THE 4TH INTERNATIONAL CONFERENCE ON BIOSCIENCES & MEDICAL ENGINEERING

21- 22 JUNE 2022 VIRTUAL CONFERENCE

SCIENTIFIC ADVANCEMENT FOR SUSTAINABLE RESOLUTION OF PANDEMIC

CONFERENCE PROGRAMME BOOK

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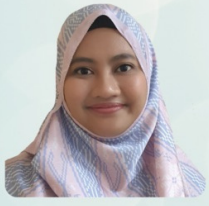

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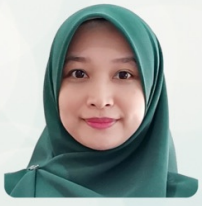

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MESSAGE FROM CHAIRMAN

Assoc. Prof. Dr. Azzmer Azzar Abdul Hamid

Chairman, 4th International Conference in Biosciences & Medical Engineering (ICBME)

Welcome to the 4th International Conference on Biosciences & Medical Engineering (ICBME 2022), organized by Kulliyyah of Science, International Islamic University Malaysia (IIUM), Faculty of Science, Universiti Teknologi Malaysia (UTM) and Udayana University (UNUD), Bali Indonesia. ICBME 2022 virtually held on 21st – 22nd June 2022 under the theme 'Scientific Advancement for Resolution of Pandemic' with the support of 8 co-organizing institutions. The organizers aim to promote continuity of science towards developing effective interventions to achieve a sustainable future for all humanity. With 56 Oral and 27 Poster participants, this conference provides a platform for academia and industry to share knowledge and showcase innovations & their achievements in health science and engineering. This event covers multidisciplinary topics on advances in Bioscience and Medical engineering such as applied & general Microbiology, Biochemistry & Molecular Biology, Functional food & Nutraceutical, and Biomechanics & Biomaterials. For the first time, the conference awarded participants and committees in the category of a young scientist, excellent researcher and lifetime contribution. I would like to express my sincere gratitude to the members of the organizing committees for their hard work and continuous support; plus my sincere appreciation to all participants, keynotes, plenary and invited speakers who have contributed to this successful conference.

Last but not least, I would like to thank Universiti Islam Sultan Sharif Ali (UNISSA) Brunei for sponsoring the best presentation and a special award for Sustainable Agriculture. The same goes to ADABI for consistently giving us financial support to manage this jointly organized conference. On behalf of the organizing committee, we are pleased to welcome all participants to the 4th International Conference on Biosciences & Medical Engineering, a virtual meeting. We hope they will find this year's program exciting and fruitful scientific discussions with local & international participants. Hence, let us enjoy the conference!

MESSAGE FROM CO-CHAIRMAN

Dr. Ida Bagus Wayan Gunam

Co-Chairman II
4th International Conference in Biosciences & Medical Engineering (ICBME)

On behalf of the International Islamic University Malaysia (IIUM), Faculty of Science Universiti Teknologi Malaysia (UTM) and Faculty of Agricultural Technology, Universitas Udayana (UNUD), I am honored to welcome all the great scientists, academicians, researchers, and students from all over the world to attend the virtual conference of the 4th INTERNATIONAL CONFERENCE ON BIOSCIENCE AND MEDICAL ENGINEERING (ICBME) 2022 from 21-22 June 2022, centered at IIUM, Malaysia.

This conference with the theme: "Scientific Advancement for Sustainable Resolution of Pandemic" serves as a platform for meeting, networking, and discussion on sustainable approaches in bioscience-related disciplines. The scientific event aims to bring together all scientists, academicians, and industries to share knowledge and experiences and showcase innovations and their achievements in bioscience, health science and engineering. The conference will be attended by participants from various countries from various research fields to present their latest scientific findings, which may prove helpful to spur future collaborative efforts. Themes emphasizing collaborative and multidisciplinary research in many scientific areas will expand the boundaries of research while embracing differences and strengths.

On this occasion, I would like to express my sincere gratitude to the UTM and IIUM for trusting the Faculty of Agricultural Technology at Udayana University to participate in this prestigious event. We would also like to extend our sincere thanks to our keynote speakers, plenaries, invited speakers, oral and poster presenters and all participants for contributing to the conference. Furthermore, we would like to express our heartfelt appreciation to all contributing organizations and the conference organizing committees who have worked hard and wholeheartedly to make this conference successful.

Finally, I hope you all enjoy the conference and have a fruitful experience and networking.

Dr. Ida Bagus Wayan Gunam
Co-Chairman II
Department of Agroindustrial Technology
Faculty of Agricultural Technology
Universitas Udayana (UNUD)

KEYNOTE SPEAKERS

PLENARY & INVITED SPEAKERS

ICBME 2022
PLENARY SPEAKERS

Prof. Dr. Shaharum Shamsuddin
Universiti Sains Malaysia

AP. Dr. Zarina Zainuddin
International Islamic University
Malaysia (IIUM)

Prof. Dr. Thomas Edison
E. dela Cruz
University of Santo Tomas
Philippines

Dr. Ahmad Zahran Md. Khudzari
Universiti Teknologi Malaysia
(UTM)

ICBME 2022
INVITED SPEAKERS

Assoc. Prof. Dr. Dasuki Hj Sul'ain
Universiti Sains Malaysia

Assoc. Prof. Dr. Sevgi Marakli
Yildiz Technical University

Assoc. Prof. Dr. Hjh. Rose Abdullah
Universiti Islam Sultan Sharif Ali

Dr. Mohd. Zulkhairi Abdul Rahim
Universiti Kuala Lumpur-MICET

Dr. Khairul Mohd. Fadzli Mustaffa
Institute for Research in Molecular
Medicine (INFORMM), USM

Dr. Siti Azma Jusoh
Universiti Teknologi Mara
(UiTM), Puncak Alam

Dr. Fazia Adyani Ahmad Fuad
International Islamic University
Malaysia (IIUM)

Dr. 'Aishah Mohamed Rehan
Universiti Tun Hussein Onn
Malaysia (UTHM)

ORGANIZERS

PROGRAMME SCHEDULE

DAY 1

Schedule
The 4th International Conference on Biosciences & Medical Engineering
21-22 June 2022

TIME (GMT +8 hours)	DAY 1 (21 June 2022)	
08.00-08.30	Registration	
08.30-08.35	Welcoming Address by Master of Ceremony, ***Dr Widya Abdul Wahab***	
08.35-08.40	Recitation of Du'a by ***Assoc. Prof. Dr. Abdurezak Abdullahi Hashi***	
08.40-08.50	Welcoming Speech by Chairman of ICBME2022, ***Assoc. Prof. Dr Azzmer Azzar Abdul Hamid***	
08.50-09.00	Opening by the Dean of Kulliyyah of Science, ***Assoc. Prof. Dr. Jesni Shamsul Shaari***	
09.00-09.30	**Keynote I:** ***Dr. Ravindran Thayan (Institute for Medical Research (IMR), National Institute of Health (NIH) Malaysia)*** Covid-19 Pandemic: Bridging Biosciences and Medical Engineering in Various Facets of Outbreak Management	
09.30-10.00	**Keynote II:** ***Assoc. Prof. Dr. Takahisa Yamamoto (Gifu College, Japan)*** How Computational Fluid Dynamics Simulation Contributes to the Development of Biomedical Engineering	
10.00-10.30	**Joint Q & A and Break**	
	ROOM A (Breakout 1)	**ROOM B (Breakout 2)**
Concurrent Session 1	**Chairperson:** **Prof. Dr. Fahrul Zaman Huyop** **(Universiti Teknologi Malaysia)**	**Chairperson:** **Prof. Tengku Haziyamin** **(International Islamic University Malaysia)**
11.00-11.30	**Plenary I:** ***Prof. Dr. Shaharum Shamsuddin*** ***(Universiti Sains Malaysia)*** Molecular Evolution Of SARS-COV-2: From Wuhan to Omicron BA.2	**Plenary II:** ***Assoc. Prof. Dr. Zarina Zainuddin*** ***(International Islamic University Malaysia)*** *Stevia rebaudiana* Improvement Strategies: Sharing A Decade of Experience
11.30-11.45	**53AO:** ***DyaFitri Kusharyati*** Bacteriocin of *Lactic Acid Bacteria* LG15 Isolated from Logending Beach Mangrove Sediment and Its Inhibition Against *Propionibacterium acnes*.	**52AO:** ***Nabihah binti Azhary*** The Effect of Biosurfactant on the Interaction of Organic Pollutants with Catabolic Enzymes Through Molecular Docking and Molecular Dynamics Simulation Studies: A Review
11.45-12.00	**47AO:** ***Dr. Saefuddin Aziz*** Detection of Phenylglycine and Pipecolic Acid Biosynthetic Genes Involved in Pristinamycin Production in *Streptomyces* SW4 by Polymerase Chain Reaction.	**50AO:** ***I Gede Putu Supadmanaba*** SF3B1 Expression Predict the Chemoresistance in Triple-Negative Breast Cancer.
12.00-12.15	**42AO:** ***Siti Aishah Sufira binti Nor Hishamuddin*** The Binding Affinity of Spike Cleavage Site with Furin Protease: Insight into Infectivity of Sars-Cov-2 Variants	**48AO:** ***Assoc. Prof. Dr. Desak Made Wihandani*** Relationship Between Serum Level of CD44 With Clinicopathology of Breast Cancer Patient in Bali, Indonesia.

PROGRAMME SCHEDULE

DAY 1

12.15-12.30	**Invited speaker I:** ***Dr. 'Aishah Mohamed Rehan*** ***(Universiti Tun Hussein Onn Malaysia)*** Utilization Of Bioinformatics Tools for Characterizing Carbohydrate-Active Enzymes (CAZYMES) For Biobased Industry	**Invited speaker II:** ***AP Dr. Mohd Dasuki Hj Sul'ain*** ***(Universiti Sains Malaysia)*** Anti-Depressant Effects of Melaleuca cajuputi Essential Oil in Chronic Immobilization Stress-Induced Mice
12.30-12.45	**41AO:** ***Dr. Ummu Afeera Zainulabid*** Rapid Identification Of SARS-CoV-2 Lineages from Two Major Clusters in Pahang, Malaysia Using Minion Sequence	**45AO:** ***I Wayan Ryantama Swastika Braja*** Formulation And Stability of Clove Leaf (*Syzygium Aromaticum* L.) Essential Oil Microemulsion
12.45-13.00	**37AO:** ***Rafida Binti Razali*** Optimization of Recombinant Production and In Silico Screening of Peptide-Based Inhibitors for SARS-CoV-2 Plpro	**36AO:** ***Syariffah Nuratiqah Syed Yaacob*** Genome Analysis of Lactic Acid Bacteria from Malaysian *Heterotrigona itama* Honey Reveal Its Source of Novel Lactobacillaceae spp. Capable to Produce B-Group Vitamins
13.00-14.00	**Poster Evaluation & Tea Break**	**Poster Evaluation & Tea Break**
Session 2 14.00-14.15	**Chairperson:** **Dr. Nurul Hidayah Samsulrizal** **(International Islamic University Malaysia)**	**Chairperson:** **Dr. Khairul Bariyyah Abd. Halim** **(International Islamic University Malaysia)**
14.15-14.30	**35AO:** ***Dr. Cahyo Budiman*** Inhibitory Properties of Hypotlide of *Hyptis Pectinata* (L.) Against Proteolytic Subunit of Caseinolytic Protease of *Plasmodium knowlesi*	**34AO:** ***Prof. Dr. drh. I Wayan Suardana, Msi*** Identification Of Gram-Positive A-Hemolysis Bacteria Isolated from Tonsil and Nasal of Pigs in Traditional Pig Slaughterhouse and Its Antimicrobial Susceptibility Against Penicillin G and Tetracycline
14.30-14.45	**33AO:** ***Teo Hwee Li*** Optimization Of Cellulase and Xylanase Synthesis by *Trichoderma harzianum* Under Solid-State Ferementation Using Untreated Oil Palm Leaves by Taguchi Ortogonal Design	**32AO:** ***Zahidah Nasuha Bt Mohd Yasin*** Comparison Of Thp-1 Macrophages Viability in Different Types of Culture Vessels
14.45-15.00	**27AO:** ***Nurhidayah Binti Ab. Rahim*** Antioxidant Activity and Lc-Ms Profiling of Leaves Extract of *Alstonia angustiloba*	**29AO:** ***Dr. A.A.S.A. Sukmaningsih K.*** Effect Of *Eucheuma cottoni* seaweed Extract on Histopathology of Testes of White Rat (*Rattus Norvegicus L.*) that Induced by Natrium Nitrite
15.00-15.15	**49BO:** ***Dr. Tooba Lateef*** Wild Oat: A Miraculous Hepatopotective Herb.	**18AO:** ***Dr. Izwan Bharudin*** Identification of Mating Genes from Oil Palm Pathogen, *Ganoderma boninense*
15.15-15.30	**Invited Speaker III:** ***Dr. Khairul Mohd Fadzli*** ***(Universiti Sains Malaysia)*** EGFP Increases DNA Aptamer Binding Affinity Against CD54 Protein	**Invited Speaker IV:** ***Dr. Siti Azma Jusoh*** ***Universiti Teknologi Mara*** Ensemble-Based Docking in Drug Discovery: Progress, Pros & Cons

PROGRAMME SCHEDULE

DAY 1

15.30-15.45	**43AO:** ***Prof. Dr. Nyoman Semadi Antara*** Promising Source of Prebiotics from Tropical Plants of Indonesia Origin	**46AO:** ***Dr. Dini Ryandini*** Inhibition Of Pathogenic Bacteria by Antibacterial Compounds Produced by *Streptomyces* Sp. Sae4034.
15.45-16.00	**30AO:** ***Nadhirah Binti Misman*** De Novo Transcriptome Dataset of Gene Expression in *Durio zibethinus* During the Infection of *Phytophthora Palmivora*	**44AO:** ***Prof. Dr. Sri Wahjuni*** Nano Extract of *Coriandrum Sativum* L (Ketumbar) Decrease Malondialdehyde (Mda), Superoxide Dismutase (Sod) Blood Glucose in STZ-Induced Wistar Rats.
16.00-16.15	**39BO:** ***Nanthini Rajindran*** Analysis Of a Special Product Honey from Sabah	**55BO:** ***Ni Made Pertiwi Jaya*** Application Of Biological Filter on Fish Cultivation in Floating Net Cages for Lake Water Quality Management
16.15-16.30		**56BO:** ***Prof. Osmanu Haruna Ahmed*** Reversing Soil Threat for Production Agriculture
16.30-17.00	**Tea Break**	
End of day 1		

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PROGRAMME SCHEDULE

DAY 2

TIME	DAY 2 (22 June 2022)	
08.30-09.00	Registration	
09.00-09.30	**Keynote Speaker III: Dr. I Nengah Sujaya (Udayana University, Indonesia)** Post COVID-19 Pandemic Era: The time to Recover Gut Dysbiosis	
09.30-09.45	**Q&A and Break**	
	ROOM A (Breakout 1)	**ROOM B (Breakout 2)**
Session 3	**Chairperson:** **Prof. Dr. Fahrul Zaman Huyop** **(Universiti Teknologi Malaysia)**	**Chairperson:** **Dr. Syafiqah Saidin** **(Universiti Teknologi Malaysia)**
10.00-10.30	**Plenary III:** ***Prof. Dr. Thomas Edison E. dela Cruz*** ***(University of Santo Thomas, Phylipines)*** Hidden Partners: Tapping Fungal Associates for Bioactive Metabolites	**Plenary IV:** ***Dr. Ahmad Zahran*** ***(Universiti Teknologi Malaysia)*** Physiological Flow as a basis for Medical Device Design
10.30-10.45	**15AO:** ***Bilyaminu Garba Jega*** Antibiotic Resistance of Gram-Negative Bacteria Isolated from Inpatients Department (Ipd) In Federal Medical Center (Fmc) Birnin Kebbi, Nigeria	**40CO:** ***Syafie Nizam*** Preliminary Result: Ai-Generated Neutrophil Image Using Deep Convolution Gan for Data Augmentation
10.45-11.00	**17AO:** ***Dr. Sarahani Harun*** Identifying The Potential Genes in Glucosinolate Biosynthesis Using Pathway Analysis	**25CO:** ***Dr. Ridwan Rachmat*** Characteristics Of Straw Mushroom Cultivated Inside Fibre Reinforce Plastic House with Iot
11.00-11.15	**9AO:** ***Lishantini A/P Pearanpan*** Annexin A1 Modulation in *Clinacanthus nutans* Treated Breast Cancer Cell Lines	**3BO:** ***Nurazira Binti Anuar*** Nutritional Properties Evaluation of Asian Sea Bass Feed Formulation from Larvae Generated by Fish and Chicken Wastes
11.15-11.30	**Invited Speaker V:** ***Dr. Zulkhairi Abdul Rahim*** ***(Universiti Kuala Lumpur)*** Biosensor: A Rapid Approach for Analytical Applications	**Invited Speaker VI:** ***Dr. Fazia Adyani Ahmad Fuad*** ***(International Islamic University Malaysia)*** The Glycolytic Pathway as a Target for Drug Discovery Against Tropical Diseases
11.30-11.45	**8AO:** ***Isah Musa*** Antibacterial Activity, UV-Vis Spectrophotometry, and FTIR Analysis of *Melaleuca cajuputi* Powell Leaves Extract	**23BO:** ***Nurul Farhana Roszaini*** Mechanical Properties of Carbon Fiber for Consumer Product: A Mini Review
11.45-12.00	**5AO:** ***Sharifah Siti Maryam Bt Syd Abdul Rahman*** Bacteria Associated with Rice Grain Discoloration in Penang	**22BO:** ***Chong Pu En*** Properties Of the Transparent Wood for Weathering Resistance

