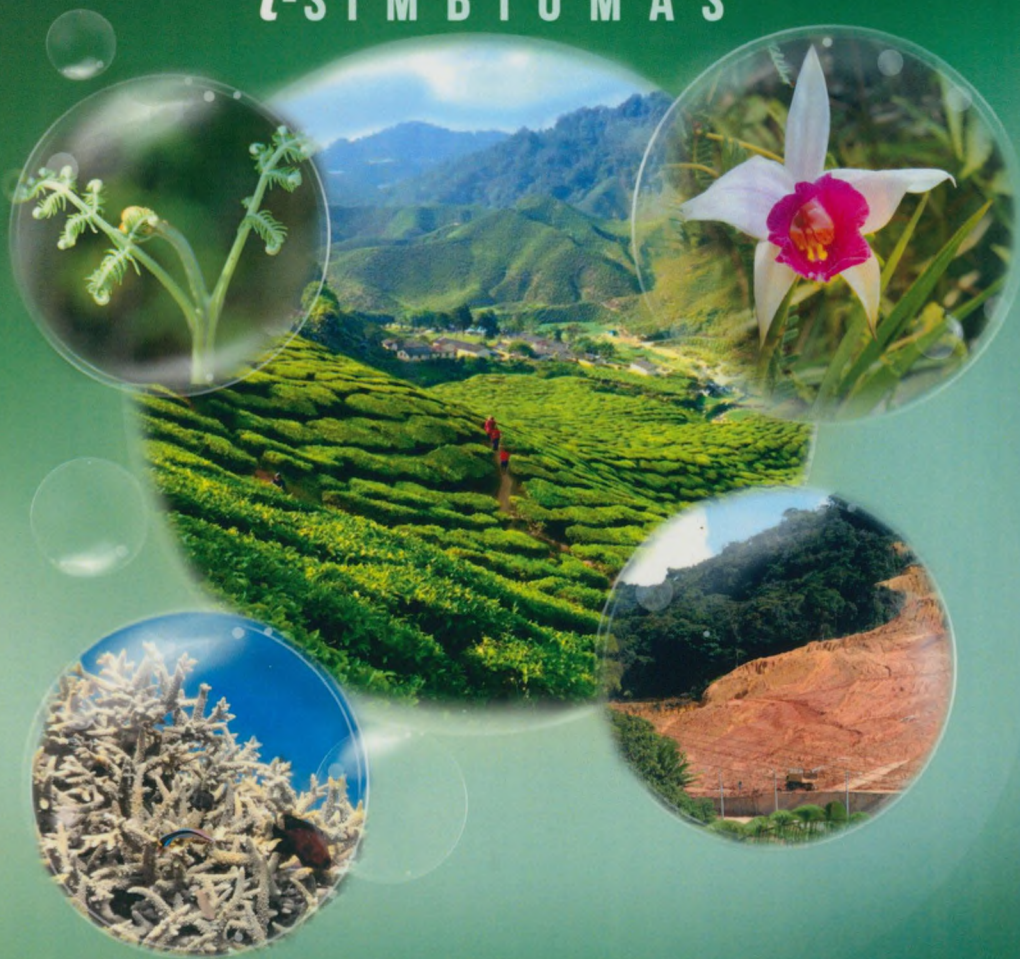


MALAYSIA INTERNATIONAL BIOLOGY SYMPOSIUM 2016 *i-SIMBIOMAS*



BIORESOURCES: ADAPTATION AND MITIGATION OF CLIMATIC CHANGES

26TH-27TH OCTOBER 2016

**PUTRAJAYA INTERNATIONAL CONVENTION CENTRE (PICC),
MALAYSIA**



UPM
UNIVERSITI PUTRA MALAYSIA
BERILMU BERBAKTI



PROGRAMME & ABSTRACTS

MALAYSIA INTERNATIONAL BIOLOGY SYMPOSIUM

“Bioresources: Adaptation and Mitigation of
Climatic Changes”

26th – 27th OCTOBER 2016 | PICC, PUTRAJAYA, MALAYSIA



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PREFACE

Bioresources which are the tangible formats of biodiversity are the renewable “value” contributors for mankind and all life forms. Bioresources have direct value as fundamental elements (earth, water, air, fire, organic and inorganic matter); derivatives such as agricultural products, medicinal products, fossil fuels and bioproducts (building materials, energy resources, clothing etc.) and indirect value as ecosystem stabilizers (carbon-water-nutrient-energy cycling, pollination, dispersal etc.). **Climate change** is generally understood as the change in regional or global climate over time due to natural variability caused by processes internal to the Earth; external forces (e.g. variations in sunlight intensity) or as a result of anthropogenic activities. The causative factors for climate change are the green house gases such as water vapor, carbon dioxide, methane, nitrous oxide, and halo carbons. **Climate Change Mitigation** refers to efforts to reduce or prevent emission of greenhouse gases and move towards a low-carbon society. **Climate Change Adaptation** refers to taking practical actions to deal and manage risks from climate impacts, protect communities and strengthen the resilience of the ecosystem.

The sustainable utilization of bioresources in the wake of climatic changes requires a paradigm shift in the way we think and do biological sciences and incorporating interdisciplinary approaches. We need to understand the concomitant sensitivity and productivity of bioresources to climate vagaries and how mitigation and adaptation measures acquiesces a positive long term outcome. Many adaptation and mitigation options can help address climate changes, but no single option is sufficient by itself. Effective implementation depends on continuous R&D, effective policies and cooperation at all scales and can be enhanced through integrated responses that link mitigation and adaptation with other environmental, societal and economic objectives. Hence, there is a dire need for exchange of views, researches, knowledge, strategies and action plans.

In order to bridge the gaps between knowledge and action based climate change mitigation and adaptation strategies for renewable and sustainable management of bioresources; the *i*-SIMBIOMAS 2016 has forayed the theme “**BIORESOURCES: ADAPTATION AND MITIGATION OF CLIMATIC CHANGES**”. *i*-SIMBIOMAS 2016 is a pulpit for research inputs - ranging from basic, applied, novel and innovative biological sciences and technologies in all stages of experimentation, preliminary designs, pilot studies and efficacy assessments; climate change mitigation and adaptation programmes in diverse ecosystems (marine, freshwater, forest, coastal, highlands etc.) and support services; terrain-based capacity building, demonstrated modalities in weather susceptible communities and examples of successful endeavors in different ecosystems and last but not least; good ecosystem management practices that can boost natural resilience to the adverse impacts of climate change and reduce the vulnerability of bioresources depletion.

It is the aspiration of the organizing committee that the international gathering of intellectuals comprising researchers, postgraduate students, experts, scientists, academicians, policy makers and others from various disciplines of Biological Sciences will accelerate the knowledge and information required to circumvent the escalating global climatic changes through bioresources, biodiversity and ecosystem based adaptation and mitigation programmes and decision making frameworks.

The Organizing Committee
Malaysia International Biology Symposium 2016

FOREWORD

With great pleasure and delight, I, on behalf of the Organizing Committee of *i*-SIMBIOMAS 2016 and Department of Biology, Faculty of Science, Universiti Putra Malaysia (UPM) welcome this august gathering of distinguished guests and participants of Malaysia International Biology Symposium 2016 (*i*-SIMBIOMAS 2016).

