-FA-16	Chew Bee Lynn (Phd)	Micropropagation of different Fig cultivars in Malaysia : From lab to the farm
1215	O-FA-17	Lim Seng Joe (Phd)	Petai (Parkia speciosa) seeds and skin as potential functional ingredients
1230	O-FA-18	Mohd Ikmal bin Asmuni (Phd)	Introduction of Sub1 increased tolerance of rice (Oryza sativa L.) to reproductive stage drought stress.
1245	O-FA-20	Ter Zhi Yin (Ms)	Proteolytic fermentation of edible bird nest glycoprotein using Lactobacillus curvatus and Lactobacillus sakei

1315	Lunch Break

Plenary 5 (Grand Ballroom 1)

1430	Title: Designer Microbial Cell Factory (Equipped with Nanoscale Multifunctional Enzyme Complex) for High-Valued Products from Renewable Resources Speaker:Prof. Dr. Sung Ok Han (Korea University, South Korea) Chairperson: Dr. Jong Bor Chyan

Parallel Session 5

Time	PaperID	Grand Ballroom 1 Green Technology Chairperson: Dr. Mohd Asyraf Kassim	
1505	O-GE-01	Naqibah Balqis binti Badrulzaman (Ms)	Enrichment of Glyerol-utilising microbial consortium for bioaugmentation of anaerobic sludge digestion to increase biogas production.
1520	O-GE-02	Mohamad Faisal bin Nik Aznan (Mr)	Penilaian model matematik bagi pertumbuhan mikroalga Characium sp. UKM1, Chlorella sp. UKM2 dan Coelastrella sp. UKM4 dalam air kumbahan sintetik
1535	O-GE-03	Nabihah Azhary (Ms)	Enhanced microbial Rhamnolipid biosurfactant production with potential in oil recovery.
1550	O-GE-04	Mardiana Mohd Ashaari (Phd)	Enhanced Microbial Rhamnolipid Biosurfactant Production with Potential in Oil Recovery
1605	O-GE-05	Wan Syaidatul Aqma Wan Mohd Noor (Phd)	Biodegradation of Polyethylene terephthalate (PET) microplastics using Bacillus species
1620	O-GE-06	Siti Nor Asma binti Musa (Ms)	Antimicrobial Activities of Strobilanthes Crispus Silver Nanoparticles (AgNpSc) against Pseudomonas aeruginosa

1635	O-GE-07	Mahendran Sithamparam (Mr)	Polymer Gels as Panspermia Seed in relation to Origin of Life

Time	PaperID	Hatten 2 Food and Agricultural Sciences Chairperson: Assoc Prof. Dr. Wahizatul Afzan Azmi	
1505	O-FA-21	Wahizatul Afzan Azmi (Phd)	Evaluation of two stingless bee species (Heterotrigona itama and Geniotrigona thoracica) for pollination efficiency on melon manis Terengganu (Cucumis melo var. inodorus cv. Manis Terengganu 1)
1520	O-FA-22	Zakiah Mustapha (Ms)	Manipulation Of Sterilizing Agents And Ascorbic Acid To Reduce Contamination And Browning In In-Vitro Propagation Of Musa Paradisiaca Var Pisang Tanduk
1535	O-FA-23	Nurul Hidayah Samsulrizal (Phd)	Strategies for developing and evaluating CRISPR/CAS9 Construct towards drought tolerance in rice (Oryza sativa ssp. indica)
1550	O-FA-24	Abdul Munir Abd. Murad (Phd)	Identification and functional analysis of G-protein coupled receptors (GPCR) in oil palm pathogen, Ganoderma boninense.
1605	O-FA-25	Norfarhan binti Mohd Assa'ad (Phd)	Comparative population genomics to dissect the evolution of pathogens
1620	O-FA-26	Anis Farhan Fatimi Ab Wahab (Phd)	Identifying Effectors from Ganoderma boninense Using Multi-Omics Approaches