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DAY 2

12.00-12.15	**2AO:** ***Dr. Yilmaz Kaya*** Degradation Of Dalapon Herbicide by *Rahnella aquatilis* Isolated from Root Nodules of Faba Bean	**21BO:** ***Aina Ashyiqin Gapor*** The Synergetic Effect of Fly Ash Concrete Mix for the Application of Sustainable Construction
12.15-12.30	**1AO:** ***Nor Wajihan Binti Muda*** Influence of Microbial Inoculant on The Oviposition and Completion of Life Cycle of *Chrysomya megacephala* and *Chrysomya Rufifacies* Infesting Rabbit Carcasses	**20BO:** ***I Gede Arya Sujana*** Selection and Growth Condition Optimization of Ethanol-Producing Microbes Isolated from Ragi Tapai
12.30-12.45	**4AO:** ***Aedrianee Reeza Alwi*** Applications Of X-Chromosome Short Tandem Repeats for Human Identification: A Review	**19BO:** ***I Wayan Wisma Pradnyana Putra*** Isolation, Screening of Cellulolytic Bacteria, Optimization of Cellulase Production and Its Partial Purification
12.45-13.00	**31BO:** ***Wan Nurul Syafawani Binti Wan Mohd Taufek*** Application of Geometric Morphometric (GMM) Approach for Writer Classification Using Handwritten Numeral Characters	**16BO:** ***Nurnabilah Binti Ahmad Pandi*** Callus Induction of *Zingiber officinale* Var. Bentong Using Different Plant Growth Regulators (Pgrs) And Photoperiod for the Establishment Oof Cell Suspension Culture
13.00-14.00	**Poster Evaluation & Tea Break:**	**Poster Evaluation & Tea Break:**
Session 4 14.00-14.15	**Chairperson 4A:** **Dr. Yilmaz Kaya** **(Ondokuz Mayis University, Turkey)**	**Chairperson 4B:** **Prof. Dr. Ahmed Jalal Khan Chowdhury** **(Universiti Islam Sultan Sharif Ali, Brunei)**
14.15-14.30	**28BO:** ***Dr. Yohanes Setiyo*** Application of the Leisa System for Land Health	**14BO:** ***Dr. Intan Zarina Zainol Abidin*** The Effects of *Piper sarmentosum* Ethyl Acetate Extract on Osteoblast Differentitation of Peripheral Blood Stem Cells
14.30-14.45	**11BO:** ***Arik Arubil Fatinah*** Incidence Of Phytoplasma Diseases in Carrot in Malang Regency, Indonesia	**13BO:** ***Nur Syafiqa Abdul Halim*** Characterization of Pineapple Leaves Paper Using Scanning Electron Microscope (SEM) And Fourier-Transform Infrared Spectroscopy (FTIR): A Review
14.45-15.00	**10BO:** ***Dr. Siti Fairuz Che Othman*** Assessing The Physicochemical Stability of Essential Oil Encapsulated in Hydrogel Beads	**12BO:** ***Umi Hartina Mohamad Razali*** Effects Of Ultrasonic Treatment on Collagen Extraction from The Skins of Barramundi
15.00-15.15	**57AO:** ***Dr. Cristalina Jalil Marsal*** Fish Skin Gelatin and Kappa-Carrageenan Mixtures; An Innovative Approach Towards Rheological Characterization	**54BO:** ***Dr. Ir. Halil Hamzah, Mba*** Developing Drip Irrigation Technology on Dry Land Chili Farming in Rural of North Lombok: Improving Farmers' Households During Pandemic Covid-19 Era

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PROGRAMME SCHEDULE

DAY 2

15.15-15.30	**Invited Speaker VII:** ***Assoc. Prof. Dr. Sevgi Marakli*** ***(Yildiz Technical University, Turkey)*** The Dark Matter Rises to Identify the Relationship Between Transposon and Mirna in Aegilops Genome	**Invited Speaker VIII:** ***Assoc. Prof. Dr. Hajah Rose Abdullah*** ***(Universiti Islam Sultan Sharif Ali, Brunei)*** COIVD-19 Pandemic Implications on Agro-Food Trade Issues and Challenges Towards Food Security in Brunei Darussalam
15.30-15.45	**26BO:** ***Qiestiena Aliya Faiezi Binti Faizul*** Callus And Cell Suspension Culture of Sacha Inchi (*Plukenetia Volubilis* L.)	**58BO:** ***Dr. Mohd Hafiz Jamaludin*** A Review of Solid-State Fermentation: An Alternative Source of Protein for Aquaculture Feed
15.45-16.00		**24BO:** ***Nurzafirah Mohamad*** Preparation and Characterization of Activated Carbon from Watermelon Peels- A Short Review
16.15-16.45	**PRESENTER AND AWARD WINNER:** **Will be given by Assoc. Prof. Dr. Azzmer Azzar and Assoc. Prof. Dr. Rose Abdullah (UNISSA)**	
16.45-17.00	**CLOSING CEREMONY BY CO-CHAIR:** **Dr. Ida Bagus Wayan Gunam (Udayana University)**	
End of the 4th International Conference on Biosciences & Medical Engineering		

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POSTER EVALUATION

DAY 1

ID	NAME OF ORAL PRESENTER	VIRTUAL VENUE	DAY	BREAKOUTROOM
1	DR. HAZLINA AHAMAD ZAKERI	HALL 1	1	A
2	DR. SHIAMALA DEVI RAMAIYA	HALL 1	1	A
3	DR. ENTESAR YASEEN ABDO QAID	HALL 1	1	A
4	DR. LATIFAH BINTI IBRAHIM	HALL 1	1	A
5	DR. MAIZATUL AKMA IBRAHIM	HALL 1	1	A
6	DR. WAN AHMAD FIRDAUS BIN WAN CHEK	HALL 1	1	A
7	DR. ERNIE ZURAIDA ALI	HALL 1	1	A
8	PROF. SHAHRUL HISHAM ZAINAL ARIFFIN	HALL 1	1	A
9	MR. AMIN ASYRAF TAMIZI	HALL 1	1	B
10	MS. ANIS AFUZA BINTI MD YUSOF	HALL 1	1	B
11	MR. HELMI HUSAINI BIN ZAINAL FITHRI	HALL 1	1	B
12	MS. NI KADEK RATNINGSIH DEWI PARWATI	HALL 1	1	B
14	MS. BALQIS NURUL HUDA BINTI ARMADI	HALL 1	1	B
15	MR. I WAYAN ARDYAN SUDHARTA PUTRA	HALL 1	1	B

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POSTER EVALUATION

DAY 2

16	MR. NOVAL WAHYU ADI	HALL 2	2	A
17	MR. I GEDE WIKANIA WIRA WIGUNA	HALL 2	2	A
18	MS. NI NYOMAN SHINTA PRASISTA SARI	HALL 2	2	A
19	MS. MADE VIOLIN WEDA YANI	HALL 2	2	A
20	MR. I GEDE KRISNA ARIM SADEVA	HALL 2	2	A
21	MR. I GEDE ASWIN PARISYA SASMANA	HALL 2	2	A
22	MS. PUTRI AYU WULANDARI	HALL 2	2	B
23	MS. NI PUTU SRI INDRANI REMITHA	HALL 2	2	B
24	MR. ANAK AGUNG BAGUS PUTRA INDRAKUSUMA	HALL 2	2	B
25	MR. I PUTU GEDE SEPTIAWAN SAPUTRA	HALL 2	2	B
26	DR. IDA AYU WIDYA ANJANI	HALL 2	2	B
27	MR. I GUSTI NGURAH ANANDA WIRA KUSUMA	HALL 2	2	B
28	MS. I GUSTI AYU STITI SADVIKA	HALL 2	2	B

KEYNOTE ABSTRACTS

COVID-19 Pandemic: Bridging Biosciences and Medical Engineering in Various Facets of Outbreak Management

Dr Ravindran Thayan
Head of Virology Unit, Institute for Medical Research,
National Institutes of Health, Setia Alam

Severe Acute Respiratory Syndrome Coronavirus 2 is responsible for COVID-19 pandemic. The infection which was first reported in Wuhan Province, China and later spread to other parts of the world, was declared as pandemic by WHO on 11th March 2020. Till date, almost 528 million people were infected and nearly 6.28 million people had died. The virus has been undergoing mutations ever since first reported, due to its ability to continuously causing infections in the community. This results in many variants of the virus such as alpha, beta, delta and omicron. These variants are of public health concern due to their role in increased transmissibility as well severe outcomes. With the advent of technology, both biosciences and bioengineering had combined to provide wide range of solutions to the pandemic, ranging from cutting-edge diagnostics, artificial intelligence in infection control and therapeutics to engineering and telecommunication advances. Among the key ventures of these sciences are breakthrough technology in diagnostics such as use of nanotechnology and biosensor in development of sensitive and specific POCT, devising cost-effective mask or respirators, developing engineering controls for improving ventilation and infection control in hospitals, use of artificial intelligence and machine learning to facilitate rapid development of therapeutics and vaccines as well as predicting outbreaks. There are also advances in telecommunications, where virtual and non-physical communications enabled many interventions progressed during the pandemic. Modelling of aerosol transmission enable better engineering control in the ventilation system and prevented outbreaks due to aerosol transmission. In summary, both biosciences and medical engineering have niche roles in outbreak management as part of preparedness for future pandemic.

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KEYNOTE ABSTRACTS

How Computational Fluid Dynamics Simulation Contributes to the Development of Biomedical Engineering

Takahisa Yamamoto, PhD.,
Associate Professor, Dept. Mech. Eng., National Institute of Technology, Gifu College,
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Computer technologies have made remarkable progress according to Moore's law which perception that the number of transistors on a microchip doubles every two years, though the cost of computers is halved. Moore's law states that we can expect the speed and capability of our computers to increase every couple of years, and we will pay less for them. Another tenet of Moore's Law asserts that this growth is exponential. With this development of computers, computational fluid dynamics (CFD) has also made great strides. The first work using computers to model fluid flow, as governed by the Navier–Stokes equations, was performed at Los Alamos National Lab. in the late 1960s, this group developed various numerical methods to simulate transient two-dimensional fluid flows. CFD is nowadays applied to a wide range of research and engineering problems not only in industrial studies but also in biomedical engineering fields; for example, in these years, the dispersal characteristics of the droplets have been numerically analyzed by using CFD in order to find the COVID-19 spread of infection. Such revelations have made a significant contribution to the control of the infection. On the other hand, coupling techniques of CFD with other numerical simulations such as structure (Fluid-Structure Interaction, FSI) analysis has been attracting attention because of the ease with large scale calculations can be performed due to the increasing computer performance. FSI has revealed actual blood flow characteristics in cerebrovascular precisely. The contribution of CFD and the related techniques will continue to contribute to the development of biomedical engineering.

KEYNOTE ABSTRACTS

Post Covid-19 Pandemic Era: The Time To Recover Gut Dysbiosis

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The World Health Organization declared a pandemic of the Coronavirus Disease 2019 (COVID-19) outbreak caused by the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) on March 11, 2020. The SARS-CoV-2 has infected more than 150 million people and caused over three million deaths as of May 2021. Respiratory illnesses including severe respiratory syndrome caused by the SARS-CoV-2 infection indicate the virus infects respiratory epithelial cells, where the angiotensin-converting enzyme (ACE) 2 acts as a viral receptor for the entry process. The ACE2 is highly expressed in the lung and intestinal tract, implying that a gastrointestinal tract is an extrapulmonary place for viral proliferation. This was also supported by the evidence that SARS-CoV-2 RNA was detected in stool specimens associated with gastrointestinal symptoms of the infected person. SARS-CoV-2 infection alters gut microbiota that is indicated by reduced diversity of gut microbiota, enrichment of pathogenic bacteria, and depletion of the beneficial symbiont. Depletion of beneficial symbiont and gut dysbiosis persisted even after clearance of SARS-CoV-2 that need to be recovered through gut microbiota target approaches. The introduction of probiotics as bacterial therapy either supplemented with prebiotic and or colonic foods offers a great opportunity. Few clinical trials in the modulation of gut dysbiosis using probiotics have been conducted with promising results, however comprehensive proven concepts will be further completed soon. In addition, the dietary approaches especially the consumption-specific available foods which enrich diverse gut microbiota provide a rational option in fastening the recovery of gut dysbiosis due to SARS-CoV-2 infection.

Keywords: 1, SARS-CoV-2 2, Gut microbiota 3 Dysbiosis 4, Probiotic

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PLENARY ABSTRACTS - 1

Molecular Evolution of SARS-COV-2: From Wuhan to Omicron BA.2

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COVID-19 is a viral respiratory disease caused by a highly transmittable and pathogenic viral infection caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). This disease caused global pandemic that led to a dramatic loss of 4.7 million human life worldwide (September 2021 data). Coronavirus has the largest genomes (26.4 – 31.7 kb) among all known RNA viruses. The large genome has given this family of virus extra plasticity in accommodating and modifying genes. The coronavirus belong to the family Coronaviridae in the order Nidovirales. The subfamily Coronavirinae can be further divided into four genera phylogenetically : Alphacoronavirus, Betacoronavirus, Gammacoronavirus and Deltacoronavirus. Alphacoronavirus and Betacoronavirus predominantly infect mammals and contain the seven coronavirus types which infect humans. Two highly pathogenic Betacoronaviruses have emerged in the past two decades in addition to SARS-CoV-2 : SARS-CoV in 2002 (Guangdong, China) and Middle Eastern Respiratory Virus (MERS-CoV) in 2012 (Saudi Arabia). RNA viruses have been recognized as highly mutable since the earliest studies. Mutations at both the receptor-binding domain (RBD) and the amino (N)-terminal domain (NTD) of the SARS-CoV-2 Spike (S) glycoprotein can alter its antigenicity and promote immune escape. Since december 2019 when the 1st case was reported in Wuhan, the original strain had gone through active mutations and using NGS genome sequencing on over two millions of viral genomic samples, these sequences revealed how the virus has mutated and changed in different periods and regions of the pandemic. Viruses exist to make copies of themselve. The more a virus spreads, the more it mutates. Most of these changes are harmful to the virus or have no effect, but occasionally a mutation will gives the virus an advantage, like making it easier to catch, more virulence or harder to detect. The mutational history led to a collection of genetic fingerprints extending from the progenitor Wuhan's SARS-CoV-2 to the current variants and shared through the GSAID platform. At the end of May 2021, WHO has announces simple-easy-to-say labels for SARS-CoV-2 Variants of Interest (VOI) and Variants of Concerns (VOC) using letters of the Greek alphabet. There is a range of changes within every variant, but after the omicron variant emerged in late 2021, a specific subvariant called BA.2 began to dominate new infections. This BA.2 variant has continued mutating and optimizing itself. Its latest form is BA.2.12.1, which is now beginning to make up a larger share of new cases in the world. We will discussed the molecular evolution of these variants based on their reported mutations and how these mutations might affect virulence, pathogenesis, host range or immune escape as well as the effectiveness of SARS-CoV-2 diagnostics and therapeutics.

