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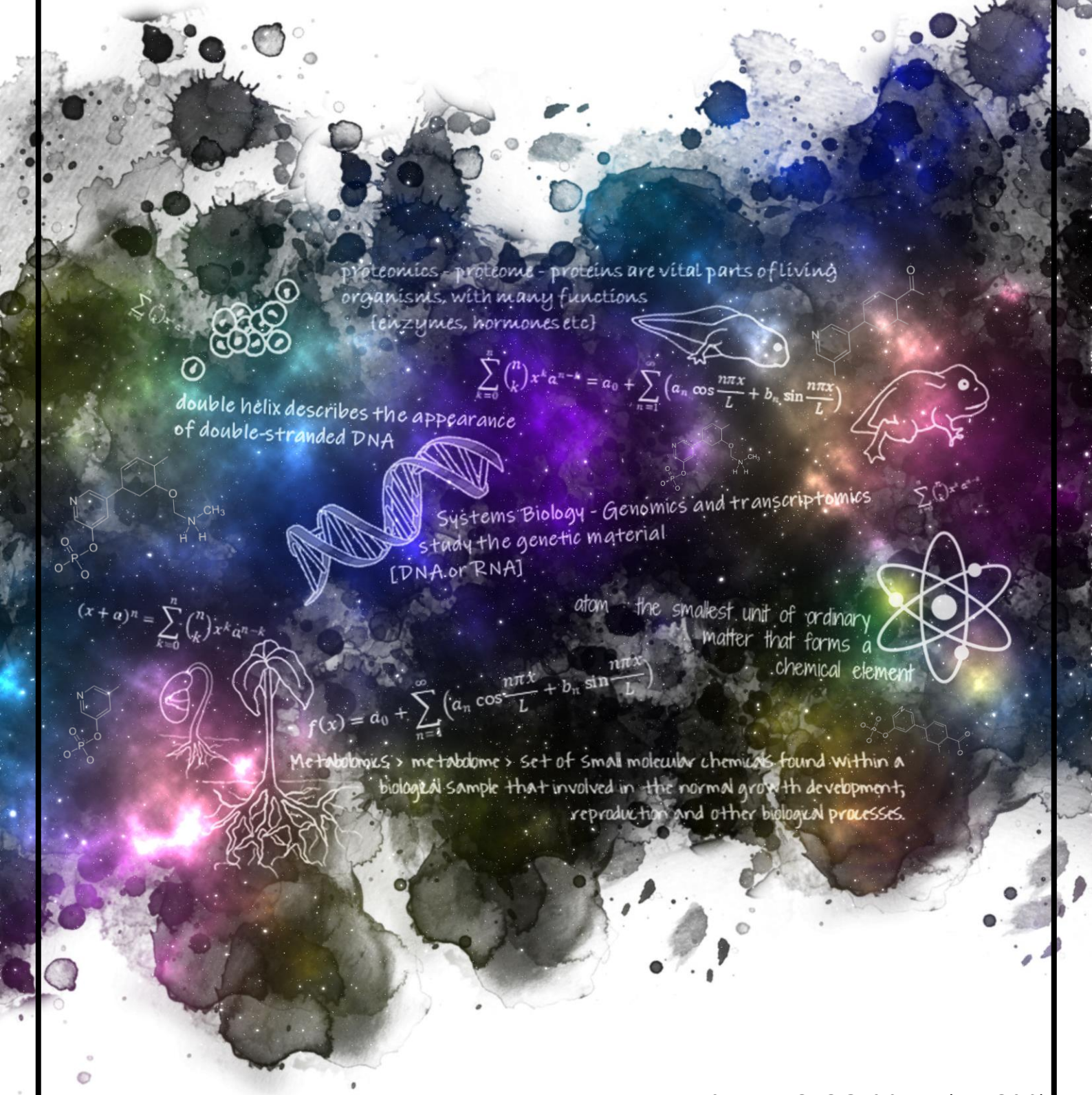

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Editorial Note

Welcome to the Systems Biology Insider Volume 4.