1650	Tea Break

1700	AWARD PRESENTATION & CLOSING CEREMONY (Grand Ballroom 1)

1600	CONFERENCE END

KEYNOTE SPEAKER

Emeritus Prof. Tan Sri Dato' Dzulkifli Abdul Razak

International Islamic University Malaysia

Biography

Dzulkifli Abdul Razak (or for short, Dzul) is the Rector of the International Islamic University. He is the immediate past president of the International Association of Universities (IAU), a UNESCO-affiliated organisation, based in Paris. He was the Convenor of the Regional Centre for Expertise on Education for Sustainable Development based in Universiti Sains Malaysia beginning 2005. Dzul was awarded the prestigious *2017 Gilbert Medal* in recognition of "his long term commitment to a sustainable approach to international higher education." He is a Fellow of the Academy of Sciences Malaysia, the World Academy of Art and Science the World Academy of Islamic Management.

Abstract

SUSTAINABLE DEVELOPMENT IN THE AGE OF BIO-DISRUPTION

DZULKIFLI, A.R.

International Islamic University, Jalan Gombak, 53100 Gombak, Selangor, Malaysia

Disruptions, especially technical ones, have been part of the way to move forward. It is well accepted as such by many sectors and players who are prepared to meet the challenges head-on. Some of the disruptions are indeed planned as a way to move the competition ahead. Those who are less savvy usually will have to pay a hefty prize. However, in the bio-disruptions - defined as induced by a biological factor, as in the case of the pandemic - the situation is less clear. This can be easily deduced from the two-year experience that the world is being faced with. In fact, the more technologically advanced communities seem to experience the worst, relative to the lesser counterparts. The levels of control and prediction are almost uncertain making the outcome more tentative and even more challenging to fulfill. The implications on Sustainable Development Goals as a framework to arrive at a more just and equitable future society is now being question. This presentation will discuss the relevance of SDGs in mitigating the impact of bio-disruptions based on the Covid-19 global scenario.

PLENARY SPEAKER I

Emeritus Prof. Dato' Dr. Abdul Latiff Mohamad
Universiti Kebangsaan Malaysia

Biography

Emeritus Professor Dato' Dr. Abdul Latiff Mohamad is a pioneer in the research of plant taxonomy and conservation biology. In September 1974 he went to the University of Reading, England where he received his Masters of Science in Pure and Applied Plant Taxonomy and, subsequently, his PhD in Plants Systematics. Professor Latiff returned to Malaysia in 1978 and assumed a position as lecturer at Universiti Kebangsaan Malaysia.His almost 40 years of research on Malaysian flora, plant taxonomy and biodiversity has led to the advancement of knowledge that includes the understanding of the science of taxonomy and conservation biology and, also, the importance, value and benefits of environmental conservation in Malaysia. Professor Latiff has also managed to secure funds from the bilateral co-operation of Malaysia-Japan initiatives and also Flora Malesiana Foundation to build the human resource capacity of botanical research in Malaysia. The University of Leiden in the Netherlands has also expressed interest in his research and he was granted a Research Fellowship for the Revision of Malesian Vitaceae Project in 1985. With the support of the Forestry Department in Peninsular Malaysia, Academy of Sciences Malaysia, and UKM, Professor Latiff has led more than 30 scientific expeditions in various states throughout Malaysia. The expeditions carried out investigations into the physical, biological and socio-economic environments. Upon completion of every scientific expedition, Professor Latiff has conducted scientific seminars to explain his findings. Over the years, he has published more than 546 scientific papers, of which 246 are in ISHF listed journals. He has also published more than 300 publications as chapters in books and as papers in proceedings. He was also a lecturer at both undergraduate and graduate levels in the Faculty of Science, UKM between 1979 and 2014. His efforts have led to the transfer of botanical knowledge to more than 35 students who are now teachers and lecturers, research officers and other science professionals in the country.