It has been a remarkable journey from the humble beginnings as an in-house Colloquium in 2003 to an International Conference in 2012, 2014 and now in 2016; we have come together again...this time in PICC, Putrajaya. Since the International frontier was embraced in 2012, we have garnered many imminent scientists and experts of notable reputation especially in areas of Biodiversity and Ecology to give their keynote addresses. We have yet again brought a set of scientific stalwarts in their fields to address the theme of ***i*-SIMBIOMAS 2016 – Bioresources: Adaptation & Mitigation of Climatic Changes**.

The theme was chosen since we can no longer deny the onslaught of climatic changes on regional and global frontiers. On Dec 2015, our Prime Minister, Datuk Seri Najib Tun Razak said "Its effects are real and Malaysians are not spared from feeling the effects of it. Our drought seasons are prolonged, as our rainy seasons too. We suffer from water supply crises in some states as well as one of the worst floods the country has seen in decades." He also said despite the government launching several initiatives since 9th Malaysia Plan (2006 -2010) which includes the National Biofuel Policy (2006), Renewable Energy Policy and Action Plan (2010), "we have not done enough."

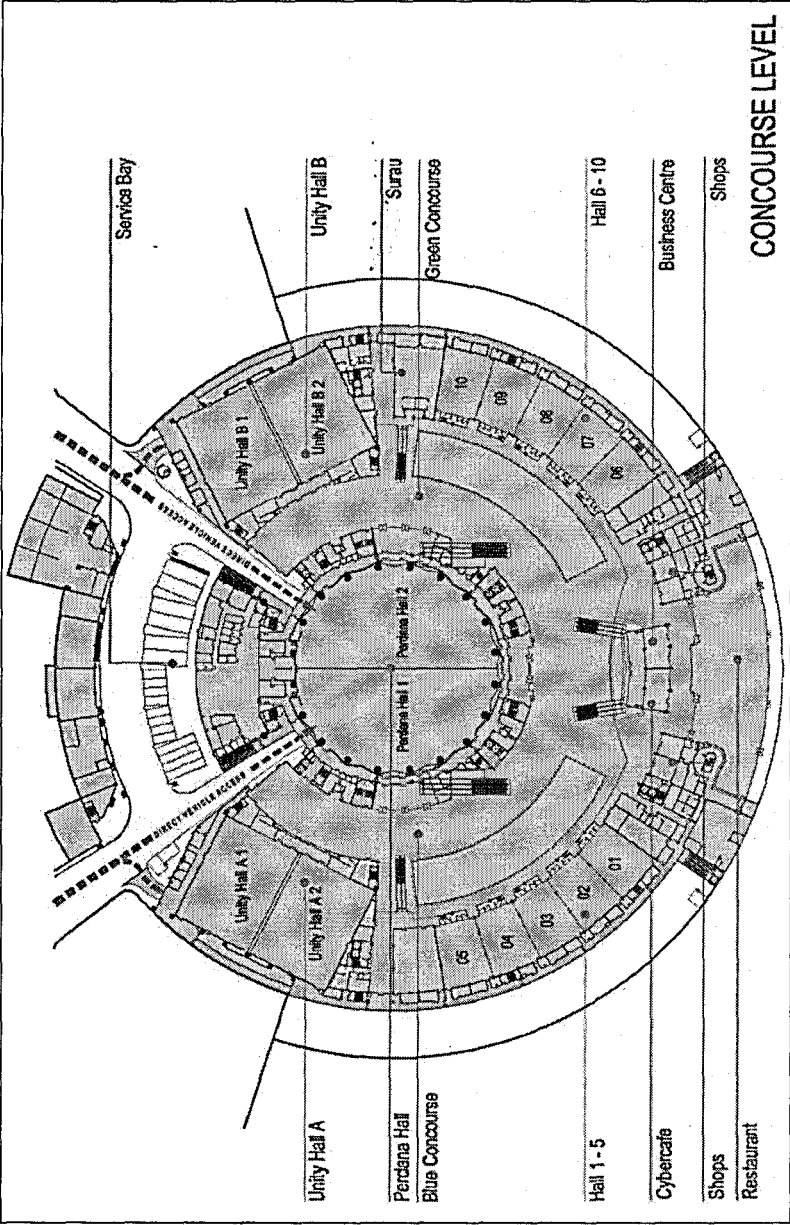
So, the question "we have not done enough" is also a question we as proponents of the various domains of Biodiversity, Ecology, Physiology and Genetics would like to ask, seek, address and assimilate from this gathering. We hope to gauge the direct and indirect impacts climatic changes bring forth to our biodiversities and bioresources in particular. We need to understand how the climatic adaptation and mitigation efforts can protect our river basins and water reservoirs; forest, marine and freshwater life forms; migratory patterns of wildlife owing to anthropogenic activities and overall vulnerabilities of ecosystems and communities and the possible remedial and resilient measures to circumvent the drastic changes of climate. Since this gathering has attracted a large number of researchers from various institutions of higher learning globally; it is deemed highly beneficial for young scientists to gain a larger picture on the significance of their researches befitting the changing tides of globalization, anthropogenic activities that impact climatic changes, national and international policies and laws that govern the mitigation and adaptation strategies and renewable bioresources for the future generation. As for the existing scientific minds that form the pool of academicians and established researches, this forum will highlight the need to bridge knowledge and action plans that will translate into viable frameworks for nation building.

To all the participants, we hope you will gain many insights and overviews of the on-going research trends associated with bioresources and climatic changes. Research networking is highly lauded. Please enjoy your stay here while attending the conference especially the international delegates. There is a lot of diversity in our way of life that will intrigue you besides our Bioresources and Biodiversities.

Thank you.

Prof. Dr. Rusea Go
Organizing Chairperson
Malaysia International Biology Symposium 2016