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PLENARY ABSTRACTS - 2

Stevia rebaudiana improvement strategies: Sharing a decade of experience

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Considered as the best alternative sweetener due to its noncaloric and noncarcinogenic properties, there is an increasing demand for Stevia rebaudiana. This plant which was originally found in Paraguay, Brazil and Argentina was first introduced into Malaysia in the early 1970s. Regardless of the demand, the cultivation of Stevia in Malaysia at a commercial scale failed due to a few constraints. Stevia is a photoperiod sensitive plant where it starts flowering as early as 6 weeks after planting under short-day condition like Malaysia, causing less production of leaves i.e. the main source of sweetener. Poor seed germination rate and a time-consuming stem cutting propagation process are two other constraints in Stevia cultivation. In this presentation, various breeding strategies for the development of Stevia varieties with good adaptation to the local environment will be discussed. Among the strategies are mutation breeding and Trigona-assisted pollination, where Stevia hybrids with delay in flowering and high glycosides content were successfully produced. The results on the mass propagation and cultivation of Stevia through tissue culture system for the production of true-to-type progenies will also be presented. In order to develop photo-insensitive Stevia through manipulation of flowering genes, transcriptome sequencing of Stevia at two different stages of growth namely 1 week before flowering and after flowering was conducted. The de novo transcriptome dataset and findings of the transcriptome profiling which successfully identified a number of Stevia flowering genes will also be covered in this presentation.

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PLENARY ABSTRACTS - 3

Hidden Partners: Tapping Fungal Associates for Bioactive Metabolites

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Fungi have always been at the forefront in the battle against infectious diseases. Our first arsenal against disease-causing microbes came from a fungus, Penicillium, which completely changed the playing field in medicine and revolutionized our approach to health management. Therefore, fungi remain as one of the most promising sources of bioactive metabolites and a recent estimate of 2.2 to 3.8 million fungal species represents an unlimited source of promising microorganisms. Recently fungal associates, those that reside within other organisms, are gaining attention as new sources of metabolites. Their unique association with their host plants and other organisms such as lichens resulted in chemical diversity of the metabolites they produce. In this presentation, fungi associated with mangroves, macroalgae and tropical plants, also known as fungal endophytes, will be discussed for their ability to produce novel compounds with inhibitory activities against bacteria, fungi, protozoa, and cancer cell lines. Different strategies to increase their production of chemically diverse bioactive metabolites will also be presented. Another emerging source of unique compounds are the fungi associated with lichens, the endolichenic fungi. Techniques for their isolation and culture will be discussed including insights to their possible roles in the lichen association. Finally, metabolomic approaches to streamline the screening process will also be presented. All these highlight the importance of fungal associates as hidden partners for drug discovery development activities.

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PLENARY ABSTRACTS - 4

Physiological Flow as a basis for Medical Device Design

Dr. Ahmad Zahran bin Md Khudzari

Design of medical devices needs to meet a much more stringent requirement from the ideation stage until commercialisation and even post implantation for patient safety. In the ideation process, it is imperative that the medical device design would not adversely affect patient condition in whatever manner. Nature does provide some hint that can be used to help medical device designer in creating devices that help with its intended purpose, which can be listed in the product specification design early on. The blood ejection from the left ventricular into the aorta involved a complex sequence of action assisted by the unique ventricular muscle arrangement, and the morphology of the aorta, which causes the blood to exhibit a peculiar flow condition. Instead of forward flow profile, due to the aforementioned facts, blood egress the left ventricle is spiral in nature, particularly during the two third part of ventricle systole period. The physiological nature of flow in the aorta is the inspiration for medical device ideation process particularly for heart lung machine aortic cannula, as well as for left ventricular assist device flow output design. A novel flow diverter design has been incorporated into blood flow devices such as cannula and left ventricular assist device, and its effect has been tested using computer simulation and flow experiment. Numerical and experimental results have shown that spiral flow can indeed decrease some of the adverse effects of existing cannula already used in the market. For left ventricular assist device, early simulation work also showed interesting results that suggest spiral flow could help with high-speed flow from the blood pump into the aorta.

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INVITED SPEAKERS ABSTRACTS

Utilization of Bioinformatics Tools For Characterization Carbohydrate-Active Enzymes (Cazymes) For Biobased Industry

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The Carbohydrate-Active Enzymes (CAZymes) are enzymes that are able to degrade, modify, or create glycosidic bonds. Microorganisms secretes large amounts of CAZymes, which allows microbial conversion of plant biomass to industrially valuable products such as bioenergy and biofuel production. Precursors produced by these enzymes can be used to generate bio-based products, such as food, paper, textile, animal feed, and chemicals, including biofuels. Unique genome assemblies from Malaysia are identified from National Centre for Biotechnology Information (NCBI) between 2018 to 2022, with the aim to investigate CAZymes and CAZymes network involved in food, waste or biofuel processing. The data contained in these assemblies are enormous and holds potential for genomic data mining of CAZymes intended for future commercial exploration. In silico tools is used to investigate glycoside hydrolases, which are responsible for the degradation of the major fraction of biomass, starting from annotation of CAZymes, identification of CAZymes network, docking and molecular dynamics. The availability of CAZymes network and annotation will initiate detailed study on each unique CAZyme and its potential application for industry.

Keywords: CAZymes, in silico, glycoside hydrolase, bioprospecting, biorefinery

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INVITED SPEAKERS ABSTRACTS

Anti-Depressant Effects of Melaleuca cajuputi Essential Oil in Chronic Immobilization Stress-Induced Mice

Dr. Mohd Dasuki Hj Sul'ain

Melaleuca cajuputi essential oil (MCEO) or locally known as cajuput oil. MCEO is derived from steam distillation processes of Melaleuca cajuputi(MC) leaves. MC leaves are traditionally used as herbal tea to relieve pain and treat various ailments including asthma, intestinal parasites, and viruses. MCEO is also used to relieve coughs, colds, laxatives, muscle relaxants, sedatives, disinfectants against bacteria, and many more. Depression is a common mental disorder that occurred due to monoamine neurotransmitter imbalance. Nowadays, available therapies are ineffective thus alternative treatment using MCEO is needed. The in vivo study was conducted to evaluate the antidepressant effects of MCEO in chronic immobilization stress (CIS) - induced mice. Eight male Swiss albino mice per group were induced with CIS procedure for 2 hours for 15 days. MCEO at all doses showed significantly reduced depression-like behaviors in all the groups of CIS-induced mice. MCEO exhibits antidepressant effects probably due to phytochemical contents, increased GCL and PCL surface areas, and regulation of the CRH pathway. MCEO has the potential to be developed as anti-depression agent.

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INVITED SPEAKERS ABSTRACTS

eGFP increases DNA aptamer binding affinity against CD54 protein

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Aptamer is a single-stranded nucleic acid with the ability bind to a variety of target molecules. Although aptamers with high affinities can be isolated from pools of random sequence oligonucleotides using affinity-based selection, this is not always the case. As a result, further aptamer refinement is required to achieve desired binding affinities. This study was aimed to demonstrate the feasibility of the use of small protein like eGFP to improve the selected DNA aptamer binding affinity towards recombinant human CD54 protein. Eight cycles of in-vitro selection (SELEX) was performed by using random oligonucleotide library against recombinant human CD54 protein coupled with Dynabeads Protein A. Isolated oligonucleotides at cycle eight were cloned and sequenced. The best binders were identified using ELONA, and aptamer DI05 demonstrated the highest binding capability when compared to other isolated aptamer groups. The binding affinity of the e-GFP conjugated and naked DI05 aptamers was determined using surface plasmon resonance (SPR). This study discovered that eGFP can significantly increase DI05 binding by 2-fold (108 nM) when compared to unconjugated DI05 (248 nM). Therefore, according to this findings, an aptamer conjugated with a small protein such eGFP could be an alternative method to improve aptamer binding affinity.

Keyword: Aptamer, Affinity

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INVITED SPEAKERS ABSTRACTS

Ensemble-based Docking in Drug Discovery: Progress, Pros & Cons

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Molecular docking method is commonly being utilized in an early stage drug discovery to search for potential drug hits/leads. The method provides a low cost and a fast solution that can rapidly screen millions of potential drug compounds only using computers. But, due to the lack of receptor structure flexibility, the rigid docking method is not being able to accurately capture all potential compounds. Meanwhile, molecular dynamics simulation is a powerful tool to study drug-protein interactions to the level of atomic interactions, yet it is too time consuming and computationally expensive to be utilized only for screening. In addition, molecular dynamics simulation has the advantage to generate nature-mimic receptor conformations. A combined method using the receptor structures-generated from molecular dynamics simulations and molecular docking, which is known as ensemble-based docking has shown to improve the accuracy of the virtual screening by many studies. However, the strategy may not be practical in certain conditions. In this work, we are discussing the current progress, pros and cons of the ensemble-based docking approach in a structure-based drug design.

Keywords: molecular docking, molecular dynamics simulations, ensemble-based docking, virtual screening, early stage drug discovery.

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INVITED SPEAKERS ABSTRACTS

Biosensor: A Rapid Approach For Analytical Applications

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The various types of biosensors such as enzyme-based, tissue-based, immunosensors, DNA biosensors, thermal and piezoelectric biosensors have been explored widely to highlight their indispensable applications in multitudinous fields. Conventional ways of analytical application are time-consuming and require centralized laboratories, experienced personnel, and bulky equipment. One of the rapid approaches for accomplishing this goal in clinical and domestic settings is by use of biosensors. In general, biosensors are fast, efficient, and reproducible devices for analytical measuring. This paper presents various strategies for the potential biosensor setups, focusing on transduction principles, biorecognition layers, and biosensor test formats, concerning potential applications in multidisciplinary research. Fabrication of a novel biosensor for diagnostic applications based on carbon nanotubes, metallic nanoparticles, and natural resources will also include as an example. Included also are the comparisons between the biosensors developed in this study and others reported biosensors were made. Also included were some recommendations for future work.

Keywords: Biosensor, Rapid Approach, Analytical Applications

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The Glycolytic Pathway As A Target For Drug Discovery Against Tropical Diseases

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Abstract: Glycolysis is the heart of various metabolic processes, ranging from energy generation to biosynthesis of molecules, indicating its importance as the most primeval metabolic pathway in nearly all living organisms. The pathway has also been perceived as an energy provider for viral replication, which has been previously shown to be altered upon virus infection. Here, we discuss the potential role of glycolysis as a target for the discovery of new drugs against infectious tropical diseases, such as malaria and dengue. Compounds that may possess the ability to inhibit some of the enzymes in the glycolytic pathway, such as lactate dehydrogenase (LDH) and hexokinase isoform 2 (HK2) were initially screened through virtual means, prior to the production of these enzymes in the bacterial system. The effects of these potential inhibitors on the activity of the enzymes were subsequently evaluated, by benchmarking with known inhibitors of these enzymes. Some of the virtually screened compounds, notably Chitin, an analogue of a known inhibitor of human HK2, 2-deoxyglucose (2-DG), exhibited substantial inhibition on the enzyme's activity, which indicates its potential to disrupt dengue virus (DENV) replication. Meanwhile, oxalic acid, which is an analogue of a known inhibitor of LDH, oxamate, has shown promising inhibition on the activity of Plasmodium knowlesi LDH (Pk-LDH), also indicating the possibility of the virtually screened compound to be developed into a potent drug that specifically targets the enzyme. These initial works may provide future explorative potential and have paved the path towards the discovery of new drugs for the treatment of tropical infectious diseases.

Keywords: Glycolysis, tropical diseases, hexokinase isoform 2, lactate dehydrogenase, drug discovery

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The Dark Matter Rises to Identify The Relationship Between Transposon and miRNA in Aegilops Genome

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Abstract: Epigenetics is defined as changes in gene function, occurring independently from changes in DNA sequence. Two important epigenetic mechanisms are transposons and miRNAs which are mobile genetic elements and non-coding RNA types, respectively. Transposons comprise a large proportion of plants' genomes and many plant miRNAs could be identical or homologous to transposons. In this study, in silico analyses were performed to determine transposon-related new miRNAs and their targets in Aegilops genome. For this purpose, reference miRNAs and also transposon sequences were retrieved from different databases. Novel miRNAs were identified, secondary structures of miRNAs were designed, evolutionary relationships were estimated, target sequences and their roles in different metabolic pathways were evaluated after using different programs including NCBI-BLASTn, NCBI-BLASTx, RNAfold, RNAhybrid, MEGAX, and BLAS2GO with strict criteria. As a result of analyses, 17 miRNAs associated with 40 target genes were determined in Aegilops genome. Moreover, it is observed that these genes play crucial roles in important metabolic pathways. Transposons are important epigenetic players similar to miRNAs but there are few studies to investigate the relationships between them. The findings of this study could provide valuable information in Aegilops and even its important relative species, Triticum aestivum, in terms of evolution and molecular breeding for crop improvement.

Keywords: epigenetics, mobile genetic elements, non-coding RNAs, wheat

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Covid-19 Pandemic Implications on Agro-Food Trade Issues and Challenges Towards Food Security in Brunei Darussalam

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The COVID-19 pandemic is a global health crisis having devastating impacts on the world economy both directly and through necessary measures to contain the spread of the disease. The Brunei economy has been buffeted by the COVID-19 pandemic and these impacts are also being stroked by the food and agriculture sector associated oil and gas (O&G) price decline. These agricultural products sectors in Brunei are also experiencing a substantial shift for some commodities on agribusiness sector such as food security, nutrition, livelihoods of farmers, fishers along the food supply chain. In the short term, governments could manage multiple demands responding to the health crisis, managing the consequences of the shock to the economy, and ensuring the smooth functioning of the food system in Brunei Darussalam. However, COVID-19 has shown serious impacts on livelihoods where agricultural production systems are more labor-intensive and there is less capacity to withstand a severe macroeconomic shock. Moreover, the effects of COVID-19 are taking place combined with supply and demand shocks associated with climate change could create food security pressures. In these contexts, this paper portrayed the long term established milestones towards “Way forward in achieving Wawasan Brunei 2035 through a “Dynamic and Sustainable Economical approach”.

Keywords: Covid-19, Wawasan Brunei 2035, Food Security, Agribusiness, Agricultural products

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Influence of microbial inoculant on the oviposition and completion of life cycle of *Chrysomya megacephala* and *Chrysomya rufifacies* infesting rabbit carcasses

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Abstract: This research was conducted to assess the influence of the microbial inoculant EM.1® on the initial oviposition and developmental pattern of two prevalent necrophagous flies (*Chrysomya megacephala* and *Chrysomya rufifacies*) in Malaysia. Nine rabbit carcasses were equally divided into control and two treated groups. The control carcasses were sprayed with deionized water (about 100 mL), whereas the two other treated groups were individually sprayed with two concentrations of EM.1® at 1:500 and 1:100, respectively. The durations taken for each fly species to first oviposit and complete their cycle in treated carcasses were compared with that of control. Results revealed that the single application of EM.1® on both treated carcasses did not statistically impede oviposition by both necrophagous species, as well as their subsequent developmental patterns (Kruskall-Wallis H: $P > 0.05$) when compared with that of controls. Therefore, estimation of minimum postmortem interval (mPMI) using empirical baseline data for the control animal model would remain appropriate for estimating mPMI in cases involving carcasses with a single application of EM.1®.

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Keywords: forensic entomology, oviposition and development, *Chrysomya megacephala*, *Chrysomya rufifacies*, microbial inoculant, postmortem interval

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Degradation of Dalapon herbicide by *Rahnella aquatilis* isolated from Root Nodules of Faba Bean

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Abstract: 2,2-dichloropropionate (2,2-DCP) is a synthetic halogenated compound used in pesticides. Bacteria were isolated from an agricultural area in the Atakum district of Samsun, where the herbicides and insecticides were used intensively. From16S rRNA analysis, the bacteria had 99% identity to *Rahnella aquatilis* strains and shared many similarities in terms of biochemical reactions and microscopic observation. We have isolated a novel dehalogenase-producing bacterium from *Vicia faba* L., Turkey. The bacteria was able to grow slowly in a minimal medium that contains only 2,2-DCP as the sole carbon source and energy and growth were evident in minimal media containing 10mM Dalapon herbicide. Genomic DNA isolation from bacteria isolated from the minimal media medium was performed and *dehE* gene was analyzed by PCR. Bands of the desired size were obtained. This study recommends that bacteria isolated from *Vicia faba* L. are having bioremediation potential and could be used as the possible source for the development of microbial agents.