Abstract

MALAYSIAN BIOLOGICAL RESOURCES AND SUSTAINABLE DEVELOPMENT GOALS : AN APPRAISAL

A. LATIFF

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Being a tropical country Malaysia is richly endowed with biodiversity in the world which is represented by various ecosystems from the deep sea to the high mountains, a large number of species of plants, animals and microbes and the genetic materials contained within them. The highest level resource is the ecosystem or community diversity which is represented by various habitats. Plant species diversity is represented by about 15,000 species whilst the diversity of animals is represented by more than 6,000 species, excluding that of the insects, the largest and most diverse single group which is inadequately known. The knowledge on genetic resource is far from satisfactory. As the country is also pursuing industrialisation and high income economy, conflicts are bound to occur between biodiversity conservation and socio-economic development, unless sustainable development is adopted at both the federal, state and local levels. To-day many forest types and marine parks have been set aside for biodiversity conservation. However, a framework for managing biodiversity to fulfill sustainable development goals is still inadequate as strategic planning and management programmes are lacking. The country is yet to define priorities for conservation and sustainable use based on ecosystem, species and genetic diversity priorities. Measures for sustainable use in agriculture, forestry, fisheries are in place but those in biodiversity prospecting, eco-tourism and impacts of urbanisation on biodiversity are yet to be established. In the absence of concrete data in most plant and animal taxa it is difficult to ascertain the lists of endangered or otherwise threatened species as the various ecosystems are prone to changes. However, efforts to assess and monitor this have been initiated through the National Policy on Biodiversity 1998, revised in 2015. Many factors have contributed to the biodiversity loss; among them is the rapid socio-economic development of the country that transformed vast forested lands by logging activities, land openings for agriculture and resettlement and subsequently creating new built-up areas such as urban and industrial areas and agricultural estates which are relatively poor in biodiversity. These changing land-use patterns are affecting not only biodiversity but the environment *per se*. These activities had led to significant habitat loss, degradation and forest fragmentation. What is needed are frameworks and strategies for biodiversity conservation, some socio-economic strategies for sustainable use and benefit sharing of biodiversity and also some legal measures for sustainable use and protection of biodiversity and assessment of land-use patterns. Some discussion pertaining to sustainable science and sustainable development goals to cater for ecotourism, biotechnology and other socio-economic activities involving our biological resources will be addressed.

PLENARY SPEAKER II

Prof. Dr. Aziz Ahmad
Universiti Malaysia Terengganu

Biography

Prof. Dr. Aziz Ahmad is a professor in Plant Biochemistry and Plant Biotechnology at the Faculty Science and Marine Environment, Universiti Malaysia Terengganu. In previous years, he was the Dean for Centre for Fundamental and Continuing Education at UMT (2019-2020), Dean for the Centre for Fundamental and Liberal Education at UMT (November 2013 – October 2016), Dean of School of Fundamental Science (Feb 2018-June 2019), Director for Centre of Corporate Communication and Image Development (2013), Head of UMT Publisher (2011 – 2012), Deputy Dean (Academics and Student Affair) for the Faculty of Science and Technology (May 2008 - October 2010) and Head of Department for Biological Sciences (April 2006 – April 2008). Professor Dr Aziz research interest is on the effects of stresses on plant growth and development, and the application of microbes in stress plants. To date, he had participated in more than 20 research projects, 9 projects as project leader funded by the Ministry of Higher Education (MOHE); Ministry of Science, Technology and Innovation (MOSTI); Ministry of Agriculture (MOA). He had also involved as a researcher in Identification of Biopharmaceuticals against Atherosclerosis from Marine Natural Resources (MOSTI, 2010-2012); Matching Fund from MOHE and Japan Science and Technology Agency (JST)/Japan International Cooperation Agency (JICA), Science and Technology Research Partnership for Sustainable Development (SATREPS) through Continuous System for Microalgae Production Optimized for Sustainable Tropical Agriculture (COSMOS); and two LRGS projects; Food Security: Enhancing Sustainable Rice Production through Innovative Research (2011 to 2016) and Climax Ready Rice Project (2019 to 2025). He has published more than 100 articles in refereed journal and proceeding as well as presenter in a seminar conferences/seminars/ symposiums at national and international level. His research linkage was built through membership in International Society for Horticulture (ISH) in the group of Pineapple and Aromatic and Medicinal Plants. Currently, he is the managing editor for Journal of Sustainability Science and Management (JSSM), editorial board member of the Journal of Tropical Plant Physiology (JTPP), advisor for the Biosecurity and Sustainability Research Group (RIG) at UMT.