VENUE MAP



SYMPOSIUM SCHEDULE**WEDNESDAY, 26th OCTOBER 2016**

8.00 AM – 9.00 AM	Registration Venue: Hall 2	
9.00 AM – 9.10 AM	Opening ceremony	
9.10 AM – 9.20 AM	Welcoming note from Prof. Dr. Rusea Go, Chairman of i-SIMBIOMAS 2016. Speech and opening from YBhg. Dato' Sri Azizan bin Ahmad, Secretary General, Ministry of Natural Resources and Environment (NRE), Malaysia.	
9.20 AM – 9.30 AM	Photo session Venue: Hall 2 Master of ceremony: Dr. Shahrizad Yusof	
9.30 AM – 10.00 AM	Tea break Venue: Foyer Hall 2 & 3	
10.00 AM – 10.40 AM	Plenary Session 1: Prof. Dr. Jamaluddin Jompa	
10.40 AM – 11.10 AM	Keynote Biodiversity and Conservation of Natural Resources : Prof. Dr. Rusea Go	
11.10 AM – 11.40 AM	Keynote Genetics: Prof. Dr. Mohamad Osman Venue: Hall 2 Chairperson: Prof. Dr. Japar Sidik Bujang	
PARALLEL SESSION 1		
11.45 AM – 12.45 PM	Biodiversity and Conservation of Natural Resources Venue: Hall 2 Chairperson: Dr. Nur Ain Izzati Mohd Zainudin	Genetics Venue: Hall 3 Chairperson: Dr. Christina Yong Seok Yien
11.45 AM	OB01 Bruno Martins Nkem	OG01 Nurul Aini Ismail
12.00 PM	OB02 Sulaiman Sani Kankara	OG02 Janna Ong Abdullah
12.15 PM	OB03 Micheal Rajaram	OG03 Faezah Syukriah Sabtu
12.30 PM	OB04 Salwa Abdullah	OG04 Tan Yoeng Leh
12.45 PM – 2.00 PM	Lunch break Venue: Cafe@PICC	
PARALLEL SESSION 2		
2.00 PM – 4.00 PM	Biodiversity and Conservation of Natural Resources (A) Venue: Hall 2 Chairperson: Dr. Marina Mohd. Top @ Mohd. Tah	Biodiversity and Conservation of Natural Resources (B) Venue: Hall 3 Chairperson: Dr. Geetha Annavi
2.00 PM	OB05 Nur Shahirah Ismail	OB13 Mohd Akmal Mohd Raffi
2.15 PM	OB06 Nur Jasmin Mohd Yaminudin	OB14 Swagata Sinha Roy
2.30 PM	OB07 Eirma Liza Nordin	OB15 Mohd Fawwaz Mohd Rashid
2.45 PM	OB08 Farah Alia Nordin	OB16 Muhammad Faris Abdul Aziz
3.00 PM	OB09 Nur Syafiqah Che Hussin	OB17 Ibtisam Abdul Wahab
3.15 PM	OB10 Farah Husna Sahari	OB18 Wan Norafikah Othman
3.30 PM	OB11 Muhammad Farhan Abdul Rahman	OB19 Tri Atmowidi
3.45 PM	OB12 Sharifah Siti Maryam Syd Abdul Rahman	OB20 Shamsul Khamis
4.05 PM – 5.00 PM	Poster presentation and judging Venue: Hall 2 <i>*The authors should be at their posters during this session</i>	
5.00 PM – 5.30 PM	Tea break Venue: Foyer Hall 2 & 3	

THURSDAY, 27th OCTOBER 2016

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10.20 AM – 11.00 AM	Tea break <i>Venue: Foyer Hall 2 & 3</i>	
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11.40 AM – 12.10 PM	Keynote Physiology: Dr. Rika Rafiuddin	
12.10 PM – 12.40 PM	Keynote Ecology: Prof. Dr. Ahmad Ismail <i>Venue: Hall 2</i> <i>Chairperson: Prof. Dr. Rusea Go</i>	
12.45 PM – 2.00 PM	Lunch break <i>Venue: Cafe@PICC</i>	
PARALLEL SESSION 4		
2.00 PM – 3.30 PM	Ecology <i>Venue: Hall 2</i> <i>Chairperson: Dr. Nurul Izza Ab. Ghani</i> OE06 Elia Godoong OE07 Fatin Zahidah Abd Aziz OE08 Swagata Sinha Roy OE09 Rohani Shahrudin OE10 Shahrizad Yusof OE11 Billy Teck Huat Guan	Physiology <i>Venue: Hall 3</i> <i>Chairperson: Dr. Mohd Hafiz Ibrahim</i> OP05 Nithiyaa Perumal OP06 Seok Fang Oon OP07 Khaled Hussin OP08 Priscilla Suresh
3.30 PM – 4.00 PM	Closing ceremony <i>Venue: Hall 2</i> <i>Master of ceremony: Dr. Wan Norhamidah Wan Ibrahim</i>	
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Abstracts of Plenaries and Keynotes

**Protecting Indonesian coral reef in the Coral Triangle Area:
Impact of global pressure and climate changes**

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Abstract

Coral reefs of Indonesia located in the center of world coral triangle have suffered from long term pressures mainly due to destructive fishing practices, overfishing, coral mining, sedimentation, pollution, eutrophication, anchoring, and recently from global warming/climate changes. Global warming has caused serious coral mortality due to mass bleaching around the globe in the last decades. Emerging diseases and more frequent outbreaks of coral predators such as Crown of Thorn star fish have also occurred in many reefs. Combinations of these factors have contributed to coral reef destructions in Indonesia, where only around 6% of its coral reefs remains in very good condition. Science based adaptive and effective management strategies have to find the delicate balance among and between the people and the reefs to create more resilient and productive coral reef ecosystems. Introducing Marine Protected Area Networks, ecosystem approach for reef management, community based and co-management, strong and effective regulations, proactive coral restorations are among the contemporary strategies. National and regional strategic actions such as COREMAP (Coral Reef Management Program) and CTI (Coral Triangle Initiative) have been implemented to save those invaluable resources and the people who depend on them. Can all of these efforts solve the increasing and alarming pressures on the reefs? This presentation describes some challenging approaches and sciences on coral reef management around Indonesia.

Keywords: Indonesian coral reefs, Coral Triangle Initiative, climate changes.

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Biodiversity, ecosystem changes and adaptations to climate change

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Abstract

Malaysia is endowed with one of the richest biodiversity in the tropical world which is represented by various ecosystems, species and the genetic resources. Ecosystem diversity is represented by the various habitats and niches, species diversity by about 12,500 species of plants whilst the diversity of animals is represented by more than 6,000 species, excluding that of the insects, the largest and most diverse single group which are inadequately known. As the country is also pursuing industrialisation by the year 2020, conflicts to occur between biodiversity conservation and socio-economic development, resulted in concomitant environmental changes. To-day a total of 1.39 million ha (about 7.6%) of the forest of all types have been set aside for biodiversity conservation. However, a framework for managing biodiversity in and outside protected areas is inadequate as strategic planning and management programmes are not in place. Measures for sustainable forestry, crop agriculture fisheries are in place but those in biodiversity prospecting, eco-tourism and impacts of urbanisation on biodiversity are yet to be established. In the absence of concrete data of biodiversity loss in the country it is difficult to ascertain the lists of endangered or otherwise threatened habitats and species as land-use changes are imperative. However, efforts to assess and monitor this have been initiated through the recently launched National Policy on Biodiversity 2015. Many factors have contributed to biodiversity loss; among them is the rapid socio-economic development of the country that transformed vast forested lands by logging activities, land openings for agriculture and resettlement and subsequently creating new built-up areas such as urban and industrial areas which are relatively poor in biodiversity. These changing land-use patterns coupled with putative climate change are affecting not only biodiversity but the environment *per se*. Other factors such as over-harvesting and marine and river pollution have also contributed in small part. These activities had led to significant habitat loss, degradation and forest fragmentation which enhance local effects of climate change on biodiversity. What are needed are frameworks and strategies for climate change adaptation to address all possibilities affecting biodiversity.

Keywords: Biodiversity, ecosystem changes, adaptations, climate change.