With INBIOSIS vision to become an outstanding institute pursuing innovative research in systems biology benefiting mankind, members of the institute have been working hard in interdependent interdisciplinary research to investigate highly complex biological processes. Members of the institute have ventured into research in the areas of biodiversity discovery, food security, human wellbeing, and sustainable bio-products. This edition of Systems Biology Insider contains the highlights of the institution research achievements, activities, publications, and research outputs, which serves as a communication channel with other academicians and the community to forge future collaborations.

Editorial team is happy to assist any of your queries, feedback, and suggestions.

Thank you.

Editorial Board

Content

MOA
Memorandum of Agreement

| 20 May 2022 | Metabolomics research group at INBIOSIS has been venturing in the exploration and development of metabolite profiling methods for various plant species, which facilitate the development and production of potential essential oil products. Now, INBIOSIS engaged with Narinar Group Sdn. Bhd. in a research collaboration entitled: Chemical Composition Analyses of the Plants Essential Oils.

The research team is lead by Assoc. Prof. Dr. Syarul Nataqain Baharum, where the team is funded with RM20,000.00 for a period of 12 months. The objective of the study is to develop metabolite profiling methods that facilitate the production of essential oil from a variety of plant species that are of interest to Narinar Group Sdn. Bhd. The research also aims to ensure the essential oil produced from the selected plant species is of high quality in the product produced by Narinar Group Sdn. Bhd.

This collaboration aims to establish an INBIOSIS-NARINAR interim lab to provide a platform for human resource exchange and technology transfer.

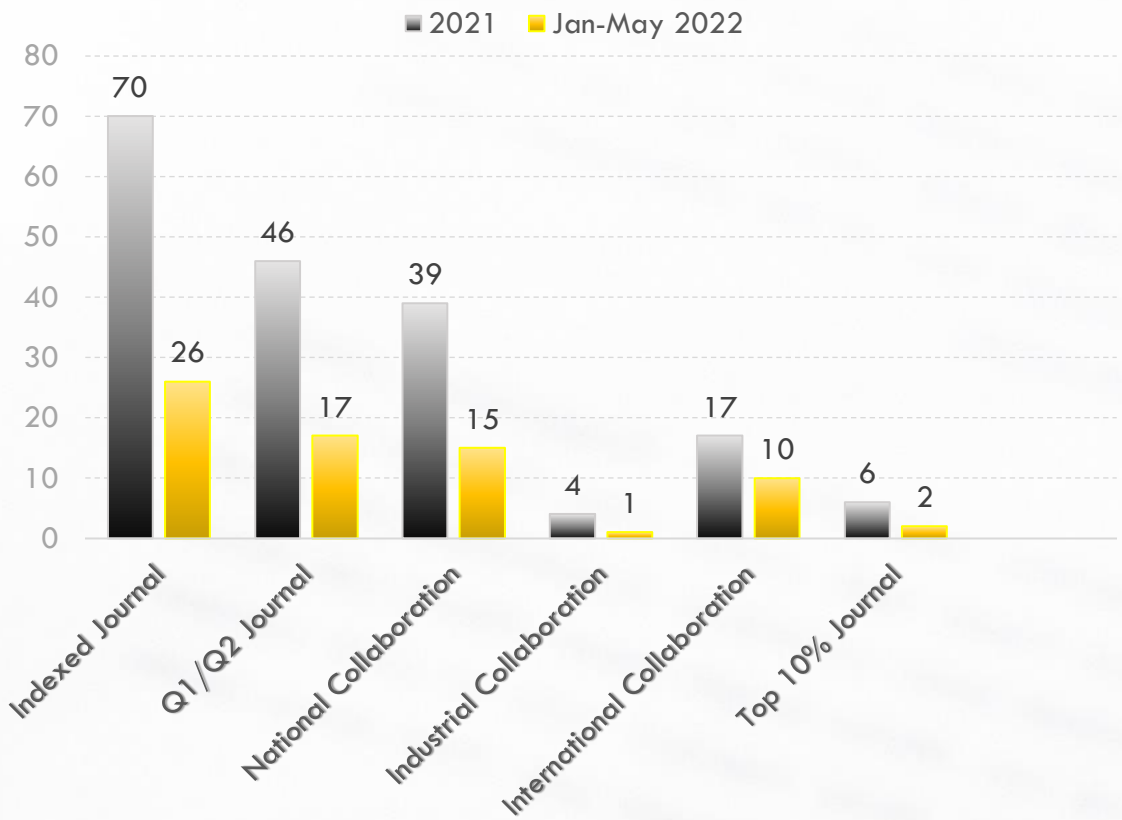
INBIOSIS Achievements
Research and Publication