Abstract

THE UTILISATION OF MICROBES FOR SUSTAINABLE AGRI-FOOD PRODUCTION

AZIZ, AHMAD

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Food demand rises with the increase of the human population. Adverse effects of climate change viz., changing of rainfall pattern, rising of temperature, born of new diseases causes thoughtful biotic and abiotic stress on agri-food production and has tremendously affected the global food production. Moreover, increased anthropogenic inputs from urbanization, industrialization as well as gases released from the utilisation of chemical fertilizers and pesticides have posed a severe threat to the agroecosystem and sustainability of agri-food security. For many decades, synthetic chemical-derived have been applied against insect microbial pests and has become an integrative part of agriculture with significant contribution to crop yield and feedstock production. However, long-term persistence, cytotoxicity and microbial resistance have resulted in a negative impact on the biosphere, creating pollution of diverse ecosystems, land degradation and biodiversity losses. For the last two decades, alternative farm management strategies have become the new avenue for a resource of fertilizers, feeds and, controlling pests and diseases in a greener safer and eco-friendly manner. Microbes are known as natural nitrogen fixation, degradation of organics and polluted materials as well as the soil-water binding. Effective microbes are useful in helping crops during water scarcity and drought conditions. Evidence showed that during the decomposition process microbes can convert the polysaccharides into proteins and amino acids. The microbes-derived proteins and essential amino acids could reduce the dependence on the fish meal in feed formulation. The utilisation of biological control agents or known as biocides; both microbes and plant-based formulation has been known to be the main emerging resource in crop disease/pest management and fertilizers. Biocides are appealing as alternatives to chemical pesticides in sustainable agri-food production. Biocides release naturally occurring chemical substances such as phytoalexin or pathotoxins that control pests (bacterial, fungal, insects and weeds) by a nontoxic mechanism with high targeted activity against causal agents and non-persistence in the environment. With this regard, scientists must isolate and identify the effective microbes which hold multi-functions; water holding capacity, nitrogen fixation and pesticide activities and subsequently introduced them to the farmers or end-user. The use of agrochemicals should be slowly reduced or substituted with biocides with great promise for sustainable agri-food production.

PLENARY SPEAKER III

Mr. Giva Kuppusamy
CEO of GK Aqua Sdn. Bhd. Malaysia

Biography

Giva Kuppusamy is the leading expertise in Aquaculture Biotechnology in the region. He also has highly refined expertise in Freshwater prawn aquaculture biotechnology. He has provided consulting advice to regional and international aquaculture companies and institutes. He has also developed technology to produce 'all-male' freshwater prawn with high economic value. He is the Founder & CEO of GK AQUA which formed to commercialize 'All-male' freshwater prawn. His advisory consultant in Crops for the Future (CFF), Giva is responsible in managing collaborative projects under the FishPLUS programme that focusses on fish-plant research interface for sustainable aquaculture. He is also active in environmental sustainability and was awarded Community Solution leader by US State department representing Malaysia. He is also a visiting fellow in University of Georgia, US. He has been invited to many national and international conferences to present his work in crustacean aquaculture. Prior to CFF, Giva was a Farm Manager with SRMM Sdn Bhd, a freshwater prawn farming company. During his tenure with SRMM Sdn Bhd, Giva conducted several research and development activities on *Macrobrachium rosenbergii*. Giva holds MSc in Aquaculture Biotechnology from University Malaya and Master's degree in Sustainable Aquaculture with University of St. Andrews. He has been awarded commonwealth scholarship to pursue this course.