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**An update on orchid diversity in Malaysia, threat, conservation status
and challenges in a changing climate**

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Abstract

Orchidaceae is one of the largest angiosperm families found in Malaysia. Botanical exploration for orchids in various forests and vegetation types since 1999 to date have revealed tremendous changes in species diversity and distribution in Malaysia, being home for more than 4000 species of wild orchids with numbers still increasing today. New species to science and new records to Malaysia numbered between 10-20 new species and up to 50 new records were published yearly since 2010. From my team's account, a total of 47 species are identified as new record to Peninsular Malaysia, which increased the total number to 1103 species in 155 genera of orchids. From these, more the 23% are endemic to Peninsular Malaysia and more than 400 species endemic to Sabah and Sarawak. As studies of orchid diversity continues, the number of species are doomed to change, it might increase in the future if more currently inaccessible vegetation are botanized and more specimens are collected, or it might decreases if rare and endemic species are vanishing due to habitat destruction and conversion to other land use. Apart from these, taxonomic and nomenclature study, too could affect the number of species. It decreases if some are reduced to synonymy or increase if some are raised from varieties, form, or subspecies to species or species complex identity is resolved into multiple genera or species. The environmental condition fluctuations or local climate change could increase or decrease this number, as some species flourished to certain changes; nevertheless some might succumb and lost forever. Major threats like deforestation, conversion of land use, over collecting of flagship species; uncontrolled borderless trades are making it almost impossible to determine the actual species diversity. However, one of the most critical set back for orchid documentation and conservation assessment is due to lack of orchid taxonomists in Malaysia, where there are less than a handful of us. Therefore, species diversity enumerations, conservation status evaluation, conservation plans, and actions are still the countries major challenges while many species slipped out of the country untraced, perished or extinct in the wild without being known of their existencel

Keywords: Orchid, diversity, threat, conservation status, challenges, changing climate, Malaysia.

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**Plant genetic resources and climate change:
Threats and needs for adaptation through plant breeding**

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Abstract

The need for food will continue to increase during the 21st century. By developing higher yielding, disease-resistant and adverse environment-tolerant crops, crop scientists will be at the forefront of the efforts to increase the global food supply. Over the past 50 years, there has been a three-fold increase in agricultural production. The use of high-yielding varieties (HYVs) is the pivot of this significant achievement. However, these varieties need optimum growing conditions to be productive, and the use of fertilisers, pesticides, mechanisation, and irrigation is an integral part of the higher yields. It is well known that plant genetic resources are the building blocks of new and better varieties. The issue of global climate change has become a dominant issue for the world touching on various aspects of human well-being. While many groups claim that the issue is just an exaggerated science-based concern, there are other groups who actively suggest that it is a nonissue, merely one which is political in nature. In just a couple of years back, we have already been witnessing never-before signs of undesirable climate change on agriculture fast becoming a reality, coupled with their adverse economic outcomes. What is the range of possibilities to mitigate the negative impacts of climate change? Can plant breeding offer any plausible strategies to help crops and commodities adapt to or even take advantage of climate change in a long term? In Malaysia, plant breeding efforts have contributed immensely to the development of superior varieties and clones to uplift our major crops and commodities particularly rice, rubber and oil palm. For these priority crops, plant breeders have made significant genetic gains from the well-organised and resourceful breeding programmes, as well as assembled considerable germplasm across the world to broaden their genetic base. However, for many important crops, breeding research to improve them are still inadequate and poorly balanced in terms of priority. In fact, there is still a large number of crops which are either still grappling with meagre plant breeding or virtually not touched by plant breeding. With rapid and gradually imminent temperature rise to aggravate climate change, plant breeding will inevitably be burdened with far more breeding objectives than it has been designed to meet heretofore. Therefore, we need to look imperatively at the considerable significance of plant genetic resources and plant breeding to move agriculture further, and to subdue the negative climate change.

Keynotes: Plant genetic resources, climate change, threats, needs, adaptation, plant breeding.

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Sensing the environment: A close look into insects smell and bioacoustic

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Abstract

Insects use smell and sound for sensing the environment to survive, adapt and reproduce. The ability of insects to sense the volatile odor is facilitated by varieties of antennal sensilla. Our studies in social bees, *Apis andreniformis* and *A. cerana*, showed that in each caste of honey bees there are several specific types of sensilla. As the survival tool, smell protects the bees from predators. Here, we documented a rapid attack of honey bee *A. cerana* to the venom substance isopenthyll alcohol (IPA) that dropped in a black cotton ball, mimicking of a predator. The honey bees rapidly construct a "balling behaviour". In nature this behavior is able to kill the predator since the heat produced by honey bees can reach up to 44° C. The honey bee smell behaviour was significantly influenced by the distance of the volatile substance source but not by the bee venom concentration. Smell is also important for insect mating behaviour especially for the nocturnal insects. The male rice stem borer, *Scirpophaga incertulas*, use the antennal sensilla to detect the pheromone released by the female moth. A molecular study of the pheromone binding protein of this important rice pest will be presented. Another mode of communication of insects is through sound, known as bioacoustic. We identified specific cicada and cricket species by aligning their bioacoustic data with the world insect bioacoustic database.

Keywords: Antennal sensilla, *Apis andreniformis*, honey bee balling behaviour, pheromone binding protein, insects bioacoustics.

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Impacts of climate change on coastal communities in Peninsular Malaysia

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Abstract

Climate change is changing of weather patterns related to the rise in average surface temperatures over years. It is mainly due natural and anthropogenic events, with emissions excessive amount of CO₂ and other greenhouse gases from fossil fuel combustions and other sources is the main contributor. With various known and unknown effects of this dreadful event, it will affect coastal biodiversity and ecology. In Malaysia, coastal ecosystem plays important role as feeding ground for local and migratory shorebird species, and habitat for various important bioresources. As physical effects of climate change are becoming more stringent, chemical and biological components exist in the area will be eventually altered. For instance, the tropical mangrove, corals and seagrass areas will be diminished. Stability of foodweb of the area could also be disrupted, especially those that are position at lower trophic levels, which relatively more susceptible to changes in the environment. Sediment bound pollutants could be released or bioavailable for bioaccumulation into organisms as physical properties of the environment changed. Scarcity of food items will be major concern in view of biodiversity and conservation, as well as human consumption. There is an urgent need for inter-governmental and international communities to work together collectively to mitigate the ecological effects of climate change.

Keywords: Climate change, coastal ecology, alteration, bioresources, scarcity.

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Abstracts Domain Biodiversity and Conservation of Natural Resources

Isolation, molecular identification and biodegradation capacities of indigenous hydrocarbon-degrading bacteria from tarball at Terengganu Beach, Malaysia

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Abstract

In this study, we isolated four indigenous hydrocarbon-degrading bacteria from tarball found in Rhu Sepuluh beach, Terengganu, Malaysia. These bacteria were identified based on their physiological characteristic and 16S rRNA gene sequence analysis, and they showed 99% similarity with *Pseudomonas stutzeri* strain A1501, *Pseudomonas balearica* strain SP1402, *Cellulosimicrobium cellulans* DSM 43879 and *Acinetobacter baumannii* ATCC 19606 respectively. Their hydrocarbon-degrading capabilities were tested using diesel-oil as sole carbon source. Results analysed using GC-MS, showed diesel-oil alkanes were degraded an average 30.5%, 16.4%, 64.4% and 58.1% with medium optical density reaching 1.172, 1.503, 0.967 and 1.515 by *Pseudomonas stutzeri*, *Pseudomonas balearica*, *Cellulosimicrobium cellulans* and *Acinetobacter baumannii* respectively in minimal salt media at 32°C for 10 days. Individual diesel-oil alkanes were degraded between 19.7% - 49.2% (*P. stutzeri*), 2.5% to 27.5% (*P. balearica*), 10% - 95.4% (*C. cellulans*) and 0.2% - 95.9% (*A. baumannii*). All strains utilized diesel-oil for growth. The study suggests all strains are part of indigenous hydrocarbon-degrading bacteria in tarball with potential for bioremediation of oil-polluted marine environment.