Research grant received in Jan-May 2022

1. Assoc. Prof. Dr. Syarul Nataqain Baharum
   Chemical composition analyses of the plants essential oils
   RM20,000.00 (12 months)
   Funded by Narinar Group Sdn. Bhd.

2. Assoc. Prof. Dr. Ng Chyan Leong
   Plant-based cold-lipase enzymes (CLPS) for industrial applications
   RM143,270.00 (2 years)
   Funded by Ministry of Science, Technology and Innovation (MOSTI)

Number of publication in Jan-May 2022



Performance of INBIOSIS in Research and Publication

List of Q1 publications (Jan-May 2022)

1. Muhammad Asyraf Mohd Amnan, Wan Mohd Aizat, Fiqri Dizar Khaidizar & Boon Chin Tan. 2022. Drought Stress Induces Morpho-Physiological and Proteome Changes of *Pandanus amaryllifolius*. Plants 11, 221. https://doi.org/10.3390/plants11020221. IF 3.935
2. Murni Nazira Sarian, Nida Iqbal, Pedram Sotoudehbagha, Mehdi Razavi, Qamar Uddin Ahmed, Cortino Sukotjo & Hendra Hermawan. 2022. Potential bioactive coating system for high-performance absorbable magnesium bone implants. Bioactive Materials12: 42-63. IF 14.593
3. Amin-Asyraf Tamizi, Noriha Mat-Amin, Jack A. Weaver, Richard T. Olumakaiye, Muhamad Afiq Akbar, Sophie Jin, Hamidun Bunawan & Fabrizio Alberti. 2022. Genome Sequencing and Analysis of Trichoderma (Hypocreaceae) Isolates Exhibiting Antagonistic Activity against the Papaya Dieback Pathogen, *Erwinia mallotivora*. Journal of Fungi 8, 246. https://doi.org/10.3390/jof8030246. IF 5.816
4. Tasneem Shakri, Muhammad Hafiz Che-Othman, Nurulhikma Md Isa, Noor Liyana Sukiran & Zamri Zainal. 2022. Morpho-Physiological and Stress-Related Gene Expression of Rice Varieties in Response to Salinity Stress at Early Vegetative Stage. Agriculture 12, 638. https://doi.org/10.3390/agriculture12050638. IF 2.925
5. Tiew-Yik Ting, Anis Baharin & Hoe-Han Goh. 2022. Post-Proline Cleaving Enzymes (PPCEs): Classification, Structure, Molecular Properties, and Applications. Plants 11, 1330. https://doi.org/10.3390/plants11101330. IF 3.935
6. Siti Suhailah Sharuddin, Norhayati Ramli, Mohd Zulkhairi Mohd Yusoff, Nor Azlan Nor Muhammad, Li Sim Ho and Toshinari Maeda. 2022. Advancement of Metatranscriptomics towards Productive Agriculture and Sustainable Environment: A Review. International Journal of Molecular Sciences 23, 3737. https://doi.org/10.3390/ijms23073737. IF 5.924