Abstract

TOWARDS THE CIRCULAR GREEN ECONOMY OF FRESHWATER PRAWN FARMING

KUPPUSAMY, GIVA

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With the proven success in Freshwater broodstock prawn development, GK AQUA SDN BHD (Bionexus Status Company) was formed to implement the cutting-edge technology and commercialize the efficiency of freshwater prawn farming. Genetic selection is the primary approach of GK Aqua for the production of premium quality of post-larvae through the manipulation of genetic through selective breeding. The excellent genetic qualities from the wild giant freshwater prawn have enhanced the pathway of our prawn production in a controlled environment. Unlike other conventional prawn farming, GK Aqua ultimately focus in the production of excellent qualities of brood prawn which in turn will produce good quality of offspring. The quality enhancement also branched our research into manipulation of nutrient retention and disease screening. Our preliminary research had shown the utilization of *Sesbania sesban*, commonly known as hummingbird leaf, an underutilized plants through black soldier fly (BSF) as promising alternative which could replace the inclusion of marine-based ingredients and other expensive plant-based meals in aquaculture. Inclusion of underutilized plants with hundreds of nutraceutical properties, certainly will deposit beneficial nutrients as well as promotes the growth, immunity and survival of the farmed species. Utilization of crop-based feeding substrate to BSF technically reduce many potential risks to the producers and consumers. The issues of traceability, higher content of heavy metals, poor hygienic organic wastes and the food permissible can be totally hindered in the BSF meal produced by GK Aqua. This also has environmental concern, where plantation of Sesbania functions as natural fertilizer to the soil and environment around as it can turn infertile soil into fertile, regulates the carbon neutrality and reduce the potential emission of greenhouse gases. Further, in the perspective of molecular approach, recent deposition of *M. rosenbergii*genome for a bio-project (Bio-sample accession: SAMN24815316) broaden our research to attempt advanced molecular and genetic studies to improve the genetic strain of brood prawns. In summary, GK Aqua believe, the approach towards promoting ‘circular green economy’ through production of environmental and economically sustainable aquafeed and advanced level of genetic selection may create a trail to the quality-prioritized commercial production of giant freshwater prawn.

PLENARY SPEAKER IV

Emeritus Prof. Dr. Geoffrey A. Cordell
University of Florida, United States of America

Biography

Emeritus Professor Geoffrey A. Cordell obtained his Ph.D. in indole alkaloid chemistry at the University of Manchester in 1970, and after two years at M.I.T. joined the College of Pharmacy, University of Illinois Chicago, holding several senior administrative positions at the College and Campus levels; he retired in 2007. The author of over 600 research publications, reviews, book chapters, two books on alkaloids, and the editor of 37 books, including 29 volumes in "*The Alkaloids Chemistry and Biology*" series. He is on the Editorial Advisory Board of 30 international scientific journals and has been a plenary speaker at over 190 international meetings. An Honorary Professor at universities in China, India, and the Philippines, he is also a Visiting Professor in Malaysia (at four universities), Japan, Thailand, Mexico, Brasil, Peru, and Colombia. He was named Outstanding International Ethnopharmacologist of the Year in 2015 by the International Society of Ethnopharmacology and received the Norman Farnsworth Research Achievement Award of the American Society of Pharmacognosy (ASP) in 2019, where he is one of thirteen Honorary Members and a former President. He presently assists governments and universities in the development of traditional medicines and their administrative and research resources, as well as providing lectures and workshops on traditional medicine quality control and grant and manuscript writing. His interests include the chemistry, biological activity, and biosynthesis of alkaloids, cyberecoethnopharmacolomics, medicines security, ecopharmacognosy, and the role of natural products in the Fourth Industrial Revolution.

Abstract

CYBERECOETHNOPHARMACOLOMICS (CEEPO)

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Natural Products Inc., Evanston, IL 60202, USA and Department of Pharmaceutics, College of Pharmacy, University of Florida, Gainesville, FL 32610, USA