Keywords: Bacteria, biodegradation, bioremediation, diesel, hydrocarbones, tarballs.

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Topical application of *Acacia nilotica* pods' water extract enhances wound healing in Sprague-Dawley rats by alleviating oxidative stress and suppressing pro-inflammatory cytokines

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Abstract

This study was conducted to validate the folkloric use of *Acacia nilotica* pods as wound healing agent. Full thickness excision wounds of 6mm diameter were created on Sprague-Dawley rats. Prior to the wound healing assessment, the antioxidant activity of the extract was determined *in vitro* using 2,2'-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging activity. Six groups of 6 wounded rats were formed. In each group, the wounds were topically treated with either petroleum jelly (vehicle control), silver sulfadiazine (positive control), 0.5%, 1% or 2% *Acacia nilotica* cream (treatment groups) prepared by mixing appropriate quantity of *A. nilotica* pods' aqueous extract with petroleum jelly. The negative control group received no treatment. The wound healing parameters assessed include wound contraction rate, level of pro-inflammatory cytokines Interleukin1 β (IL-1 β) and Tumor Necrosis Factor- α (TNF- α) and histopathological analysis of the wound area. Wounds were assessed on 7th and 14th post wounding days. The extract showed a good, dose dependent DPPH-radical scavenging activity comparable to trolox. Topical application of *A. nilotica* cream significantly ($P < 0.05$) enhances wound contraction rate compared to the control groups in both 7th and 14th days of evaluation. The extract also significantly suppressed the expression of both IL-1 β and TNF- α in dose dependent manner throughout the study period. The histological analysis revealed that the extract treatment enhanced cellular proliferation as evident by the increased capillary vessels, re-epithelization and dermal tissues regeneration. Overall study suggest that *A. nilotica* pods' water extract promotes wound healing in Sprague-Dawley rats by ameliorating oxidative stress and suppression of pro-inflammatory cytokines. This study validates the folkloric use of *A. nilotica* pods for postpartum wound healing for the first time. Further studies aimed at identifying and isolating active principles from this plant is recommended.

Keywords: *Acacia nilotica*, wound healing, oxidative stress, pro-inflammatory cytokines.

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**The differences between *Paphiopedilum barbatum* (Lindl.) and *Paphiopedilum callosum* (Rchb.f.)
Stein var. *sublaeve* (Rchb.f.) P.J. Cribb**

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Abstract

The genus *Paphiopedilum* is a flagship species among orchids and comprises of some of the most sought after orchids for its beauty and rarity. Thus, all *Paphiopedilum* are placed in CITES Appendix I. Among orchids, *Paphiopedilum* has the most revised literature. In spite of this, misidentifications tend to occur even in publications. This is mainly due to the close resemblance that some species have with each other. Identification is important for the accurate knowledge on the distribution of the species done through biodiversity inventories as this can result in the decision making of environmental policies and conservation strategies. In the case of *P. barbatum* and *P. callosum* var. *sublaeve*, methods used for the correct species identification include morphological study, distribution and DNA barcoding. The morphology presents many similarities between both species but with some differences in the petal angle, staminode shape and the presence of ciliated hair on the petal margins. Distributions of both species in Peninsular Malaysia do not overlap. DNA barcoding using the molecular markers; *rbcL*, *matK* and *ITS*, were used to differentiate both species. Analysis of sequences generated shows *ITS* and *matK* forming two separate clades for each species in Neighbour-Joining trees. The *rbcL* sequences provided poor species resolution as evidenced from the formation of multiple clades for both species. Presence of barcoding gap and BLAST results were used to confirm the two species. DNA barcoding is an effective taxonomic tool and accuracy is increased when morphology and distribution data are included.

Keywords: Distribution, DNA barcoding, identification, morphology, *Paphiopedilum*.

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**Current status of algae biodiversity and succession in North Lake
of Hutan Simpan Ayer Hitam, Puchong**

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Abstract

This study presents data on the diversity and succession of algae in North Lake, Hutan Simpan Air Hitam (HSAH) as well as its relationship with chemical and physical factors. Algae samples were collected weekly from three different sites in North Lake started from October 2015 until January 2016 (15 weeks). Physico-chemical parameters such as pH, temperature, light, dissolved oxygen (DO), total dissolved solid (TDS) and nutrients statuses were measured simultaneously. A total of 18 species were recorded comprising Bacillariophyta (3 species), Charophyta (4 species), Chlorophyta (4 species), Cyanobacteria (2 species), Dinophyta (4 species), and Ochrophyta (1 species). The highest total density of algal cells were phyla Dinophyta (24%) followed by Charophyta (22%), Bacillariophyta (19%), Ochrophyta (18%), Cyanophyta (10%) and Chlorophyta (7%). *Dinobryon sertularia* was the most frequent species found throughout the 15 weeks of sampling and became dominant in week 3, 4, 6, 10 and 13; whereas *Staurostrum* sp. achieved the highest algal counts in week 1 and 2. *Gonyaulax apiculata* was dominant during week 5, 8, 14 and 15. The Shannon-Weaver diversity Index, H' classified North Lake as being moderately polluted, whereas the pH values indicates that the lake was quite acidic by having pH lower than 7 and ranged between 4.28 and 5.57. The occurrence of some phytoplankton groups may be influenced by pH, as has been found in acidic natural lakes and also in extremely acidic lakes around the world. In addition, other physico-chemical factors may also give impact on algae structure and community.

Keywords: Acidic lake, Hutan Simpan Ayer Hitam, algae, biodiversity, succession.

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**Physico-chemical parameters and trophic status of an acidic lake
in Hutan Simpan Ayer Hitam, Puchong**

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Abstract

Relationship between physico-chemical parameters including pH, Temperature, total dissolved solid, dissolved oxygen, light intensity, ammonia, nitrate, silica, and phosphate with microalgae diversity were studied. Water sampling was conducted biweekly for 4 months from October 2015 to February 2016 for 15 weeks in North Lake of Hutan Simpan Ayer Hitam Puchong. Physico-chemical parameters were determined at site and laboratory. Data analysis including Pearson Correlation Analysis, Principal Component Analysis, and Canonical Correspondence Analysis were carried out. Green algae, *Staurastrum* sp. and *Chlamydomonas* have a positive correlation with pH and total dissolved solid. *Cosmarium* spp. have a positive correlation with dissolved oxygen and have association with increased pH and ammonia. Diatom, *Navicula* sp. have high negative correlation with pH and have association with increased silica. Dinoflagellates, *Gymnodinium* sp. and *Gonyaulax apiculata* both have high negative correlation with pH. *Gymnodinium* sp. have association with increased phosphate and temperature. *Gonyaulax apiculata* have a positive correlation with temperature. Based on research, this lake were slightly acidic but remains oligotrophic North Lake of Hutan Simpan Ayer Hitam Puchong are acidic but oligotrophic due to pH in range of acidic condition but below the boundary of phosphate concentration from 0.01mg/L to 0.075mg/L suggested by USEPA (2002) in aquatic systems.

Keywords: Acidic lake, Hutan Simpan Ayer Hitam, physico-chemical, trophic status, CCA.