Keywords Dehalogenase, Dalaphon, *Rahnella aquatilis*

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NUTRITIONAL PROPERTIES EVALUATION OF ASEAN SEA BASS FEED FORMULATION FROM LARVAE GENERATED BY FISH AND CHICKEN WASTES

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Abstract: This present research characterized the proximate nutrient, fatty acids and amino acids compositions of the wild third instar Calliphorid larvae collected from fish and chicken wastes as well as its mixture, in view of aquaculture feeding for Asian sea bass (*L. Calcarifer*). Analyses of crude protein, crude lipids, crude fiber, ash, carbohydrates, amino as well as fatty acids were performed. Results revealed that the larvae that fed on the mixed substrates (chicken and fish, 50:50 ratio) had significantly ($P < 0.05$) the highest nutritional values (51.47 ± 0.32% of crude protein, 29.4 ± 1.47% of crude fat, 4.81 ± 0.83% of crude fiber, 4.85 ± 0.01% of ash and 12.71 ± 1.67% of carbohydrate) for formulating feeds for Asian sea bass when compared with that of chicken and fish wastes alone. Similarly, significantly higher percentages ($P < 0.05$) of fatty acids (DHA and EPA) and amino acids (Arg, Lys, Met, Trp, His, Val, Ile, Leu and Phe) were observed in the larvae from mixed-substrates when compared with that of the remaining two substrates. The findings supported the utilization of Calliphorid larvae harvested on mixed substrate as the possible candidate of nutrient for Asian sea bass feed formulations.

Keywords: Calliphorid larvae, Chicken waste, Fish waste, Feed formulation, Asian sea bass.

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APPLICATIONS OF X-CHROMOSOME SHORT TANDEM REPEATS FOR HUMAN IDENTIFICATION: A REVIEW

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Abstract: Forensic DNA profiling technique has tremendously contributed to the field of forensic science especially for human identification, an important aspect of forensic investigations. In instances whereby comparison samples are unavailable, utilization of short tandem repeats of X chromosome may prove useful to resolve kinship investigations involving missing persons and mass disasters. Despite such evidential values, the use of X-short tandem repeats during investigations remains scarce in many countries including Malaysia probably due to analytical and statistical issues. Hence, this review paper aims to highlight the overview, developments, applications and population data of X-short tandem repeats, as well as its challenges and future insights.

Keywords: Human identification, X-chromosome, short tandem repeats, kinship, forensic statistical parameters, population genetics.

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BACTERIA ASSOCIATED WITH RICE GRAIN DISCOLOURATION IN PENANG

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Abstract: Rice panicle blight and grain discoloration condition is a newly paddy disease that firstly discovered from China in 2020 and recently discovered in Malaysia with adverse impact on our granary production. The symptoms first appeared on the glumes as light-brown spots that progressed to darker brown or black spots, dotted spots that varied in shape and size, hollow light weight panicles, or even unfilled grains. Therefore, the objective of this research was to study the bacteria associated from rice panicle blight and grain discolouration by identifying the causal pathogen based on their phenotypic and molecular characterization. Sampling was done in naturally infected granary areas and the collected panicles have been performed throughout surface sterilization for bacteria isolation until obtained single pure colony. 11 representatives of pure isolates obtained have been identified and classified through phenotypic and molecular characteristics. Based from that, 4 genera of bacteria were obtained. They were from *Pseudomonas* sp., *Pantoea* sp., *Enterobacter* sp. and *Paenibacillus* sp. Hence, to alleviate this serious disease, a precise identification of the pathogen is required in order to control the disease from spreading which results in a rice grain yield reduction.

Keywords: Bacteria, Pathogen, Rice panicle blight, Grain discolouration, Penang

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SUB-ACUTE TOXICITY STUDY OF DIABECINE RECONSTITUTE IN SPRAGUE-DAWLEY RATS

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Abstract: Diabecine reconstitute is a combination of well-known herbs such as *Cinnomomum zeylanicum, Eugenia polyanta, Curcuma xanthorizza, Orthosiphon stamineus* and *Andrographis paniculate*, which are believed to give promising findings especially in the treatment of diabetes mellitus. However, no scientific studies have been performed to investigate its toxicological effect. Therefore, this study aimed to evaluate its safety profile using sub-acute toxicity (14 days repeated doses) in rat model. The sub-acute toxicity study was evaluated by daily administration of different doses (250, 600 and 2000 mg/kg) of diabecine reconstitute for 14 days. Half of the survived rats from each group were kept for another 14 days for observation. Clinical signs, body weight changes, food and water intake, white blood count and relative organ weight were recorded. At the end of the treatment period, the liver and kidney were removed for histological analysis. The administration of diabecine reconstitute did not show significant differences in food consumption, water intake and white blood count ($p>0.05$) as compared to the control. However, significant differences were observed in body weight and relative organ weight ($p<0.05$). Diabecine reconstitutes at 600 and 2000 mg/kg proved to be toxic to kidney and liver in histopathology studies. However, the diabecine reconstitute at a 250mg/kg concentration did not show toxicity effect. Therefore, diabecine reconstitute at a dose of 250mg/kg can be considered as safe for consumption and to be incorporated in diabetes mellitus management.

Keywords: Diabecine reconstitute, Sprague-Dawley rat, Diabetes mellitus, sub-acute toxicity, histopathological

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ANTIBACTERIAL ACTIVITY, UV-VIS SPECTROPHOTOMETRY, AND FTIR ANALYSIS OF *MELALEUCA CAJUPUTI* POWELL LEAVES EXTRACT

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Abstract: The increasing resistance of bacteria to conventional drugs has prompted the search for alternative agents from medicinal plants. This study aimed to determine the antibacterial activity and phytoconstituents of leaves extracts of *Melaleuca cajuputi* (MC). Minimum inhibitory and minimum bactericidal concentrations of MC leaves crude extracts (methanol, ethanol, and aqueous) were determined through broth microdilution assay. The extracts were obtained by cold maceration and reconstituted in DMSO before antibacterial assay. The most effective extract was subjected to ultraviolet-visible spectrophotometry (UV-VIS) in the range of 200–800 nm and Fourier transform infrared spectroscopy (FTIR) at 400–4000cm^{-1}. The study revealed that MC leaves extracts have potent antibacterial activity against *Staphylococcus aureus, Streptococcus agalactiae, Escherichia coli,* and *Klebsiella pneumoniae*. Methanol extract demonstrated the lowest MIC and MBC values (1.00 - 2.00 mg/ml and 2.00 mg/ml respectively) against the tested organisms except for the *E. coli.* The UV-Visible spectrum showed peaks at 368, 434, 534, 605, and 663 nm indicating the presence of flavonoids, alkaloids, and phenolic compounds. The FTIR spectra detected the presence of alcohols, alkane, alkene, sulfoxide, aldehyde, phenol, aromatics, nitro, and halo compounds in the methanol extract. MC leaves possess significant phytoconstituents that have pharmacological properties.

Keywords: Antibacterial, FTIR, Medicinal plants, *Melaleuca cajuputi,* UV-Vis Spectrum.

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ANNEXIN A1 MODULATION IN *CLINACANTHUS NUTANS* TREATED BREAST CANCER CELL LINES

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Abstract: Annexin A1 (AnxA1) is engaged in immunomodulatory effects in tumor microenvironment. *Clinacanthus Nutans* (CN) has gained attention for its anti-cancer effect, however, mechanism remains unclear. This study investigates the association between AnxA1 expression in breast cancer and its role following treatment with CN. A comparative transcriptomic analysis was performed between different breast cancer subtype, MDA-MB 231 and MCF-7 and results vadilated using qRT-PCR. The CN ethanolic extract (0-2mg/ml) cytotoxicity was tested against MDA-MB 231, AnxA1 knockdown (KD) MDA-MB 231, MDA-MB 468 and MCF-7 cell line. The transcriptomic profiling showed that AnxA1 gene signatures were highly expressed in MDA-MB 231, but not in MCF-7. A total of 8647 differentially expressed genes were identified. The functional enrichment analysis of the DEGs revealed a predominant role of high AnxA1 expression in immunomodulation. In addition, only MCF-7, a low AnxA1 expressed cell, was susceptible to CN treatment, compared to MDA-MB 231 cell, expressing high AnxA1. However, CN extract tested against AnxA1 KD MDA-MB 231 cell possessed significant cytotoxicity. The disparity in treatment responsiveness of breast cancer may be linked to increased AnxA1 expression, which is associated to breast cancer's aggressive and metastatic characteristics. As a result, the immunomodulation mediated by AnxA1 in CN warrants further evaluation.

Keywords: AnxA1 knockdown, breast cancer, cytotoxicity, RNA sequencing, immunomodulation

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ASSESSING THE PHYSICOCHEMICAL STABILITY OF ESSENTIAL OIL ENCAPSULATED IN HYDROGEL BEADS

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Abstract: Essential oil contains mainly of volatile constituents, making it vulnerable upon exposure to external environment. Encapsulation method is known to protect the bioactive components of the essential oil from damage, in which alginate was used as the hydrogel in this study. This work investigated the physicochemical stability of the peppermint oil encapsulated within alginate beads (1.5% and 2.0%) during its five weeks of storage. Peppermint oil was added at four different weight ratios to alginate, which were 1:3, 1:2, 1:1, and 2:1. The encapsulation technique involved mixing alginate and oil using a homogeniser. Constituents profiling was done weekly using UV-Vis spectrophotometer and Gas chromatography-mass spectroscopy (GC-MS). Investigation revealed that 1.5% (*w*/*w*) alginate in weight ratio of 1:1 had the highest encapsulation efficiency which was 42.00% while for 2.0% (*w*/*w*) alginate, the weight ratio of 1:2 gave a maximum encapsulation efficiency of 33.38%. Assessment on the beads diameter with time showed little physical changes throughout storage time. Constituents profile of the oil indicated a decline of the chemical constituents between pure sample and the encapsulated peppermint oil, and this might be associated to the heat generated during mixing or exposure to the light during the preparation stage. Even so, the analysis on the encapsulated oil each week suggested no striking changes, indicating the stability the peppermint oil encapsulated in the alginate beads.

Keywords: encapsulation, essential oil, alginate, peppermint oil, physicochemical profiling

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INCIDENCE OF PHYTOPLASMA DISEASES IN CARROT IN MALANG REGENCY, INDONESIA

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Abstract: Phytoplasma is one of the disease-causing agents of plant diseases such as yellow wilt, witches' broom, phyllody, and virescence that is difficult to detect. Information on phytoplasma infection in crops, especially carrots in Malang Regency, East Java, is unavailable. A study on the incidence of phytoplasma disease in carrots was conducted in Malang Regency. Thirty (30) young leave samples were collected from 6 villages in Malang Regency. The young leave samples were extracted using Plant Genomic DNA Mini Kit (GP100) as kit protocol. Phytoplasma detection was performed by PCR and nested PCR using a universal primer targeting the 16Sr DNA region. This assay revealed that phytoplasma disease incidence was varied among locations, about 0-100 %. The phytoplasma disease incidence was not correlated to disease-specific symptoms because all samples were asymptomatic. The high incidence of phytoplasma disease in carrot plants was caused by the use of seeds produced by farmers independently from selected carrot plants. The study identified that phytoplasma disease is widely present in carrots in the Malang Regency with no symptoms.

Keywords: carrot, disease incidence, P1/P7, seed-borne disease, asymptomatic disease.

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EFFECTS OF ULTRASONIC TREATMENT ON COLLAGEN EXTRACTION FROM THE SKINS OF BARRAMUNDI

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Abstract:

Barramundi skin, a by-product of fish processing industry, has shown potential as an alternative collagen source. However, the commonly used acid extraction method to produce collagen rendered a low yield, required lengthy time and is not environmentally friendly. As a result, the adoption of greener technology, such as ultrasound, to enhance the conventional extraction process is emerging. This study aimed to investigate the effect of different ultrasonication amplitude on the recovery of collagen from barramundi skin. The resulting collagens were evaluated for their protein, hydroxyproline and moisture content, colour, molecular weight distribution and FTIR spectra. Ultrasound-assisted extraction (UAE) was performed at 40 (UAE40), 60 (UAE60) and 80 (UAE80) %

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CHARACTERIZATION OF PINEAPPLE LEAVES PAPER USING SCANNING ELECTRON MICROSCOPE (SEM) AND FOURIER-TRANSFORM INFRARED SPECTROSCOPY (FTIR): A REVIEW

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Abstract: Climate change, desertification, soil erosion, poorer crops, floods, more greenhouse gases in the atmosphere, and plenty of other issues for indigenous people can all destroy trees and other plants. There are plenty of effects of deforestation due to the demand for paper made of wood is too high and all these requests are wood-based. This review was conducted to investigate the feasibility of magnetic pineapple leaves paper as a replacement material and to investigate the morphological features of pineapple leaves fiber. Besides, this paper aimed to review the texture, opacity, brightness, thickness, ink absorbency, and paper bleaching. Next, the characterization of the pineapple leaves undergoing Scanning Electron Microscope (SEM) as well as the characterization using Fourier-Transform Infrared Spectroscopy (FTIR) to analyze whether the bonding of the pineapple leaves suitable for papermaking were discussed. As conclusion, the pineapple leaves with bleaching and magnet appears suitable for commercial purposes. In the future, it can prevent trees from being felled and can be commercialized worldwide along with paper products on the market now.

Keywords: Pineapples leaves, pineapple paper, SEM, FTIR, fiber

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THE EFFECTS OF *Piper sarmentosum* ETHYL ACETATE EXTRACT ON OSTEOBLAST DIFFERENTITATION OF PERIPHERAL BLOOD STEM CELLS

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Abstract: *Piper sarmentosum* or 'kaduk' is a well-known herb plant in Malaysia. Its extracts are found to exhibit bone protective effect against osteoporotic rats. Our study is aimed to morphologically observe the effect of *P. sarmentosum* ethyl acetate extract on the differentiation of human peripheral blood stem cells (PBSCs) into osteoblasts. *P. sarmentosum* extracts (1-500 µg/mL) prepared using 1% DMSO were used in the cytotoxicity assay. Then, the differentiation assay was performed using varying concentrations (1-50 µg/mL). The untreated cells acted as the negative controls, while the cells cultured in 50 µg/mL ascorbic acid and 10 mM β-glycerophosphate were the positive controls. The cytotoxicity effect and proliferation capacity of the cells were analyzed using Trypan Blue exclusion method, while the differentiation of PBSCs was observed using *von Kossa* staining. The cytotoxicity graph showed decrease of cells' viability in a dose-dependent manner. After 14 days of differentiation, a constant rate of proliferation could be observed in the treated cells and positive control, while the untreated cells showed an increase in proliferation. The mineralization of extract-treated cells showed significant differences compared to the negative control. These results showed the extract capable to induce osteoblast differentiation and potential to be used in tissue regeneration.

Keywords: *Piper sarmentosum*, Ethyl acetate, Cytotoxicity, Osteoblast, Differentiation

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ANTIBIOTIC RESISTANCE OF GRAM-NEGATIVE BACTERIA ISOLATED FROM INPATIENTS DEPARTMENT (IPD) IN FEDERAL MEDICAL CENTER (FMC) BIRNIN KEBBI, NIGERIA

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Abstract:
Nosocomial infections have been acknowledged as a serious problem affecting health care quality globally. The study determined the antibiotic resistance of gram-negative bacteria isolated from inpatient department (IPD)in Federal Medical Centre, Birnin Kebbi. A total of thirty (30) surface samples were swabbed from different units of the IPD. The most probable number (MPN) and the agar disc diffusion techniques were employed to characterize the resistance pattern of the isolates to azetreonam (ATM), meropenem (MEM) and imipenem (IPM) as in EUCAST guidelines version 12.0. The MPN of the samples demonstrated the lowest of 7 MPN index/100ml for samples 10 and 12, while samples 5 and 19 had the highest of 150 MPN index/100 mL. The technique further confirmed the occurrence of; *Escherichia. coli* (35%), *Pseudomonas aeruginosa* (30%), *Klebsiella pneumonia* (20%) and *Acinetobacter baumannii* (15%). *E. coli* and *A. baumannii* demonstrated multi-drug resistance (MDR) to the antibiotics, the remaining isolates also showed resistance to multiple antibiotics. *P. aeruginosa* and *K. pneumonia* were found sensitive to MEM and ATM, respectively. Bacteria isolated from the IDP are highly resistant to antibiotics, and hence necessitating for proper personal hygiene, as well as drug repositioning and molecular assay for rapid detection of MDR bacteria.

Keywords: IPD, MDR, MPN, Nosocomial infections, Resistance.