7. Shahidah Md Nor, Phebe Ding, Faridah Abas & Ahmed Mediani. 2022. 1H NMR Reveals Dynamic Changes of Primary Metabolites in Purple Passion Fruit (*Passiflora edulis* Sims) Juice during Maturation and Ripening. Agriculture 12, 156. https://doi.org/10.3390/agriculture12020156. IF 2.925
8. Syazwani Basir, Muhamad Afiq Akbar, Noraini Talip, Syarul Nataqain Baharum & Hamidun Bunawan. 2022. An Integrative Volatile Terpenoid Profiling and Transcriptomics Analysis in *Hoya cagayanensis*, *Hoya lacunosa* and *Hoya coriacea* (Apocynaceae, Marsdenieae). Horticulturae 8, 224. https://doi.org/10.3390/horticulturae8030224. IF 2.331
9. Juwairiah Remali, Idin Sahidin & Wan Mohd Aizat. 2022. Xanthone Biosynthetic Pathway in Plants: A Review. Frontiers in Plant Science, https://doi.org/10.3389/fpls.2022.809497. IF 5.754
10. Moupriya Nag, Dibyajit Lahiri, Ankita Dey Tanmay Sarkar, Siddhartha Pati, Sanket Joshi, Hamidun Bunawan, Arifullah Mohammed, Hisham Atan Edinur, Sreejita Ghosh & Rina Rani Ray. 2022. Seafood Discards: A Potent Source of Enzymes and Biomacromolecules With Nutritional and Nutraceutical Significance. Frontiers in Nutrition, https://doi.org/10.3389/fnut.2022.879929. IF 6.576
11. Tiew-Yik Ting, Anis Baharin, Ahmad Bazli Ramzi, Chyan-Leong Ng, Hoe-Han Goh. 2022. Neprosin belongs to a new family of glutamic peptidase based on *in silico* evidence. Plant Physiology and Biochemistry 183, 23–35. IF 4.27

Fundamentals of LC-MS-Based Metabolomics for Beginners

| 8 – 10 March 2022 |

Liquid Chromatography – High Resolution Mass Spectroscopy (LC-HRMS) continued to grow in the last two decades as an analytical technique used in metabolomics. Additionally, by combining spectral resolution, mass accuracy, and mass fragmentation, MS metabolite identification capabilities have been enhanced and recognized as the most employed technique in metabolomics. The INBIOSIS, as a leading institute in metabolomics study was organising a Fundamentals of LC-MS-based Metabolomics for Beginners workshop from 8-10 March 2022 with 12 participants attended from academia and industries. In this three-day workshop, several modules were given by Assoc. Prof. Dr Syarul Nataqain and Dr. Nurkhalida which cover on sample preparation (extraction with hands-on), data acquisition (qualitative and quantitative analysis), and finally data analysis using univariate and multivariate approaches.

Practical Course on GC-MS Metabolomics

Demo | Hands-on Session | Interactive Session | Data Interpretation

| 29 – 31 March 2022 |

GC-MS is an essential instrument for high-throughput metabolomics studies especially for VOCs profiling. GC-MS utilizes a quadrupole mass spectrometer capable of high-speed scanning, which enables reliable and fast metabolites identification that are biologically relevant. During the workshop, ChM. Dr. Kamalrul Azlan Azizan and Dr. Ahmed Mediani have shared a detailed practical GC-MS based metabolomics that covered sample preparation (extraction and derivatization methods of GC-MS, with hands-on), data acquisition including qualitative and quantitative analysis and finally data analysis using univariate and multivariate approaches.

Symposium on Synthetic Biology and CRISPR Technology

| 17 – 19 May 2022 |

A 3-day event has been organized by synthetic biology research group at INBIOSIS to provide an effective platform for knowledge exchange in the field of CRISPR technology, systems and synthetic biology among the invited distinguished speakers, renowned scientists and researchers. The steering committee headed by Dr. Ahmad Bazli Ramzi has recruited experts in CRISPR technology to share the latest update, development, and advancement of CRISPR research during the symposium. Special highlights of CRISPR technology applications in cancer research, animal vaccine and therapeutics, microbial genome editing etc.

In conjunction with the symposium on synthetic biology and CRISPR technology, researchers had the hands-on experience in laboratory techniques and skills involved in CRISPR research during the iCRISPr workshop. Design for CRISPR-Cas-mediated gene knock-in was demonstrated by Dr. Ahmad Bazli Ramzi during the workshop, followed by the hands-on session where researchers were given the opportunity to experience the laboratory procedures in the synthesis and purification of CRISPR sgRNA, assembly and *in vitro* cleavage assay of Cas9/sgRNA RNP, lastly, the *in vitro* assay for gene mutation detection.