The optimal future utilization of natural products for societal benefit remains underexplored. The holistic and integrative term "cyberecoethnopharmacolomics" (CEEPO) conceptualizes the breadth of the applicable contemporary sciences and technologies required to pursue the continuing sustainable development of natural product resources in an era of profound and accelerating climate change. The morphemes of CEEPO reflect a deep interconnectedness with seven technologies from the Fourth Industrial Revolution (4IR) and the broad societal initiatives promulgated in the Quintuple Helix (QH) of tripartite collaboration, an equitable "knowledge society", and ecological sensitivities which result in collaborative, integrated innovation towards the Sustainable Development Goals. Within CEEPO, "Cyber" indicates the criticality of comprehensive, holistic information systems of accumulated data on all aspects of natural products, the applications of artificial intelligence, machine learning, and robotics, and of blockchain technology for medicinal plant quality control. "Eco" focuses on developing applications sustainably and embraces the urgent need to assess the impact of climate change on medicinal and aromatic plants and spices, their distribution, and their metabolite profile. "Ethno" fosters respect for the historical and contemporary use of plants by various societies for medicinal and other purposes, and a commitment to compile, analyze, and prioritize this information. "Pharmacol" reflects that the studied material(s) will be assessed in a biologically relevant manner. "Omics" refers to five essential aspects of natural product development, taxonomics, genomics, metabolomics, agronomics, and economics.

PLENARY SPEAKER V

Prof. Dr. Sung Ok Han
Korea University, Seoul, Korea

Biography

Professor Sung Ok Han has been a Professor at the Department of Biotechnology, Korea University since 2007. He obtained an undergraduate degree from Korea University in 1989. Two years later, he finished his Master's from the University of Sydney. In 2003, he completed his PhD study at the University of Sydney. Professor Han is active in various societies such as the Korean Society for Biotechnology and Bioengineering, the Asian Federation of Biotechnology and the European Federation of Biotechnology. His research interests include Industrial Microbiology, Metabolic Engineering, Synthetic Biology and Bioenergy. He has published in numerous reputable journals such as Metabolic Engineering, ACS Journal of Agricultural and Food Chemistry, Bioresource Technology and Journal of Cleaner Production. In addition to that, Professor Han registered more than 16 patents in the last 3 years.

Abstract

DESIGNER MICROBIAL CELL FACTORY (EQUIPPED WITH NANOSCALE MULTIFUNCTIONAL ENZYME COMPLEX) FOR HIGH-VALUED PRODUCTS FROM RENEWABLE RESOURCES

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In the practice of converting biomass into valuable biomaterials, the critical step is the decomposition process to give fermentable monomeric sugars. Thus, the designed microbes based on enzyme complexes are a key biological technology for biorefinery. For utilizing of polysaccharides by simultaneous saccharification and fermentation,a recombinant scaffolding protein from *Clostridium cellulovorans* and a chimeric hydrolysis enzyme were assembled as a complex system. The utilization of scaffolds for enzyme immobilization involves advanced bionanotechnology applications in biorefinery fields, which can be achieved by optimizing the function of various enzymes. The assembly of minicellulosomes by *Saccharomyces cerevisiae* and *Corynebacterium glutamicum* increased the activity against various lignocellulosic materials by approximately 3-fold compared with control. Also, red algae-degrading complexes increased the activity against the marine biomass substrate by approximately 2-fold. Final, carbon monoxide (CO) was successfully converted by functional complexes containing carbon monoxide dehydrogenase and carbon monoxide sensing heme protein with enhanced CO binding affinity. An enzyme complex was anchored on the cell surface of CO_2-utilizing *Ralstonia eutropha* and successfully showed 3.3-fold increased conversion efficiency. Moreover, the electrical conductivities of hemozoin prepared by heme polymerase enzyme complexes were investigated and compared with those of the heme monomer. Because of the synergetic effects of polymerized heme, synthesized artificial nanocrystals exhibited a greater conductive property than a heme monomer. In the field of metabolic engineering with synthetic biology, *C. glutamicum* is one of attractive biosystems for production from essential primary metabolites to high-valued chemicals such as L-cysteine, taurine, heme, porphyrin and biliverdin, because it can produce various amino acids and is being used in industry. Thus, designing metabolic pathways of this industrial microbe to tailor the final product production is a key biotechnology and can be an alternative process for large-scale and high-yield production. In conclusion, intelligent application of various scaffolds to couple with nanoscale engineering tools and metabolic engineering technology may offer particular benefits. The development of multi-functional protein complexes for use as tools in whole-cell biocatalyst systems has drawn considerable attention as an attractive strategy for bioprocess applications.

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