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CALLUS INDUCTION OF *Zingiber officinale* var. BENTONG USING DIFFERENT PLANT GROWTH REGULATORS (PGRS) AND PHOTOPERIOD FOR THE ESTABLISHMENT OF CELL SUSPENSION CULTURE

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Abstract: *Zingiber officinale* Roscoe or ginger is recognized as a medicinal plant due to its ability to accumulate high amount of pharmacologically active metabolites. Besides known for its pharmacological properties, demand for ginger is high in Malaysia also because of its wide uses in cooking. However, the current source of these metabolites is mainly from ginger rhizome which is very limited. Tissue culture techniques, specifically cell suspension culture could serve as a potential alternative bio-production system for producing secondary metabolites from plant. Therefore, the objective of this study is to induce and optimize callus production from young shoot bud explant of Z. *officinale* var Bentong using various combinations and concentrations of plant growth regulators. The explants were subjected to different treatments consists of series of concentration of 2,4-dichlorophenoxyacetic acid (2,4-D) (0, 0.5, 1.0 and 2.0 mg/L) singly, or in combination with benzylaminopurine (BAP) (0.1 and 0.5mg/L) and kinetin (Kin) (0.1, 0.2, 0.5, and 1.0 mg/L) in MS media. Cultures were incubated in two different photoperiods, 16/8h light/dark and 24h dark. As a result, several treatments produced 100% callus induction percentage with different color (creamy, green) and morphology (compact, friable, globular). 24h dark photoperiod is more favorable than 16/8h light/dark photoperiod in inducing creamy and friable callus. Meanwhile, explants cultured in 16/8h light/dark photoperiod mainly turned to green color. The screening of various treatments in callus induction of *Z. officinale* to produce creamy, and friable callus is important to successfully establish a stable cell suspension culture for secondary metabolites production.

Keywords: callus, cell suspension culture, secondary metabolites, shoot bud, *Zingiber officinale* var Bentong

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IDENTIFYING THE POTENTIAL GENES IN GLUCOSINOLATE BIOSYNTHESIS USING PATHWAY ANALYSIS

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Abstract: Glucosinolates (GSLs) are sulfur and nitrogen-containing secondary metabolites in *Brassicaceae* plants like *Arabidopsis thaliana* and many cultivated vegetables (broccoli, cabbage, wasabi, and mustard). They are essential in the plant defense system and known to protect against cancer in humans. The model plant *A. thaliana* has provided a wealth of knowledge on GSL biosynthesis, transport, hormone pathways, and mechanisms regulating GSL accumulation. However, a comprehensive understanding of the GSL mechanism remains unclear. In this study, we utilized a 'guilt-by-association' (GBA) approach to predict the genes encoding proteins that may be involved in the GSL mechanism. First, a co-expression network was constructed using 113 known GSL genes derived from our in-house database, SuCComBase (https://plant-scc.org/), as a query against co-expression databases, i.e., ATTED, GeneMANIA, STRING, and AraNet. The constructed gene co-expression network consists of 752 genes and 9,121 edges. Next, the DPClusO algorithm was used to identify the GSL co-expression network clusters. Each cluster was evaluated using Fisher's exact test and pathway enrichment analysis. The findings revealed that graph clustering analysis could identify potential genes missed by sequence-based searching. Finally, using a similar approach, we confirmed the function of the possible GSL gene ARIA-interacting double AP2 domain (*ADAP*) as a negative regulator in GSL biosynthesis. As a result, this bioinformatics pipeline can be used to build genetic resources for crop improvement.

Keywords: glucosinolate, Arabidopsis thaliana, co-expression, network, graph clustering.

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IDENTIFICATION OF MATING GENES FROM OIL PALM PATHOGEN, *Ganoderma boninense*

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Abstract: Palm oil is one of the essential oil-producing crops globally as it contributes ~31% of the world's vegetable oil and fat supply. However, the sustainability of oil palm plantations is threatened by basal stem rot (BSR) disease caused by the phytopathogenic fungus *Ganoderma boninense*. Previous studies have identified that this fungus was infective only in the dikaryotic stage, but it could not infect the oil palm host in the monokaryotic stage. This study aims to uncover the genes responsible for mating, which leads to the virulence of this fungus. The next-generation sequencing (NGS) technology was utilised to generate the transcriptome datasets in this study. We have successfully verified that this fungus harbouring the tetrapolar mating system by having two mating loci, *mat*A and *mat*B. The *mat*A genes contain homeodomain 1 (HD1) and homeodomain 2 (HD2), whereas *mat*B consists of 10 putative pheromone receptor genes, a *Ste3* gene and 4 putative pheromone precursor genes. The results from this study lay the foundation for understanding *G. boninense* mating, which will help to uncover the mechanism of infection towards the oil palm host.

Keywords: Basal stem rot, fungal mating, oil palm pathogen, transcriptome

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ISOLATION, SCREENING OF CELLULOLYTIC BACTERIA, OPTIMIZATION OF CELLULASE PRODUCTION AND ITS PARTIAL PURIFICATION

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Abstract: Cellulose is the most abundant biomass on earth, and therefore has the greatest potential into bioenergy. Microorganisms are the main producers of enzymes that decompose cellulose and hemicellulose in the soil. The purpose of this study is to find out and optimize the cellulase activity of cellulolytic bacterial isolates. Isolations were carried out using a salt medium with CMC as a substrate, isolates with the highest cellulase activity optimized for their growth conditions and subsequently identified molecularly using primary 16sRNA. One hundred and twenty-three isolates of cellulolytic bacteria were obtained from some forest soils in Bali and confirmed with a cellulolytic index, 43 isolates were indicated to have cellulolytic activity. B2S8 isolates has 0.1241±0.001 (U/ml) CMCase activity. The optimum condition as carbon source was CMC 6% with CMCase activity 0.138±0.00 (U/ml), nitrogen source as NH_4NO_3 0.1%, temperature at 40°C, pH 7.0, and incubation period was 8 days. After production of CMCase and partial purification (precipitation with ammonium sulfate and dialysis) CMCase activity increases to 0.4368±0.0011(U/ml). B2S8 isolate was identified as *Bacillus thuringiensis* on the basis of 16S rRNA sequence homology.

Keywords: isolation, identification, B2S8, corn straw, cellulase production, partial purification

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SELECTION AND GROWTH CONDITION OPTIMIZATION OF ETHANOL-PRODUCING MICROBES ISOLATED FROM *RAGI* TAPAI

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Abstract: Ethanol is currently one of the most important fuels, produced from renewable resources, playing an important role in effectively solving the current and future fuel problems. This study aimed to evaluate the best ethanol-producing isolates obtained from samples of *ragi* and cassava tapai that was previously isolated, through growth temperature and pH optimization then to be evaluated for the highest ethanol-producing capability. This research was conducted in 2 stages, namely: 1) Selection best performing ethanol-producer from 7 isolates using PYG media contains Peptone (0,75%), yeast extract (0,45%), and glucose (15%), then followed by 2) Optimization of the best ethanol-producing isolate growth conditions at various temperatures (27, 30, 33, 35, 37, and 40 °C) and pH (3.5, 4.5, 5.5, and 6.5). The experimental results from seven isolates revealed the R5I3 isolate having highest ethanol-producing performance yielded as much as 4.69 ± 0.25% (v/v). Following the temperature and pH optimization of the growth conditions, the best growth condition (temperature 35 °C and pH 5.5) was able to improve the ethanol produced to 8.63 ± 0.04% (v/v).

Keywords: *ragi* tapai, cassava tapai, selection, ethanol-producing microbe, optimization condition

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THE SYNERGETIC EFFECT OF FLY ASH CONCRETE MIX FOR THE APPLICATION OF SUSTAINABLE CONSTRUCTION

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Abstract: All precast concrete producers can now use a group of materials called fly ash to improve the quality and durability of their products. Fly ash improves concrete's workability, pumpability, cohesiveness, finish, ultimate strength and durability as well as solves many problems experienced with concrete today and all for less cost. Fly ash, however, must be used with care. Without adequate knowledge of its use and taking proper precautions, problems can result in mixing, setting time, strength development and durability. The fly ash mix content with different percentage will be used in this study. Therefore, in order to study the strength and durability of each type of fly ash when partially mix with concrete, the bricks will be exposed to different atmospheric pressure, temperature as well as humidity. The increase of construction industry has contributed to an increase in environmental pollution as the production of building materials leads to green-house effect. Fly ash bricks however are environmentally friendly and hence allows many businesses to take a step towards sustainable development. Apart from that, considering the climate in Malaysia, it is suitable for us to increase the use of fly ash bricks as the building blocks on our building as it is far more light and stronger compared to clay bricks.

Keywords: synergetic effect, fly ash, sustainable, construction, building

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PROPERTIES OF THE TRANSPARENT WOOD FOR WEATHERING RESISTANCE

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Abstract: This material is one of the selections of transparent and sustainable building materials. Transparent wood is made by natural wood with synthesis process. Wood is a renewable and earth-abundant resource. Fabrication transparent wood is by removing lignin in wood and replacing it by a similar refractive index polymer. The fabricated transparent wood with high transmittance and enhanced mechanical properties is a potential material for light-transmitting building materials, magnetic materials and transparent solar cell windows. Cells in the wood are mainly composed of cellulose, hemicellulose and lignin. The hierarchical structure and the strong interactions among cellulose, hemicelluloses, and lignin lead to excellent mechanical properties in wood. Cellulose and hemicelluloses are optically colorless, lignin cause by complex structure is opaque with dark colour. Lignin provides high hardness and rigidity to the wood. The wood sample will be washed and immerse in acid then followed by a heat treatment. The properties of transparent wood such as strengthless, flexibility, light transmittance, roughness, thermal resistance and chemical resistance was measured. Transparent wood is a potential material for several sector like building material and solar cell material. Transparent wood can be one of new enable selection sustainable material for some sector.

Keywords: transparent, wood, weathering, resistance, cellulose

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MECHANICAL PROPERTIES OF CARBON FIBER FOR CONSUMER PRODUCT: A MINI REVIEW

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Abstract: One of the newest trends in engineering materials is using natural fiber reinforced composites (NFCs). The most important factor in engineering product manufacture is cost effectiveness. These NFCs are favored in most applications because they are less polluting and have larger fiber contents for equal performance, reducing the use of more polluting base polymers. Carbon fiber reinforced composite materials that were developed in the 1950s as a reinforcement for high temperatures molded plastic component on missiles. Carbon fiber contained 90% from Polyacrylonitrile and 10% from Rayon or Petroleum pitch. Carbon fiber is one of the strong material polymers, but it is lightweight, consisting of a thin but strong crystalline filament of carbon. The carbon fiber was made from a process that is a part chemical and part mechanical. The carbon atoms in carbon fiber are bonded together in microscopic crystals. The crystal alignment will make the fiber incredibly strong. Carbon fibers are classified by the tensile modulus of the fiber with numerous applications such as parts of automobiles, airplanes, and recreational product as well as phone casing.

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PREPARATION AND CHARACTERIZATION OF ACTIVATED CARBON FROM WATERMELON PEELS- A SHORT REVIEW

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Abstract: Watermelon has a high amount of water, and it is easily available in Malaysia. Waste watermelon rind, a waste biomaterial, has not yet been evaluated as a raw material for the production of activated carbon using the chemical activation method by zinc chloride. The fact that it contains a high amount of water with promising levels of solid matter, it is even more appealing for the industrial manufacture of high-quality activated carbon. This unique usage of watermelon peels will not only reduce waste, but will also increase income for farmers and food processors, as well as lessen several negative environmental effects. Thus, the main objective of the present work was to review the utility of waste watermelon rind as an abundant and accessible precursor for activated carbon production. Some of the activated carbon treatments consist of a simple separation procedure. Other than that, is to review the optimal conditions for pre-treatment of watermelon peel wastes to make them useful as adsorbents for contaminated waste from industrial effluents. The impact of operating parameters like carbonization temperature and time also was reviewed in this study.

Keywords: activated, carbon, watermelon peel, environment, treatment

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CHARACTERISTICS OF STRAW MUSHROOM CULTIVATED INSIDE FIBRE REINFORCE PLASTIC HOUSE WITH IOT

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Abstract: This article describes research on the application of Internet of think (IoT) in a Fiber Reinforced Plastic (FRP) house designed for a straw mushroom cultivation. The characteristics of an FRP house was evaluated. The purpose of the research was to evaluate: (1) the air condition variation inside the house; (2) the effect of air condition against mushroom growth and quality; and (3) Analysis of antioxidant content in mushroom. In this work, the air temperature and humidity per unit mass of mushroom to be recorded, and the ergothioneine (EGT) content are discussed. The results showed that average body of fresh harvested mushroom is 865±100 mg, with average dimension around 41.5±6, 60.0±4.0, 29.5±9,0 mm in length, width, and height, respectively. The microbial assay proved that on the harvested mushrooms were not found salmonella infection. The mushrooms in the button stage have lower total fungus than those of blooms mushrooms. The average recording results from the EGT chromatography data were 0.674 mg/g. The exploration and analysis in-depth of potential utilization of EGT of straw mushrooms were prospective besides for healthy food.

Keywords: *Fiber Reinforced Plastic house, Internet of think, straw mushroom, ergothioneine.*

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CALLUS AND CELL SUSPENSION CULTURE OF SACHA INCHI (*Plukenetia volubilis* L.)

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Sacha Inchi (*Plukenetia volubilis* L.) from the Euphorbiaceae family is the economic crop to the Peruvian Amazon native. Sacha Inchi's seed was reported to contain a high level of essential polyunsaturated fatty acids including α-linolenic acid (ω-3) and linoleic acid (ω-6) compare to other seed oils which is beneficial for humans' health. This study aims to establish *in vitro* propagation of Sacha Inchi through callogenesis and the cell suspension culture. In this study, leaves and ovules from female flowers were selected as explants. For callogenesis, the explants were cultured on MS medium fortified with 1.0 mg/L of 2,4-D, 0.05 mg/L of BAP and 3% of sucrose under different photoperiods (24 hours light and 24 hours dark). Cell suspension was established by inoculating 1 g of friable callus (male flower) into 50 mL liquid MS media fortified with 0.1 mg/L of 2,4-D, 0.05 mg/L of TDZ and 3% of sucrose in 250 mL Erlenmeyer flask with the agitation of 120 rpm at 25 ºC under 24 hours dark photoperiods. The highest explants survival of 100% was achieved from leaves that incubated in 24 hours dark photoperiod. The ovules depicted the maximum callogenesis rate of 70% under 24 hours light photoperiod whereas, there was no induction of callus from leaves observed under 24 hours light photoperiod after 6 weeks of culture. MS media supplemented with 0.1 mg/L of 2,4-D, 0.05 mg/L of TDZ and 3% of sucrose produced a bigger and friable callus when subcultured every 4 weeks during the callus maintenance and a fine cell suspension culture was achieved when supernatant from centrifuged cell suspension was subcultured into the fresh liquid medium. The presence of TDZ in the MS media contributed to the maintenance of friable callus for the establishment of cell suspension culture.

Keywords: Sacha Inchi, Euphorbiaceae, *in vitro* culture, callus, cell suspension culture

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ANTIOXIDANT ACTIVITY AND LC-MS PROFILING OF LEAVES EXTRACT OF *Alstonia angustiloba*

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Abstract: Plants have a wide range of active compounds crucial in treating various ailments. Most people consume plants and herbals as an alternative medicine to improve their health and abilities. The DPPH and ABTS assay was carried out to determine the antioxidant activity of the aqueous, and methanolic extract of *A. angustiloba* leaves. Moreover, total phenolic and flavonoid contents were quantitated. The presence of potential active compounds was then screened using a liquid chromatography system 1290 coupled with a Q-TOF 6520 mass spectrometer (LC-MS) equipped with dual electrospray ionization (ESI) source. The EC_{50} values measured by DPPH for the methanolic and aqueous extracts of *A. angustiloba* leaves were 80.38 and 94.11 µg/mL, respectively and for ABTS assays were 85.80 and 115.43 µg/mL, respectively. The methanolic extract exhibited the highest value of total phenolic and total flavonoid (382.53 ± 15.00 mg GAE/g and 23.45 ± 1.04 mg quercetin equivalent/g) while the aqueous extract with the least value (301.17 ± 3.49 mg GAE/g and 9.73 ± 1.76 mg quercetin equivalent/g). LC-MS analysis revealed the presence of 108 and 115 compounds in the aqueous and methanolic extract, respectively. It consists of phenolic acids, flavonoids, alkaloids, amino acids, glycosides, etc. It can be concluded that the therapeutic action of this plant is derived from the presence of various active compounds; however, further research is necessary to determine its efficacy.

Keywords: *Alstonia angustiloba*, antioxidant, phenolic, flavonoid, LC-MS.