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**Evaluation of potential bacteria isolated from marine shellfish as probiotic for
Penaeus monodon larviculture against pathogenic *Vibrio harveyi***

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Abstract

Probiotics have been widely used as an alternative treatment in aquaculture. This study was carried out to determine the ability of two potential probionts; *Bacillus* strain I24 and *Exiguobacterium* strain S66 in producing biofilm and reducing hemolysin production in two *Vibrio* sp; *Vibrio alginolyticus* and *Vibrio harveyi*. Biofilm assay was carried out to determine the ability of the potential probionts in producing biofilm; a slimy compound that facilitates bacterial attachment. Results showed that all potential probionts able to produce biofilm. Potential probionts started to produce high biofilm formation at 40 hr. For probiont S66, the highest production was recorded at 60 hr, and started to decrease at 70 hr. Meanwhile for potential probiont I24, increased of biofilm formation started at 30 hr until 70 hr. Furthermore, *V. harveyi* and *V. alginolyticus* had lower biofilm formation compared with the potential probionts. Thus, results indicated that potential probionts S66 and I24 possibly able to compete with pathogen for adhesion sites hence colonize the host. Hemolysin assay was carried out to determine the ability of potential probionts in reducing hemolysin production that caused hemolysis, which was one of the virulence factor in *Vibrio* sp.. Incubation of potential probionts and pathogen showed no reduction in hemolysin production.

Keywords: Biofilm, hemolysin, probiont S66, probiont I24, *Vibrio* sp.

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The application of garlic (*Allium sativum*) peel on African catfish (*Clarias gariepinus*) against *Aeromonas hydrophila* infection

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Abstract

This study aim to investigate the efficacy of dietary doses of garlic (*Allium sativum*) peel on disease resistance and the duration of protection of African catfish (*Clarias gariepinus*) juveniles against *Aeromonas hydrophila* infection. African catfish juveniles were fed twice daily for 4 weeks with 20 gkg⁻¹ of garlic peels incorporated into fish formulated diet. Meanwhile 0 g of peels was served as control. After 4 weeks of post feeding, 15 fish were randomly selected for challenge with 10⁸ cell/mL of *A. hydrophila*. During the challenge the fish were not fed with dietary of garlic. The duration of protection was observed at 7, 14 and 21 days following infection. The results demonstrated that dietary garlic peels provided protection toward African catfish against *A. hydrophila* after 14 days post feeding and slightly reduced protection after 21 days of post feeding. Significantly higher survival rate were recorded in dietary garlic peels (66%, 86% and 42%) when compared with the control. The result indicated that garlic peels able to enhance disease resistant of African catfish towards *A. hydrophila* infection.

Keywords: African catfish, garlic peels, *Aeromonas hydrophila*, survival, duration protection.

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A taxonomic review of Yellow *Spathoglottis* (Orchidaceae) Complex in Malaysia

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Abstract

Spathoglottis Blume is a well-known genus with a total of 44 species and widely distributed from Tropical Asia to Subtropical Asia and Pacific Islands; concentrated particularly in the Malesian region. Eight species were recorded from Malaysia and despite of a widely grown genus; *Spathoglottis* is a taxonomically confused genus in Orchidaceae. Confusion on several species within the Yellow *Spathoglottis* Complex was resolved using both morphological and molecular evidences.

Keywords: Orchidaceae, *Spathoglottis*.

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The conceptual design of decision support system to preserve *Neolissochilus hexagonolepis* (McClelland, 1839) in Pelus River, Perak

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Abstract

Over the past three decades, Malaysia extensively exploits the natural water resources to satisfy increasing demands of human and industrial development in line with the rapid urbanization. This exploitation contribute to the degrading of water storage and decreasing in water quality which consequently, fluctuates the habitat's quantity and quality of the river ecosystem. The biological functions of the fish population are highly dependent upon the characteristics of their aquatic habitat. Thus, any alteration to the river ecosystem will put the integrity at risk. To determine the condition and action for fish habitat is time consuming. Therefore, advanced technology tools such as Decision Support System (DSS) is needed in making decision process. This system was developed to support the user by applying easy-to-use concept and comprehensive one for preserve the target species that focus on habitat condition, includes physical and chemical factors. The concept applied in DSS for this study is based on IF-THEN rules concept. The *Neolissochilus hexagonolepis* (McClelland, 1839) in Pelus River, Perak fulfil all must-have criteria as a target species. The objective of this paper is focusing on brief description of aims and concepts in developing Decision Support System in order to preserve the target species, *N. hexagonolepis* in Pelus River, Perak.

Keywords: Decision Support System, IF-THEN rules, *Neolissochilus hexagonolepis*, habitat.

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Arthropod diversity during vegetative growth phase of rice field at Kedah, Malaysia

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Abstract

Other than being wetland ecosystems that occupy the largest area of the agricultural land in Malaysia, rice field is also a home to numerous organisms. This study attempts to investigate the arthropod diversity during the vegetative growth phase of rice field at Kedah. Six sampling points has been chosen spreading across Kedah districts which are, Kubang Pasu, Kota Star, Padang Terap, Pendang, Sik, and Bandar Baharu. Sweeping net, yellow pan and light traps are the methods used for insect trapping. Arthropod diversity was calculated using Shanon-Wiener Diversity Index. The outcome of the study shows that, Kubang Pasu has the highest diversity index value with 3.218 and Pendang has the lowest diversity index value. A total of 2434 insect specimen had been collected consisting of 9 orders and 66 species. Among the 66 species collected, 23 species has been identified as a rice pest.

Keywords: Diversity, arthropods, rice fields, ecosystems, vegetative growth phase.

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Conservation of river terrapin (*Batagur affinis*) in Malaysia: Status and challenges

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Abstract

With the steady declining of nesting river terrapin reported annually in Malaysia, it is just a matter of time before this species listed extinct in IUCN Red List of Endangered Animal. This paper attempts to develop an overview on the current status, conservation effort, and challenges in conservation of river terrapin (*Batagur affinis*) in Malaysia. Lack of knowledge and lack of enforcement of law and regulation is the two main factors contribute to the failure of conservation of wildlife in Malaysia. Overview on the existing conservation programme at Perak and Kedah show that the programme are not sustain and number of terrapin successfully being breed annually is decreasing. It was relevant to enhance proper approach in the management from wildlife conservation perspective. Despite the high potential and opportunities and successfulness at Terengganu in conserving river terrapin, we should try to replicate the programme in Terengganu to Perak and Kedah as well. The government should committed to significantly improve the facilities in Perak and Kedah to promote and enhance the programme. With issues and challenges in river terrapin conservation that were highlighted in this context especially from the, aspects of knowledge and awareness, availability and other loopholes within policies and, related wildlife conservation such as turtle within the country, the question on whether the goals in increasing the wild population of river terrapin remains unsure of but there is a possibility for a successful implementation of sustainable conservation programme.

Keywords: River terrapin, wildlife conservation, habitat loss, enforcement, awareness.