INBIOSIS CRISPR (iCRISPr) Workshop

Webinars on Systems Biology Research

Malaysia is rich in biodiversity with many tropical plants remain to be explored for human wellbeing. The advent of sequencing and mass spectrometry technology allowed unprecedented opportunity for transcriptome-wide study and biomolecular discovery. For the past ten years, we have been applying omics approach to study various plants, including rice, oil palm, papaya, mangosteen, *Arabidopsis*, *Nepenthes* spp., *Rafflesia cantleyi*, *Persicaria minor*, and *Mitragyna speciosa*. This talk will cover some of these plants to demonstrate how we utilised omics approaches to understand the molecular regulation of plant physiology, such as biotic stress response from elicitation, botanical carnivory, and seed germination. Transcriptomic profiling is useful for elucidating biosynthesis pathways of beneficial compounds of interest, such as phenylpropanoids, flavonoids, and alkaloids. These studies provide fundamental understanding for biotechnological applications.

Tropical Plant Functional Genomics: From Panomics to Translational Applications

Assoc. Prof. Dr. Goh Hoe-Han

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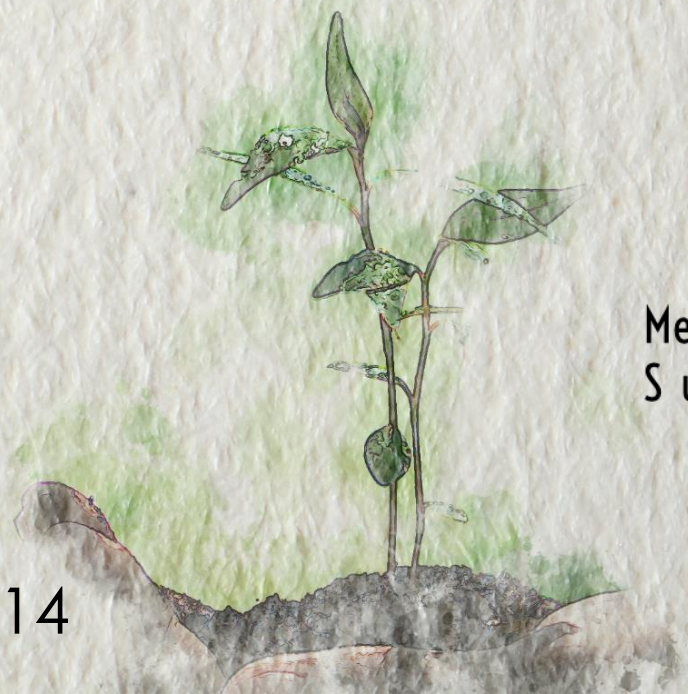
Over the last decade, metabolomics has continued to grow rapidly and is considered a dynamic technology in envisaging and elucidating complex phenotypes in systems biology area. The advantage of metabolomics compared to other omics technologies such as transcriptomics and proteomics is that these later omics only consider the intermediate steps in the central dogma pathway (mRNA and protein expression). Meanwhile, metabolomics reveals the downstream products of gene and expression of proteins. One of the goals of metabolite profiling is to detect all metabolites (defined as the metabolome) in a biological sample with high accuracy in terms of quality and quantity. Thus, metabolomics approaches here have the benefit of building on present knowledge and research. Nonetheless, non-targeted metabolomics does provide a distinctively different philosophy as opposed to analyses of known metabolites. In order to achieve this goal, a variety of techniques, including gas chromatography-mass spectrometry (GC-MS), liquid chromatography-mass spectrometry (LC-MS) and nuclear magnetic resonance (NMR) are applied to carry out metabolite detection to the maximum extent possible. This talk will focus on two case studies; 1. applications of metabolomics platform in unraveling the local herb potential in pharmaceutical and nutraceutical industry, 2. Identification of metabolites that responsible for the survival of the grouper fish against vibriosis. These findings demonstrated the feasibility of using metabolomics to identify immune-response pathways and potential target gene networks, which could serve as excellent candidates for functional metabolomics studies for sustainable agriculture in improve the human health, aquaculture health and production.



Metabolomics: An Emerging Technology for Sustainable Agriculture

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