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APPLICATION OF THE LEISA SYSTEM FOR LAND HEALTH

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Abstract: Soil in Bali contains <3% organic matter, suitable for horticultural cultivation. The research objective is to improve the health of cultivated land by applying the LEISA system. Cultivation with the LEISA system was carried out on experimental land with a planting area of 2 ha which was divided into 4 experimental blocks. The cultivation treatments were: fertilizing using compost and bio-urine (LEISACU), fertilizing using compost plus NPK fertilizer (LEISANPK), and fertilizing using NPK fertilizer (NONLEISA). The parameters of the physical properties of the growing media observed were porosity, the ability of the soil to hold water (Water Holding Capacity/WHC). The parameters of the chemical properties of the growing media observed were: cation exchange capacity (CEC), pH, organic matter content (OM), C/N value. The parameters of plant growth observed were: the number of plants affected by pests and diseases, while the parameters of plant production were per ha. LEISACU and LEISANPK were able to increase porosity, WHC, infiltration, CEC, OM, C/N, macro element content, micro element content, and microbial population in soil in the root zone per year by 2.6±0.2%, 1.6±0.08%, 1.06±0.02%, 2.3±0.2%, 24.8±1.2%, -3.1±0.2%, 3.61± 0.17%, 12.8±1.5%, and 17.6±2.2%, respectively. LEISAKU and LEISANPK caused a decrease in diseased plants by 15.7±0.2% for chili plants and 32.3% for oranges and avocado plants. The production of chilies, oranges, and avocados increased by 0.55±0.03 tons/year/ha, 2.14±0.3 tons/year/ha, and 5.14±0.3 tons/year/ha, respectively.

Keywords: LEISA, land health, horticulture, production

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EFFECT OF *Eucheuma cottoni* SEEWEAD EXTRACT ON HISTOPATHOLOGY OF TESTES OF WHITE RAT (*Rattus norvegicus* L.) THAT INDUCED BY NATRIUM NITRITE

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Abstract: This study aimed to determine the ability of *Eucheuma cottoni* seaweed extract to reduce reproductive damage in white male rats (*Rattus norvegicus* L.) induced by $NaNO_2$. The design used was a completely randomized design consisting of two controls and two treatments, each with six replications. The treatment was carried out using a combination method for 45 days. The male rats were given sodium nitrite at 22.5 mg/kg BW and seaweed extract at 150 mg/kg BW/day (P1), 300 mg/kg BW/day (P2), and 450 mg/kg BW/day. Parameters observed were mitotic index, meiosis, epithelial index, and histological abnormalities in the seminiferous tubules. The results showed that *Eucheuma cottoni* seaweed extract at all doses did not significantly increase the mitotic index, meiotic index, and seminiferous tubular epithelial index. *E. cottoni* seaweed extract at a dose of 150 mg/ kg BW significantly decreased the histopathological index in the testes. Still, *E. cottoni* seaweed extract at a dose of 450 mg/kg BW significantly increased the histopathological index in the testes of male rats. The types of abnormalities seen in the tubules are exfoliation of germ cells, atypical residual body, vacuolization, giant cells, epithelial degeneration, hyperplasia, tubular atrophy, vacuolization, and absence of spermatogenic cells (empty tubules). It concluded that the antioxidant activity of *E. cottoni* extract was able to reduce the potential for sodium nitrite free radicals that cause disturbances in the male reproductive system.

Keywords: *Euchema cottoni*, antioxidant, free radical, spermatogenesis

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DE NOVO TRANSCRIPTOME DATASET OF GENE EXPRESSION IN *Durio zibethinus* DURING THE INFECTION OF *Phytophthora palmivora*

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Abstract: *Phytophthora palmivora* is a notorious oomycete that causes fatal diseases in tropical perennial crops. Over time, extensive literatures have been published on the destructive diseases caused by *P. palmivora* in *Durio zibethinus* (durian). The sequencing and analyzing of virulence-related genes that are involved during the infection of *P. palmivora* in durian will give a comprehensive understanding about the gene expression and infection mechanism. Healthy durian leave samples were inoculated with *P. palmivora* zoospores and harvested at 3 days-post-inoculation. The process involved transcriptome sequencing using Illumina RNA-seq technology and *de novo* assembly of the transcripts. The transcriptomic analysis managed to annotate 75,945 unigenes and 95,158 unigenes for control and infected sample respectively. The total length, N50 and GC content of Unigenes for control sample are 52,649,717, 1087 and 41.91% while for infected samples are 58,582,609, 911 and 43.24% respectively. 9 necrosis-inducing-Phytophthora-protein 1 (NPP1) genes, 17 elicitins and 45 RxLR proteins are the virulence-related genes acquired through data mining. This transcriptome data will be used to create novel control strategies for *P. palmivora* diseases in durian using molecular technology, resulting in increased durian production in durian-producing countries. The potential new control measures can also be a great benefit for farmers to minimize their exposure to hazardous fungicides.

Keywords: *De novo* assembly, RNA-Seq, *Phytophthora palmivora,* durian, gene discovery

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APPLICATION OF GEOMETRIC MORPHOMETRIC (GMM) APPROACH FOR WRITER CLASSIFICATION USING HANDWRITTEN NUMERAL CHARACTERS

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Abstract: Handwriting evidence is a valuable source of authorship identification which is important for forensic investigators in cases involving murder, suicide, kidnapping and document forgery. Identification of writers relies heavily on the examination of written characters that makes the documents. Studies of numeral handwriting are typically limited despite the fact that handwritten numeral characters analysis is crucial in assisting investigators in solving crimes. The main aim of this study is to gauge whether or not it is possible to classify writers according to the ethnic origin by mean of their handwritten numeral characters using novel Geometric Morphometric (GMM) technique. Handwritten numeral characters (n=270) collected from three main different ethnic backgrounds in Malaysia, were first digitized and then landmarked using GMM software. Cluster patterns can be observed in Principal Component Analysis (PCA) scatterplot which belong exclusively to the three different ethnic groups. Significant differences were discovered in handwritten numerals 2 until 9 amongst Malay,Chinese and Indian writers when tested using Procrustes ANOVA, indicating that it is possible to classify writer according to their ethnicities using their handwritten numeral characters. Further studies are required to determine the most effective technique for identifying the ethnicity of the writer, as well as to conduct a more advanced meta-analysis of the results.

Keywords: forensic science, handwritten numeral characters, forensic questioned document, geometric morphometric, principal component analysis.

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COMPARISON OF THP-1 MACROPHAGES VIABILITY IN DIFFERENT TYPES OF CULTURE VESSELS

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Abstract: The ox-LDL generated apoptotic bodies using THP-1 macrophage is a useful tool to study foam cell formation in atherosclerosis. However, the common problem is the cells in the negative control (i.e., absence of ox-LDL) undergo apoptosis. Therefore, the type of cell culture vessel was proposed to be the key factor contributing to cell apoptosis. The THP-1 cells were differentiated into M1 macrophages using 5 ng/μL PMA, 10 ng/μL LPS, and 20 ng/μL IFN-γ while 20 ng/μL IL-4 and 20 ng/μL IL-13 were used to differentiate THP-1 into M2 macrophages. Two types of cell culture vessels (6-well plate and T25 flask) were used to culture the macrophages. The cells were subsequently stained using Annexin V-FITC and Propidium Iodide prior to flow cytometry analysis. Interestingly, both M1 and M2 macrophages cultured in the T25 flask resulted in a significantly higher percentage of cell viability compared to macrophages cultured in 6-well plate [M1: 84.15% ± 4.39 vs 8.02% ± 1.55, $p < 0.0001$; M2: 95.95% ± 1.74 vs 10.50% ± 0.05, $p < 0.0001$]. In summary, the type of culture vessel is a vital factor in determining cell viability attributed to the surface area and cell seeding density in different types of vessels.

Keywords: THP-1, macrophage, apoptosis, culture vessel, cell viability

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OPTIMIZATION OF CELLULASE AND XYLANASE SYNTHESIS BY *Trichoderma harzianum* UNDER SOLID-STATE FEREMENTATION USING UNTREATED OIL PALM LEAVES BY TAGUCHI ORTOGONAL DESIGN

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Abstract: The oil palm biomass produced by plantations and mills in Malaysia is the largest contributor to the nation's agro-waste, with the oil palm leaves (OPL) topping the list. Nevertheless, the surplus of OPL might have applicability as the substrate for cultivating lignocellulolytic bio-degraders. This study employed raw OPL as the carbon source for cultivating *Trichoderma harzianum* under solid-state fermentation (SSF). Optimization of the SSF process using the Taguchi orthogonal design to produce enzymes, xylanase (XYase) and cellulases (endoglucanase (CMCase), exoglucanase (FPase), and β-glucosidase (BGase)) successfully established the optimal fermentation conditions as the following: 5.00×10^8 spore/g inoculum size, 50% moisture content, pH 9 Mandel's medium, with 7-day incubation at 30°C. The crude enzyme cocktail exhibited the corresponding maximum activity of 495.058 U/g XYase, 351.025 U/g CMCase, 167.992 U/g FPase, and 43.5219 U/g BGase. The enzymatic activities were statistically shown to be significantly affected by factors, moisture content, inoculum size, and incubation day (p-value < 0.05). In short, the high extracellular CMCase and XYase activity of the *T. harzianum* crude enzyme cocktail may prove valuable in accelerating the saccharification of cellulose for biofuel production and nanocellulose synthesis.

Keywords: Solid-state fermentation, Taguchi orthogonal design, Cellulase, Xylanase, *Trichoderma harzianum*

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IDENTIFICATION OF GRAM-POSITIVE α-HEMOLYSIS BACTERIA ISOLATED FROM TONSIL AND NASAL OF PIGS IN TRADITIONAL PIG SLAUGHTERHOUSE AND ITS ANTIMICROBIAL SUSCEPTIBILITY AGAINST PENICILLIN G AND TETRACYCLINE

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Abstract: Bacterial infections are common in pigs, and the increased resistance of bacterial species to common antibiotics used remains a problem. This study aimed to identify isolated Gram-positive α-hemolysis bacteria confirmed molecularly using the 16S rRNA gene. Bacterial sensitivity tests of isolates were also conducted against Penicillin G and Tetracycline. This research was initiated by the cultivation of isolates on blood agar media, followed by a Gram staining test, catalase test, oxidase test, Salt tolerance test, and molecular confirmation using Polymerase Chain Reaction (PCR) and DNA sequencing. A sensitivity test was carried out using the Kirby Bauer method according to the Clinical and Laboratory Standards Institute (CLSI). As many as 9 out of 18 isolates formed α-hemolysis patterns on blood agar media and were confirmed as Gram-positive (+), Oxidase Negative (-), and showed tolerance to 6.5% NaCl. As many as 7 of these isolates tested positive in the catalase test. Molecular testing confirmed that 5 out of 9 isolates showed a high similarity with *Enterococcus faecalis* 98.28 to 100% and 96.54% with *Enterococcus sp.* However, it is different from the rest 4 of the isolates that showed low similarity, namely 86.01 - 90.54% with *Enterococcus faecalis*. The results of the sensitivity test showed all isolates were resistant to Penicillin G (100%), sensitive to Tetracyclines (88.9%), and resistant (11.1%). TNonetheless, multiple-resistance bacteria among isolates were not observed. Confirmation of isolates by DNA sequencing on five of nine isolates showed a high similarity with *Enterococcus faecalis* ranging from 98.28 to 100% and 96.54% with *Enterococcus sp.* Identification of Gram-positive α-hemolysis isolates showed as *Enterococcus faecalis*. All isolates were resistant to Penicillin G, and some isolates also showed resistance to Tetracyclines.

Keywords: Antibiotic sensitivity, Swine, α-hemolysis, 16S RNA gene, tonsil, nasal, pig

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INHIBITORY PROPERTIES OF HYPOTLIDE OF *Hyptis pectinata* (L.) AGAINST PROTEOLYTIC SUBUNIT OF CASEINOLYTIC PROTEASE OF *Plasmodium knowlesi*

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Abstract: Inhibition of caseinolytic proteases (ClpP) plays an essential role in the protein homeostasis of the parasite through the degradation of damaged or misfolded proteins. This degradation activity is controlled by the proteolytic subunit (ClpP), which belongs to the serine protease family member and is therefore extensively studied for further inhibitors development. Among many inhibitors, the group of β-lactone is known to be a specific inhibitor for ClpP. Nevertheless, other groups of lactones have never been studied. This study aims to characterize the inhibition properties of a δ-lactone hyptolide of *Hyptis pectinata* (L.) against ClpP of the simian malaria parasite *Plasmodium knowlesi* (Pk-ClpP). To address, Pk-ClpP was over-expressed in *Escherichia coli* BL21(DE3) and purified. δ-lactone of hyptolide was shown to inhibit Pk-ClpP with an IC_{50} value of 17.36 ± 1.44 nM. Docking simulation revealed that the catalytic triad of Pk-ClpP (Ser87, Asp161 and His112) was involved in the interaction between this protein and hyptolide or the substrate. Given the Gibss energy of hyptolide and the substrate are comparable, it was concluded that the inhibition by hyptolide is a competitive inhibition in which hyptolide was able to dock into the catalytic site and block the substrate access.

Keywords: caseinolytic protease, *Plasmodium knowlesi*, malaria, serine protease, hyptolide.

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GENOME ANALYSIS OF LACTIC ACID BACTERIA FROM MALAYSIAN *Heterotrigona itama* HONEY REVEAL ITS SOURCE OF NOVEL *Lactobacillaceae* SPP. CAPABLE TO PRODUCE B-GROUP VITAMINS

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Abstract: Malaysia is a home to 50 distinct species of stingless bees with the *Heterotrigona itama* (H. itama) being the most popular. Honey produced by *H. itama* bees is well-documented to show good biological properties, viz. antioxidant, anti-inflammatory, anti-bacterial, and anti-ulcer properties. Hence, it is not surprising that lactic acid bacteria (LAB) harboring *H. itama* honey may be involved in its excellent bioactivity. To date, no genomic analysis of LAB isolated from *H. itama* honey has been reported. Hence, in the present study, one LAB strain, identified as Sy-1 was successfully isolated from freshly collected Malaysian *H. itama* honey and the genome was characterized. Taxonomic analyses of strain Sy-1 were also carried out and the findings confirm that this strain represents a new genus within the family of *Lactobacillaceae*. Interestingly, the genome analysis and experimental studied reveal the capability of strain Sy-1 to produce vitamins B2 and B9. Our collective findings support the suitable application of strain Sy-1 in the functional food and pharmaceutical industries.

Keywords: *Heterotrigona itama* honey, Lactic acid bacteria, *Lactobacillacea,* Vitamin B2, Vitamin B9.

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OPTIMIZATION OF RECOMBINANT PRODUCTION AND IN SILICO SCREENING OF PEPTIDE-BASED INHIBITORS FOR SARS-COV-2 PLPRO

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Abstract: Papain-like protease of SARS-CoV-2 (PLpro-CoV2) is an essential protease for SARS-CoV-2, which is considered a viable drug target for inhibiting virus replication. However, its recombinant production in *Escherichia coli* for further drug screening studies remains challenging. While many attempts to screen inhibitor candidates against PLpro-CoV2 are reported, the safety issue of the candidates is concerning. Alternatively, peptide-based inhibitors are an interesting avenue to explore for PLpro-CoV2 inhibitors due to their well-known safety advantages as drugs. This study aims to determine the most efficient production condition and computationally screen the potential peptide-based inhibitors targeting PLpro-CoV2. Accordingly, PLpro-CoV2 was expressed in *E. coli* at various conditions, where 18 °C was found to be the best expression temperature to produce PLpro-CoV2. The expressed protein was also successfully purified by a single-step chromatography. Further, more than 8000 peptides from the Huanglab Database were used to screen the inhibitor candidates using EasyDock Vina. Two peptides (PDB ID: 1X1K and 4J9H) demonstrated comparable binding energy (~ -9 kcal/mol) to the well-known PLpro's inhibitor of GRL0617. Interaction map analysis revealed that both peptides interacted with PLpro-Cov2 mainly through hydrophobic interactions. Altogether, this study should benefit the development of novel drugs against SARS-CoV-2 with better efficacy and safety.