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Diversity of *Trichoderma* species isolated from soil

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Abstract

Soils consist of complex mixtures of mineral, water, air, organic matter and as an ecosystem of a large number of countless microorganisms such as bacteria, fungi and nematodes. Due to the limitation on understanding of fungi biodiversity in soil, many people do not know there consists of very useful microbe that can help in suppression of plant pathogens. *Trichoderma* (Hypocreales, Ascomycota) is one of the microorganisms that living in all types of soil. *Trichoderma* species has been used as a biological control agent of phytopathogens due to its abundance and having an antagonistic property. This study will provide checklists of *Trichoderma* species that have been isolated from cultivated crop soils in Malaysia. The objectives of this study are to isolate and identify *Trichoderma* species from soil based on morphological characterization and to calculate diversity of *Trichoderma* species based on Shannon-Wiener Index. Soil samples from each cultivated agricultural crops were collected in three spots in 17 locations around Malaysia. Isolation of *Trichoderma* was completed using soil dilution technique to obtain a pure single colony-forming unit (CFU). A total of 253 of *Trichoderma* isolates were successfully isolated from rhizosphere of different crops. All isolates were tentatively identified into six species such as *T. harzianum* (114 isolates), *T. asperellum* (65 isolates), *T. hamatum* (22 isolates), *T. viride* (26 isolates), *T. koningii* (20 isolates) and *T. virens* (6 isolates). The differences between species were characterized based on their colony features, pigmentation on potato dextrose agar (PDA) and the branching of conidiophores. The diversity index of *Trichoderma* species found in the Malaysia soil was 1.43 and *T. harzianum* was dominated. Due to diverse species of *Trichoderma* found in Malaysia, it will increase the opportunity in selection for biological control agent of plant diseases.

Keywords: *Trichoderma* species, soil fungi, biological control, diversity.

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Malaysian *Vanilla*: Species diversity, threats and conservation action plan

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Abstract

The diversity in *Vanilla* genus from Malaysia was updated after the checklist by Soto Arenas and Cribb (2010) with the discovery of two undescribed species and few new records which made up the genus to be most likely represented by nine species. In general, wild vanilla populations were difficult to locate and distributed in many habitats. The taxa localized in Peninsular and Borneo showed different physiological behaviour but experiencing similar depleting factors in their natural habitats. The Checklist of CITES Appendices rated *Vanilla* spp. under Appendix II which are not necessarily now threatened with extinction but their trade must be closely controlled and monitored. Malaysian *Vanilla* were observed to be vulnerable to several threats including poor taxonomic information and revision, forest fragmentation, natural disaster and natural leaves abscission phenomenon. A conservatory action plan was proposed to protect the genus from depletion as they served as important secondary gene pool in the crop improvement program of *V. planifolia* which produce one of the world precious flavouring agent, vanillin.

Keywords: *Vanilla*, diversity, conservation.

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Recycling and waste separation: Where does one go from here?

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Abstract

In tandem with 'go green' initiatives being implemented in many countries, there is a great tendency to focus on recycling of materials. In Malaysia, recycling practices are underway in many states and organizations whereby waste separation is seen as a part and parcel of these efforts. In line with the recycling drive this study aims to examine the i) methods employed in the waste segregation process in a private university the Klang Valley and ii) the awareness of waste management among tertiary students at the particular academic institution. Parson's equilibrium theory will be applied in this investigation to determine if the efforts taken will achieve the long term goals of gross waste reduction. This research attempts to bring forth via the qualitative approach the perspectives of 30 undergraduate students who will be interviewed through a set of questions regarding the recycling initiative undertaken by the university. The interviews will be audio recorded with the interviewees' consent and later transcribed and peer checked by the authors to minimize bias if there be any. The results will then be presented.

Keywords: Recycling, waste management, waste segregation.

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Environmental factors that affect the degradation rate of Termiticides in Malaysia sandy loam soil

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Abstract

The soil termiticides treatment is to control termite population and protect structures from termite invasion. It will create a continuous barrier surrounding the structure that impacts the termite population. However, termiticides may degrade and the degradation rate depends on environmental factors such as moisture, temperature and soil pH. The estimation of degradation on various commercial termiticides under field conditions will provide the information of degradation rate of termiticide in soil. Three different termiticides, fipronil, bifenthrin and imidacloprid were used to study the estimation of degradation (half-life). The degradation rate of insecticides from soil treatments was analyzed using Ultra Performance Liquid Chromatography (UPLC). All the termiticide tested show high rate of degradation, fipronil is the most persistent termiticide as 1.4% of the residual content present in 20th month and consistent over two years of treatment compared to the other two termiticides. Imidacloprid showed the largest degradation percentage at 98% during the first month and degraded after one year of treatment.

Keywords: Termiticides, degradation, half-life, termite.

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Frog biodiversity in Ayer Hitam Forest Reserve, Puchong, Selangor

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Abstract

A research inventory of frogs in Ayer Hitam Forest Reserve (AHFR), Puchong, Selangor was carried out from November 2015 until January 2016. Nine nocturnal transect lines (300 m) were used in this inventory of frogs at three difference study areas which were walking trails, streams and swampy areas. The results showed that 24 species of frogs (45 individuals) from six families (Bufonidae, Dicroglossidae, Megophryidae, Microhylidae, Ranidae and Rhacophoridae) inhabit the Compartment 15, AHFR. The highest numbers of frogs captured were recorded at walking trails and swampy areas while the lowest numbers of frogs captured were recorded at streams. The most abundant species of frog recorded were *Hylarana raniceps* (White-lipped Frog) and *Polypedates leucomystax* (Four-lined Tree Frog) that are 9%, respectively. From the checklist of 33 frog species recorded, there is one species with endemic distribution to Malaysia and with 'Endangered' conservation status by International Union for Conservation of Nature and Natural Resources (IUCN 2016) were found in AHFR namely *Kalophrynus palmatissimus*. Four species recorded are classified under IUCN's 'Near Threatened' category namely *Limnonectes blythii*, *Limnonectes ibanorum*, *Limnonectes malesianus* and *Limnonectes paramacrodon* and two species is under 'Data Deficient' category namely *Limnonectes doriae* and *Rhacophorus robinsonii*.

Keywords: Frogs, Ayer Hitam Forest Reserve, Puchong, biodiversity, transect line.

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Carnosic acid and its derivatives from *Origanum* species

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Abstract

This study is to present the oregano or in scientific name is known as *Origanum* species. The historical uses of *Origanum* include as herbal remedy for skin burns, bruises, cuts, asthma, colds, coughs, flu and sore throat due to the minty properties of the plant, in addition to be used as food flavoring. The medicinal properties of *Origanum* were reported as having high antioxidant and antimicrobial characteristics due to the presence of the phenolics in the plants. From the literature review, the pharmacological attributes of *Origanum* and some phytochemical compositions such as the phenolic acid (rosmarinic acid), phenolic diterpenes (carnosol and carnosic acid) and flavonoids were mentioned. The essential oils from *Origanum* species are widely studied however; little information is available regarding nonvolatile compounds such as the phenolics. Thus, more information is required regarding the phenolics in *Origanum* extracts. Therefore, the research objectives include the extraction of phenolics by using methanol and the screening of these compounds via Thin Layer Chromatography (TLC). The phenolics were detected on TLC when visualized using FeCl₃. ¹H-NMR spectrum of *Origanum* extract presented the derivative of carnosic acid. Finally, it is concluded that *Origanum* samples in this study, exhibited the presence of phytochemicals, which would contribute to the antioxidant and antimicrobial activities.

Keywords: Carnosol, herb, natural, oregano, phytochemistry.