Keywords: PLpro, SARS-CoV-2, recombinant protein, peptide inhibitors, GRL0617

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POTENTIAL OF *Azolla pinnata* AND *Lemna minor* TO TREAT RUBBER MILL WASTEWATER

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Abstract: Effluent generated from the rubber mill industry contributed primarily to wastewater production, leading to environmental problems and long-lasting consequences. Phytoremediation using free-floating aquatic plant is a safe method that can be used in in-situ wastewater treatment. In this work, *Azolla pinnata* and *Lemna minor* were used to test their potential in treating rubber mill wastewater. The parameters reflecting the potential of *A. pinnata* and *L. minor* to remediate rubber mill wastewater, such as the fresh and dry biomass, photosynthetic pigments, and characteristics of rubber mill wastewater before and after the period of treatment were determined. The concentration of biochemical oxygen demand (BOD), chemical oxygen demand (COD), nitrate, ammonia, and phosphate were significantly declined after being treated with *A. pinnata* and *L. minor*. The rubber mill wastewater also caused an increase in the growth rate and total chlorophyll content of both plants indicating its potential in treating rubber mill wastewater.

Keywords: rubber mill effluent, wastewater, phytoremediation, *Azolla pinnata*, *Lemna minor*

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ANALYSIS OF A SPECIAL PRODUCT HONEY FROM SABAH

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Abstract: The green honey is exclusively available only in Sabah, and its uniqueness sees the commodity being sold at a higher market price. Therefore, green honey is prone to adulteration by unscrupulous individuals, possibly compromising the health of those consuming this food commodity for its curative properties. This green honey is produced by *Apis cerana*, which builds hive under the ground in the region of Sabah Island. Ipso facto, the study aimed to profile the chemical properties such as heavy metal and volatile organic compounds as well as microbiological properties of green honey. The honey's naturally green color is because of chlorophyll aside from nectar from various flowers on the island. Interestingly, low levels of arsenic, lead, nickel, cadmium, copper, and cobalt were detected in the honey samples, presumably due to their subterranean hives. Moreover, green honey also contains volatile organic compounds which contribute to honey color and odour such as Ethyl Acetate ($CH_3COOC_2H_5$), Propanamide, N, N-dimethyl- ($C_5H_{11}NO$), D-Limonene ($C_{10}H_{16}$), 1,4-Cyclohexadiene, 1-methyl-4-(1-methylethyl)- ($C_{10}H_{16}$), Cyclohexene, 1-methyl-4-(1-methylethylidene)- ($C_{10}H_{16}$) and Benzene, (2-methyl-1-propenyl)-o-Isopropenyltoluene ($C_{10}H_{12}$). Microbiological contamination of honey can occur during its production by the bee especially from the gut of the bee as well as during its extraction and handling. Green honey contains less than 100 cfu/g of total plate count. With regard to coliform bacteria, green honey contains less than 3 MPN/g. both raw and processed green honey does not contain Staphylococcus aureus. Salmonella spp. And Listeria spp. was absent in green honey. There are few microbes were isolated from the green honey such as *Lysinibacillus macrolides, Lysinibacillus boronitolerans, Bacillus oleronius, Paenibacillus cineris,* and *Paenibacillus favisporus*. Nevertheless, the honey is fit for general consumption as the concentrations were below the maxima in the Codex Alimentarius Commission 2001.

Keywords: Green honey; Sabah honey; Borneo; physicochemical; volatile organic compounds; microbiological.

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PRELIMINARY RESULT: AI-GENERATED NEUTROPHIL IMAGE USING DEEP CONVOLUTION GAN FOR DATA AUGMENTATION

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Abstract: GANs (Generative Adversarial Networks) have grown impressively, producing significant photorealistic visuals that imitate the content of datasets they were trained to replicate. A GAN is essentially two neural networks that feed into one other. One generates increasingly accurate data, while the other increases its capacity to classify such data over time. One recurring subject in medical imaging is whether GANs can be as effective at producing usable medical data as they are at producing realistic images. The deep learning model is data-hungry in nature, it requires a lot of example images to train well. However, due to the lack of medical images, data augmentation comes in handy to generate extra medical images using GAN. This paper aims to generate microscopic peripheral blood cell images, specifically neutrophils, as a form of data augmentation to optimize hematological diagnosis. To accomplish this, we developed a Deep Convolution GAN (DCGAN) and trained with 3329 neutrophil images. For the preliminary result, we will present our work on the impact of different learning rates and optimizers of DCGAN on the generated images and training losses. The quality of the generated images is far from perfect from the dataset we want to imitate, also the convergence of the model is slow and not stable. Yet, there were reasonably generated images during the training where the model has a rough idea about the neutrophil structure.

Keywords: Generative Models, Deep Learning, GAN, Data Augmentation, Neutrophil

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RAPID IDENTIFICATION OF SARS-COV-2 LINEAGES FROM TWO MAJOR CLUSTERS IN PAHANG, MALAYSIA USING MINION SEQUENCER

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Abstract: Rapid identification of variants is needed to take prompt action for public health measures. It was proven that a combination of public health knowledge and Oxford Nanopore Technologies (ONT) could assist in understanding genomic epidemiology. This study explores the utility of employing the Oxford Nanopore Sequencing in understanding the genomic epidemiology in 2 large clusters in Pahang, Malaysia. The total RNAs from clinical specimens of combined oropharyngeal and nasopharyngeal swabs representing two major clusters in Pahang, Malaysia, were extracted and proceeded for long-read sequencing. We reported 2 variants of concern from this investigation – Beta and Delta variants. We observed that the Taman Tanah Putih Baru and Pasar Kemunting clusters were caused by B.1.351 (ß) and B.1.617 (Δ) variants, respectively. Long-read sequencing devices from Oxford Nanopore Technologies (ONT) provide a viable alternative with several benefits. ONT devices are small, inexpensive, and need little laboratory infrastructure or technical expertise to prepare samples. They can also be utilised to perform quick sequencing analysis with flexibility and aid in understanding genomic epidemiology.

Keywords: MinION Sequencer, SARS-CoV-2, Covid-19, Beta variant, Delta variant

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THE BINDING AFFINITY OF SPIKE CLEAVAGE SITE WITH FURIN PROTEASE : INSIGHT INTO INFECTIVITY OF SARS-CoV-2 VARIANTS

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Abstract: SARS-CoV-2 and its variants have caused a global pandemic and chaotic events worldwide. The cleavage site (PRRAR) of SARS-CoV-2 spike protein is the essential key factor for viral infectivity. However, minimal information is available to relate cleavage interaction with viral survivability. Therefore, we designed the spike cleavage site mutants complex with Furin representing the variant of concerns (P681R & P681H) and a novel Malaysian lineage B.1.524 (A701V). In silico study had involved molecular docking, Hdock and molecular dynamics simulation of designed complexes for 100 ns in duplicates using a biophysical program, GROMACS 2021. FURIN – SPIKE mutant complex structures have stabilized their conformations with consistent energy and oscillated molecular changes at ~15Å. Local conformations revealed that the spike cleavage site (SCS) at 682-685 amino acids had minimal fluctuation, especially P681R-Furin and P681H-Furin, compared to the highly flexible Receptor binding motif (RBM). The mutated SCS increased flexibility during the simulation but portrayed strong interaction with Furin. These molecules have closely interacted with a minimum distance of 1.5-1.7 Å and 5-13 hydrogen bonds. Delta Spike (P681R) formed outstanding hbonds, and had a shorter molecular length over Omicron (P681H). For hydrogen-bond occupancy, P681R system possessed close and similar interaction to P681H with all the SCS residues, including a point mutated residue, ARG681 which also involved in the intermolecular hydrogen bond. Interestingly, the A701V had an additional residue, SER689, outside the cleavage site that supports Furin binding. This may explain the prevalence of A701V during Malaysia's third wave of COVID-19 infection. All these favourable interactions ease the molecular recognition by Furin and promote efficient activation of the Spike during SARS-CoV-2 infectivity.

Keywords: Spike cleavage spike, SARS-CoV-2, COVID-19, Furin protease, Molecular Dynamics Simulation

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PROMISING SOURCE OF PREBIOTICS FROM TROPICAL PLANTS OF INDONESIA ORIGIN

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Abstract: Prebiotic is defined as a non-digestible compounds or food ingredient that beneficially affects the host by selectively stimulating the growth or activity of one or a limited number of bacteria in the colon and improves host health. Various compounds have been tested for their function as prebiotics and produced commercially, such as fructo-oligosaccharides (FOS), galacto-oligosaccharide (GOS), and trans-galacto-oligosaccharides (TOS). In this paper we discuss about the promising source of prebiotics from tropical plants Indonesia origin. Young fruit of *Arenga pinata* (palm sugar), leaf of *Premna oblongifolia* (green grass), and shoots of *Gigantochloa nigrociliata* (*tabah* bamboo) which contained galactomannan, pectin, and raffinose, respectively, were tested as a source of prebiotics. It was found that they could stimulate the growth of lactic acid bacteria (LAB). Besides stimulating the growth of LAB, shoots powder of *Gigantochloa nigrociliata* as a growth medium could produce short-chain fatty acids.

Keywords: prebiotic, tropical plants, *Arenga pinata, Pemna oblongifolia, Gigantochloa nigrociliata*

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NANO EXTRACT OF *CORIANDRUM SATIVUM* L (Ketumbar) DECREASE MALONDIALDEHYDE (MDA), SUPEROXIDE DISMUTASE (SOD) BLOOD GLUCOSE IN STZ-INDUCED WISTAR RATS

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Abstract: *Coriandrum sativum* L (Ketumbar seeds) nano extract was prepared using chitosan as a nano extract framework and tripolyphosphate as a stabilizer by ionic gelatin method. This study aims to reduce free radicals in streptozotocin-induced hyperglycemic rats by administering *C. sativum* L nano extract as nano herbal. Characterization of the resulting nano extract was performed using Fourier transformation infrared (FTIR), and the surface topography of nano extract and characterization of zeta potential particle size was carried out using PSA (Particle Size Analyser). The antihyperglycemic effect of nano extract on streptozotocin-induced rats was tested using the randomized posttest only control group design research by observing the blood glucose levels, while MDA and SOD levels as a marker for oxidative stress. The phytochemical test showed that *C. sativum* L extracts contained polyphenols, flavonoids, alkaloids, and terpenoids. The characterization of nano extract using FTIR showed that there had been an encapsulation of bioactive substances from *C. sativum* L extract on the chitosan-tripolyphosphate absorption of NH, PO groups, and shifts in absorption for -OH, C=C, C- C in the concentration of C and O in the resulting nano extract. Characterization with PSA strongly supports nano extract as a delivery system for bioactive substances with a zeta potential of -25.80 mV and a particle size of 455.20 nm. The result of the antihyperglycemic test on streptozotocin-induced rats showed that oral administration of the nano extract at a dose of 50 mg/Kg BW/day gave the best result for decreasing blood glucose levels and increasing MDA and SOD levels in hyperglycemic rats.

Keywords: Coriandrum sativum L, hyperglycemic, nano extract, MDA, SOD

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FORMULATION AND STABILITY OF CLOVE LEAF (*Syzygium aromaticum* L.) ESSENTIAL OIL MICROEMULSION

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Abstract: Clove leaf essential oil is a volatile compound, unstable to heat, light and air. Clove leaf essential oil can be prepared in microemulsion (o/w) preparations to maintain its stability and applicable in food. The purpose of this study was to obtain a microemulsion formulation of clove leaf essential oil (o/w) with good stability. The nonionic surfactants used consisted of Tween 20, Span 80 and Tween 80. This research was carried out in 2 stages. The first stage consisted of a mixture of surfactant ratios (Tween 20, Span 80 and Tween 80) with 5 treatment levels, namely (98:2:0), (98:0:2), (98:0,5:1.5), (98:1,5:0,5), and (98:1:1). The second stage consisted of the 8 ratios of clove leaf essential oil and the ratio of surfactants selected in the first stage, namely (15:85), (17.5:82,5), (20:80), (22.5: 77.5), (25:75), (27.5:72,5), (30:70), and (32.5:67,5). Stability test was carried out on centrifugation force, heating, pH, and dilution with turbidity index parameters. The turbidity index value was below 1% and the transparent appearance was declared as a stable microemulsion. The results showed that the ratio of the mixture of nonionic surfactants (98: 0.5: 1.5) was the best result with the characteristic turbidity index value before testing 0.181±0.007%, after centrifugation 0.188±0.004% and after heating 0.215±0.013%. Meanwhile, the ratio of clove leaf essential oil to surfactant 22.5:77.5 was the best with a transparent appearance, the turbidity index value before testing was 0.214±0.013%, after centrifugation was 0.225±0.013% and after heating was 0.268±0.012%. The clove essential oil microemulsion was stable at pH (3.5; 4.5; 5.5) and dilution (1:1, 1:9, 1:99). The size of the clove leaf essential oil microemulsion droplets formed 2 peaks, namely peak 1 of 93% with an average size of 35.4 nm and peak 2 of 7% with an average size of 2759.3 nm with a polydispersity index value of 0.420. The clove essential oil microemulsion had an average zeta potential value of 0.1 mV.

Keywords: microemulsion, surfactant, formulation, stability, *Syzygium aromaticum* L.

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INHIBITION OF PATHOGENIC BACTERIA BY ANTIBACTERIAL COMPOUNDS PRODUCED BY *Streptomyces* sp. SAE4034

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Abstract: *Streptomyces* sp. SAE4034 isolated from mangrove rhizosphere in Segara Anakan, Cilacap, Indonesia, has the potential as a source of pathogenic antibacterial compounds. This article reports on its potential as a source of antibacterial compounds that inhibit pathogenic bacteria and their inhibition mechanism. Antibacterial activity was observed by diffusion and dilution methods. While antibacterial compounds were studied by TLC and phytochemical methods, antibacterial mechanism was assayed by spectrophotometric method. The results showed that the antibacterial crude extract contained peptide, polyphenol, polyketide, flavonoid, terpenoid, and alkaloid compounds. Inhibition activities were performed in inhibition zone diameters (IZD, mm) and MIC values (µg/mL). Crude extract inhibited *K. pneumoniae* (16.25 mm and 128 µg/mL), *P. aeruginosa* (17.33 mm and 32 µg/mL), and *S. aureus* (15 mm and 256 µg/mL). The growth of *V. cholera* and *S. typhi* was inhibited with IZDs 14.5 mm and 11 mm with MIC values of 20% and 50% crude extract, respectively. The mechanism of inhibition against bacterial pathogens was due to nucleic acid and protein leakages indicating cell wall damage. *Streptomyces* sp. SAE4034 potent to be developed as a source of antibiotics.

Keywords: *Streptomyces* sp. SAE4034, antibacterial compound, pathogenic bacteria, inhibition mechanism

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DETECTION OF PHENYLGLYCINE AND PIPECOLIC ACID BIOSYNTHETIC GENES INVOLVED IN PRISTINAMYCIN PRODUCTION IN *Streptomyces* SW4 BY POLYMERASE CHAIN REACTION

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Abstract: A biosynthetic gene cluster that produces phenylglycine and pipecolic acid has been detected by PCR from *Streptomyces* SW4. Sequence analysis of the amplified genes revealed similarity with corresponding genes from pristinamycin-producing bacteria, *Streptomyces pristinalis*. Liquid chromatography–high resolution mass spectrometry (LC-MS) and high-resolution mass spectrometry were used to confirm antibiotic synthesis in SW4 strains (HRMS). This study revealed SW4 produces pristinamycin I, a streptogramin type B antibiotic, and the possibility of using the strain as a potential biocontrol. Furthermore, it will enable researchers to develop rational strategies for their use in medicine and agriculture.

Keywords: 1, biosinthetic gene cluster 2, phenylglycine 3, pipecolic acid 4, PCR 5, pristinamycin

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RELATIONSHIP BETWEEN SERUM LEVEL OF CD44 WITH CLINICOPATHOLOGY OF BREAST CANCER PATIENT IN BALI, INDONESIA.

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Abstract: CD44 expression is associated with increased metastasis in breast cancer cells, advanced tumor grade, and decreased free survival rate. However, this protein usually assessed in the tissue and there is very limited data regarding its level in the serum which can be accessed easily to predict the outcome of breast cancer. Therefore, this study aimed to determine the relationship of CD44 level in breast cancer patient's serum and its relationship with clinicopathological data. 46 blood samples were used in this study and serum CD44 was assessed using ELISA while clinicopathological data was obtained from medical records. All variables were statistically analyzed via SPSS version 25. The average age of the research subjects was 54.24±10.67, ranging between 38-86 years, with the majority of subjects had less than three children. The mean serum CD44 level in all samples was 1177.83 ± 268.47 ng / mL, with a median value of 81.42 ng/mL. There was a significant relationship between CD44 level and menstrual status ($p = 0.037$), tumor size ($p = 0.012$), stadium ($p = 0.026$) and distant metastasis ($p = 0.021$) in breast cancer patients. It can be concluded that high level of CD 44 was found in high concentration in patient serum and significantly associated with menstrual status, tumor size, stadium, and distant metastasis.

Keywords: Breast cancer, Serum, CD44, distant metastasis, stadium

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WILD OAT: A MIRACULOUS HEPATOPOTECTIVE HERB

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Abstract: Liver diseases are one of the major problems worldwide. Various toxicants like carbon tetra chloride (CCl_4) used by workers in industries increased the risk of liver diseases. In recent years focus on effective hepatoprotective medicinal plant has been increasing. *Avena Fatua* (wild oat) available in different regions of Pakistan has been used in present study to evaluate its hepatoprotective effect in CCl_4-induced liver injury. The seeds selected for the present study, were first extracted with ethanol which was fractionated and divided into hexane soluble (HSF) and defatted seeds (DSF) fractions. The experimental rats were grouped into 3 control groups as normal control (distilled water 1ml/kg), hepatotoxic control (distilled water 1mL/kg), positive control (silymarin 100mg/kg), and 2 test groups as HSF (800mg/kg) and DSF (800mg/kg) for 5 days. On third and fifth day of the trial animals were intraperitoneally injected with CCl_4 (3 mL/kg) with olive oil in ratio of 1:1 to bring about hepatotoxicity after 1 hour of their decided treatment, except for normal control. Both the fractions significantly decreased the levels of liver specific enzymes, bilirubins and increase total protein, albumin, globulin, and A/G ratio in test groups. Thus, both the fractions of wild oat demonstrated hepatoprotectivity, reviving liver structure.

Keywords: Hepatoprotective, Liver diseases, Wild oat, CCl4, Medicinal plants

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SF3B1 EXPRESSION PREDICT THE CHEMORESISTANCE IN TRIPLE-NEGATIVE BREAST CANCER

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Abstract: Triple-negative breast cancer (TNBC) is the most malignant type of breast cancer. Although usually responsive to chemotherapy, chemoresistance or recurrent disease is often very difficult to treat and severely reduced patient's survival. SF3B1 is one of splicing factors that often mutated or overexpressed in solid cancers. Initial pre-clinical studies have showed that splicing aberration plays important role in breast cancer progression but there are still no studies regarding the expression of SF3B1 in TNBC and how it affects the chemotherapeutic response. Therefore, this study aimed to evaluate the prognostic value of SF3B1 in chemosensitivity in TNBC. A case control study design was adopted in this study. Paraffin blocks from stadium III TNBC patients were used and those with incomplete medical record data or have other types of malignancy were excluded. The clinicopathological data was obtained from medical record in Sanglah General Hospital while SF3B1 was assessed by using immunohistochemistry method in Pathology Anatomy lab. All variables were statistically analyzed SPSS version 25. 51 subjects with partial response and 9 subjects with no response were included in this study. The average age of the subjects was 51.28±10.765 years. Multivariate analysis showed that three variables independently associated and increased the risk of chemoresistance in TNBC namely: SF3B1 (AOR: 13.714; 95%IC: 1.24-133.28; p: 0.029), Ki-67 (AOR: 14.4; 95%IC: 1.80-115.73; p: 0.012), and TIL (AOR: 6.7; 95%IC: 1.12-40.46; p: 0.037). It can be concluded that SF3B1 expression is associated with chemoresistance in TNBC together with Ki-67 and TIL.

Keywords: Triple-Negative Breast Cancer, SF3B1, Chemoresistance

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THE EFFECT OF BIOSURFACTANT ON THE INTERACTION OF ORGANIC POLLUTANTS WITH CATABOLIC ENZYMES THROUGH MOLECULAR DOCKING AND MOLECULAR DYNAMICS SIMULATION STUDIES: A REVIEW

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Abstract: The specific role of microbial biosurfactants in biodegradation have been confirmed in various experimental investigations particularly for the application in bioremediation of organic pollutants. Detailed molecular level knowledge of biosurfactant behaviour in biodegradation is critical towards understanding and determining the optimum parameters for biosurfactant production. Thus, molecular docking and molecular dynamic simulation come in handy as they are very convenient and inexpensive method to probe structural information to unravel the underlying molecular mechanism. This review provides an overview of computational studies involving molecular docking and molecular dynamic simulation between organic pollutants and the catabolic enzymes produced by microorganisms in the presence of biosurfactant. Interactions of organic pollutants such as hydrocarbons with catabolic enzymes such as dioxygenases in the coexistence of biosurfactant such as rhamnolipids are revealed in aqueous systems and the entire stability of catabolic enzymes, conformational transformation of complexes, hydrogen bonds and binding energy distribution are further described. Hence, this paper reviews the computational approaches in biosurfactant research and their findings for further molecular level understanding.

Keywords: biodegradation, biosurfactant, catabolic enzymes, molecular docking, molecular dynamic simulation

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BACTERIOCIN OF LACTIC ACID BACTERIA LG15 ISOLATED FROM LOGENDING BEACH MANGROVE SEDIMENT AND ITS INHIBITION AGAINST *Propionibacterium acnes*

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Abstract: Lactic Acid Bacteria (LAB) LG15 was isolated from mangrove sediments of Logending Beach and the bacteriocin produced was able to inhibit several pathogenic bacteria. The inhibitory activity of bacteriocin has the opportunity to be used as an antibacterial agent in inhibiting the skin-infecting bacteria that causes acne, *Propionibacterium acnes*. The aim of this study was to identify the isolate LG15 and to measure its bacteriocins ability to inhibit the P. acnes growth. Bacterial characterization was carried out by phenetic method, crude bacteriocin was produced using ammonium sulphate precipitation method and *P. acnes* inhibition test by diffusion method. The main parameter observed was the diameter of the inhibition zone against *P. acnes*. The results obtained were LAB LG15 isolate had similar phenetic characters to the genus Enterococcus. Bacteriocins produced by isolate LG15 were able to inhibit the growth of *P. acnes* with an inhibition zone diameter of 14 mm. The inhibitory ability is categorized as strong.

Keywords: Lactic Acid Bacteria, bacteriocin, acne, *Propionibacterium acnes*

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DEVELOPING DRIP IRRIGATION TECHNOLOGY ON DRY LAND CHILI FARMING IN RURAL OF NORTH LOMBOK: IMPROVING FARMERS' HOUSEHOLDS DURING PANDEMIC COVID-19 ERA

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Abstract: Lack of capital for irrigation of horticultural farming is one of main problems faced by rural community on the dry land agriculture in North Lombok. Thus, it is necessary to innovate in the development of a drip irrigation technology with an automatic gravity control system using plastic waste (LIPSTIK). This study aims to analyze the technical and economic efficiency of the drip irrigation technology in chili farming on dry land using the medium to long term action research. The research method (Short to Medium Action Research) starting at the beginning of the dry season. The participatory action research, action research by applying a rural community participatory approach, was the approach of the research. The results showed that drip irrigation technology was able to economize irrigation water and casul labor. This technology is considered a new technology in the rural Salut location, but due to the relatively expensive price of the equipment it can be difficult to implement. To overcome the high price, the use of irrigation equipment can be adjusted by replacing some components with the cheaper and easily available materials. This technology is more appropriate if applied to large-scale economic commodity farming. The water requirement for chili cultivation in one growing season was 22,000 liters per 500 m^2 at a cost of Rp. 150,000. Meanwhile, by manual method (irrigation surface flow) by draining water from drilled wells to the planting area of about 75,000 liters per 500 m2 with a cost of IDR 400,000. This proves that the drip irrigation system can save water and energy consumption. The Total revenue of chili farming calculations show that the financial turnover obtained from chili cultivation using drip irrigation technology was Rp. 5,525,000 per 500 m^2, while that obtained of revenuew by local farmers was Rp. 3,365,000.00 per 500 M2. By applying drip irrigation technology in rural areas of dry land, farmers can plant chili farming out of season without relying on rainfall. It indicated that the farmer imcome gaining from chili farming could accelerate the economic recovery of farmers household of pandemic COVID-19 era.

Keywords: Drip Irrigation technology, dry land agriculture, horticulture, economic recovery.

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APPLICATION OF BIOLOGICAL FILTER ON FISH CULTIVATION IN FLOATING NET CAGES FOR LAKE WATER QUALITY MANAGEMENT

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Abstract: Intensive fish farming activities using floating net cages potentially lead to an increase in water pollution. Processing of water contaminants from the fish farming waste is essential for treating lake water quality. An application of biological filter on cages was developed as a wastewater treatment plant system in Lake Batur, Bali, Indonesia. The system consists of three main components, i.e., a watertight pond, a reservoir for feed waste, and aquaponic plants. The watertight pond was equipped with a circulation window to circulate water between the cage pond and the lake waters. The reservoir served to accommodate the leftover feed and fish feces sucked from the bottom of the pond. Aquaponic plants as the biological filters grown in a media placed inside pipes were arranged on the side of the cage pond. Fish farming with 12,200 floating net cages have contributed to the pollution of 3,425 kg/year phosphates and 202,778 kg/year ammonium to the natural lake. The bio-filter utilization was able to absorb toxic pollutants, i.e., 76.50% phosphates and 73.60% of ammonia. Moreover, the high-economic plants used as bio-filter, such as water spinach, Chinese cabbage, and red spinach can provide economy benefits to the fish farming community.

Keywords: Biological filter, Environmentally friendly lake water cage technology, Fish farming, Floating net cages, Water quality

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REVERSING SOIL THREAT FOR PRODUCTION AGRICULTURE

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Abstract: By 2050, the world food demand will be 60% higher than what is currently produced. The continued soil degradation could significantly reduce availability of arable land. Greater than half of the global arable lands have been degraded or are infertile, leaving limited arable lands for agricultural expansion. Literature has it that 24 billion tons fertile soil were lost through erosion in 2011 and this translates into 3.4 tons per person worldwide. The loss of soil through erosion translates into $70/year/person and the total cost of the soil which is lost each year is $490 billion not forgetting that a cup of soil has more micro-organisms than the human population. Furthermore, considering the fact that the soil being a non-renewable resource, it is essential that we take cognisance of the fact that it takes many years to form for example, a 1 kg of a mineral soil but it takes few moments to degrade soil health. Less than 10% of the global land is soil, it takes 500 years to form 2 cm topsoil, 2000 years to form 10 cm fertile soil, but soils are destroyed in few years and are gone forever. These facts suggest that to achieve sustainable agriculture, the need for modern farming systems which are rooted in appropriate innovations and technologies cannot be over-emphasized because apart from them being able to improve soil and crop productivity, they are ideal for generational agriculture such as soilless farming approaches. This paper discusses important drivers of soil degradation, types of soil degradation, consequences of soil degradation, and sustainable soil management for production agriculture.

Keywords: *Soil health, crop health, soil degradation, sustainable agriculture, soil and crop productivity.*

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FISH SKIN GELATIN AND KAPPA-CARRAGEENAN MIXTURES; AN INNOVATIVE APPROACH TOWARDS RHEOLOGICAL CHARACTERIZATION

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Abstract: The skin of economically most important fish such as tilapia is a potential source of gelatin that can be used in products requiring very high gel strength. This research was designed to provide an opportunity to investigate the extraction of fish gelatin from tilapia fish (*Oreochromis mozambica*), to characterize the structure and physical- chemical properties, and to identify the gelling properties with κ- carrageenan (κ-CG). Fish skin gelatin was extracted and was heated to 60°C for 30 min. Commercial κ-CG solutions of 0.25%, 0.50%, 0.75% (w/v) in distilled water, mixed with 5% tilapia gelatin (TG). Gelatin-κ-CG mixtures were analysed for rheological (Rheometer and Texture Analyser) and thermodynamic properties by Differential Scanning Calorimetry (DSC). The outcome was good gelling effect and enhanced gelation of κ-CG and tilapia gelatin mixtures. The rheological results for G′ value (storage modulus) of tilapia gelatin-κ-carrageenan increased significantly ($p<0.05$) as the concentration of κ-CG was increased. The gelling temperature for gelatin-κ-CG mixtures was higher than that for TG alone, although this gelatin produced a good gel at room temperature. It is anticipated that the research findings could assist in the future application of fish gelatin in food and pharmaceutical industries in providing an avenue for using alternative ingredients in the halal and global market.

Keywords: *Tilapia fish, gelatin, kappa-carrageenan, rheological characterization, differential scanning calorimetry.*

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A REVIEW OF SOLID-STATE FERMENTATION: AN ALTERNATIVE SOURCE OF PROTEIN FOR AQUACULTURE FEED

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Abstract: In response to environmental concerns and increased costs, substantial efforts have been focused on research to reduce or eliminate fishmeal in aquafeeds. Thus, the potential use of plant-based material, to undergo Solid State Fermentation (SSF) to increase protein content and improve its nutritional values, is advocated for aquaculture. Several studies reported that the increased growth, better gut environment and improved health by the utilization of SSF as fish feed, either alone or in combination with commercial feed. In fact, the commercial viability and utilization of these biomass within the aquaculture industry is limited due to farmers are not inclined to change feed sources. The efficiency and utilization of alternative plant raw materials could be maximized by means of biotechnological processes aimed at concentrating protein content, improving essential amino acid profiles, reducing the level of antinutritional factors and increasing nutrient digestibility and availability. This review evaluates approach of several SSF methods, its biomass, the microbial starter used, and the improvement it provided to nutritional content of the aquafeed. Noteworthy, the enhancement of the nutritional quality of alternative protein ingredients could be one of the main strategies towards the sustainable development of new products with added value that can be of interest for the aquafeed-manufacturing industry and aquaculture in general.

Keywords: *Fish meal, Solid State fermentation, Fish feed, Aquaculture, Nutrition.*

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Professor Fahrul Huyop received his PhD. from Leicester University in the United Kingdom, the Top 200 British University according to the University World ranking. Professor Fahrul was former Head of Department and Deputy Dean and the last post was Assistant Dean for External and Global Engagement before he went for sabbatical leave in Turkey between 2018/2019. Currently, he is an active professor in Biosciences, teaching and doing research. He is Chief Editor of the Journal Tropical Life Science and member of several Editorial Board of reputable journals in science. Professor Fahrul interest is in Pollutant Degradation, Plant Biotechnology and Food Biotechnology. He has published more than 200 papers in the area of his interest and delivered several Keynote Lectures and invited lectures in his area of expertise. Professor Fahrul was affiliated to the Philippines Society for Microbiology as Life Member and also awarded "Fellow of the Philippines Academy of Microbiology-FPAM". In 2020 he was awarded "Fellow Biotechnology Society of Nepal" for his contribution in Biotechnology Research. His expertise and contributions in the area of Microbiology & Biotechnology was acknowledged when he was invited as "World Class Professor" in Semarang State University Indonesia (2018) and visiting Professor/Lecturer in several other universities in Asean countries (2012-2019). In Malaysia, Professor Fahrul is an academic reviewer of the university Academic Programmes apart from serving the Ministry of Higher Learning to represent the Ministry as the Malaysian University Research Auditor. His passion for science opened doors for local and international collaboration.

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Ida Bagus Wayan Gunam, Ph.D. was born in Karangasem Bali, April 24, 1963. He obtained a bachelor's degree at Bogor Agricultural University (IPB) in Food Technology and Nutrition in 1986. Prior to being accepted as a lecturer at the Faculty of Agricultural Technology, Udayana University, he was as a Production Manager at PT. Wihadi Jaya for 2 years. In 1997, he completed his Master Degree in the field of Food Science and Technology at the Postgraduate Program at Gadjah Mada University (UGM) Yogyakarta. He continued his study at the PhD level at the Graduate School of Agriculture, Faculty of Agriculture, Hokkaido University Sapporo Japan and graduated in 2006 in the field of applied bioscience. Since 1989 until now he works as a lecturer at the Department of Agricultural Industrial Technology, Faculty of Agricultural Technology, Udayana University. His main research is applied microbiology on energy, beverage, and fermentation technology. Currently, he has published more than 120 scientific writings, in the form of journals, proceedings, chapter in books, and books. Aside from teaching and supervising student at the level of undergraduate, master, and PhD in his own specialty. During his career, he served as chairman of the Department of Agroindustrial Technology, Secretary for Research at the Institute for Research and Community Service at Udayana University (2010-2014). Secretary of the Udayana University Quality Assurance Institute (2014-2017). Head of the Bioindustry and Environment Laboratory (2018-2021). Secretary of the Indonesian Climate Change & Forestry Association (APIKI) Bali Sub-Region (2013-2021). Besides that, he is also active as a consultant in the field of agricultural industrial technology.

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