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**Breeding habitats of mosquito larvae in a paddy growing area in
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Abstract

Surveillance of mosquito larvae was performed in a paddy growing area in Kuala Pilah, Negeri Sembilan, Malaysia to uncover different types of breeding receptacles for mosquito larvae and species composition that bred in those positive receptacles. Fifty (50) natural and artificial receptacles were positive with mosquito breeding. About 96.00% of these positive receptacles were found outdoor. All positive indoor and most positive outdoor receptacles were conquered by *Aedes albopictus* Skuse while the rest were occupied by *Culex quinquefasciatus* Say. Population dynamics of *A. albopictus* in the study site should be constantly monitored and controlled to avoid the dispersal of mosquito-borne diseases such as dengue and chikungunya among local residents.

Keywords: Mosquitoes, breeding habitats, paddy growing area, Malaysia.

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**Morphological characteristics of stingless bee, *Trigona* sp. (Hymenoptera: Apidae)
from West Java, Indonesia**

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Abstract

Stingless bees (Meliponini: Apidae) are eusocial insect with a highly organized system. Stingless bees are characterized by complex communication, permanent colonies, and has division of caste (queen, males, and workers). *Trigona* belong to stingless bees. In this research, we described morphological characteristics of "teuweul omas" (*Trigona* sp.) collected from Ciomas, Serang, Banten Province. Identification of specimen based on morphological characters and morphometric study, such as body length, characteristics of the head, thorax, wings, and legs. Morphological characteristics of worker "teuweul omas" are 4.445 ± 0.072 mm body length, 1.911 ± 0.019 mm head width, mesoscutum with distinct hair bands (well banded) separated by glabrous interspaces area, with plumose frontal hairs, and black metasoma, legs, and hairs on the frontal. Based on morphological characteristics of the body, "teuweul omas" was grouped in the genus *Trigona*, subgenus *Tetragonula*, and *iridipennis* group.

Keywords: Morphological character, morphometric, stingless bee, *Tetragonula*.

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**The use of medicinal plants species by the Temuan Tribe of National Botanical Garden
Shah Alam, Malaysia**

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Abstract

Results on the use of medicinal plants in the forest reserve at National Botanical Garden Shah Alam, Malaysia are presented. Although this forest is surrounded by activities of rapid sosio-economic development, is still serves as a resource for indigenous people to find alternative medicinal plant for treating diseases beside readily modern medicine. A total of 66 plant species were recognized with 15 uses recorded. The collection includes herbaceous plants, trees, shrubs, lianas and epiphytes. They were grouped into 12 methods of application namely as a drink, food, drop, cooking material, shampoo, bath, rub, massage, poultice, bandage, smoke and boil. Some plants can be multipurpose, used to treat more than one disease, and the plant part most frequently used is root.

Keywords: Medicinal plants, species composition, Temuan Tribe, uses.

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Antibacterial activity of garlic extracts on fish pathogenic bacteria

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Abstract

Aqueous and methanol extracts of *Allium sativum* (clove and peel) were investigated for its *in vitro* antibacterial properties against four marine pathogens, *Aeromonas hydrophila*, *Vibrio anguillarum*, *Vibrio alginolyticus*, and *Vibrio harveyi*. Antibacterial activity of different concentrations of aqueous and methanol garlic extracts were evaluated based on the inhibition zone using disc-diffusion method, minimal inhibitory concentration (MIC) and minimal bactericidal concentration (MBC) values. The aqueous extract of *A. sativum* (clove and peel) had no antibacterial effect against the pathogenic bacteria tested whereas the clove extract of methanol had inhibitory effects on the growth of all pathogenic bacteria tested. The maximum zone of inhibition was observed in *A. hydrophila* and the minimum was observed in *V. anguillarum* and *V. harveyi*. The MIC and MBC values revealed that *A. hydrophila* was able to be inhibited by supernatant extract of clove at lower concentration (0.6 mg/ml) while other pathogens are inhibited at slightly higher concentration. This study suggests that clove extract of *A. sativum* has the potential to be used as phytobiotics in controlling the growth of marine pathogens.

Keywords: Garlic extract, marine pathogens, antibacterial activity.

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Molecular characterization of three *Vibrio* species and study its pathogenic potential in a gnotobiotic *Artemia* model

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Abstract

Vibriosis remains the main problem in aquaculture industry caused by bacteria from the genus *Vibrio*. This study was developed to identify and differentiate between the three *Vibrio* species which are *Vibrio harveyi*, *V. alginolyticus* and *V. parahaemolyticus* by PCR-outer membrane protein (ompW) gene. Three specific bands with size of 643 bp were produced and sequence analysis of three *Vibrios* used in this study showed high similarities of *V. harveyi*, *V. alginolyticus* and *V. parahaemolyticus* with published sequences, respectively. Thus, ompW gene can be used as phylomarker in differentiating *Vibrio* isolates. The effect of pathogenicity of local *Vibrios* strains with different concentrations on host-microbe interaction has been studied in the gnotobiotic *Artemia*. After challenged, investigation revealed that maximum mortality of *Artemia* was observed at the concentration of 10⁷ CFU/mL with *V. parahaemolyticus* have a highest mortality rate.

Keywords: *Vibrio* species, ompW, gnotobiotic *Artemia*.

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Enhance desilication and delignification in paddy straw via chemical and physical pretreatment

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Abstract

Paddy straw is one of the most common agricultural wastes and renewable resources available in Malaysia containing lignocellulosic values. Large parts of these plant materials are made up of complex carbohydrates such as cellulose and hemicelluloses which can be converted to fermentable sugars. In fermentation process of sugars, ethanol can be produce as by-product with the help of aerobic microorganism. However, the presence of high ash and silica content in paddy straw makes it an inferior feedstock for ethanol production. The objective of this study is set to determine the best physical and chemical pretreatment for desilication of paddy straw and encouraged delignification process. The pretreatment comprises the combination of physical and chemical treatments to maximize the process of desilication and delignification in the paddy straw. Physical treatment begins with paddy straws cut and grind to three different sizes which were 2 mm, 5 mm and 8 mm. All different sizes of paddy straw was (i) autoclave, (ii) boiled and (iii) soaked in four different concentrations (0.5%, 1%, 2% and 5%) of nitric acid and sodium hydroxide, respectively for chemical treatment. With the comparison on dry matter basis to untreated paddy straw, 5mm paddy straw pretreated with 0.5% nitric acid showed the highest cellulose content (96.6%). Through this combination, the cellulose fragment was improved by 54% but the lignin and hemicellulose were reduce to 38% and 54%, compared to untreated paddy straw, respectively. The percentage of ash content in acid treatment have total increment of 56% compared to untreated samples content while the percentage of ash content for alkali treatment have total loss of 55% and reduced compared to untreated samples. Therefore, 0.5% nitric acid was found to be the most suitable condition to break the cellulose-lignin complex.

Keywords: Cellulose, hemicellulose, pretreatment, desilication, delignification.

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Characterization of secondary metabolites from hexane and chloroform crude of four *Trametes* spp. isolated from Sarawak using analysis of GS-MS

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Abstract

The secondary metabolite from hexane and chloroform crude extract of fruiting body and culture mycelia of *Trametes cervina*, *T. ljubarski*, *T. velutina* and *T. orientalis* were investigated and characterized using gas chromatography-mass spectrometry (GC-MS). Forty peaks of compounds from a series of volatile hydrocarbons and hydrocarbon derivatives were detected on the GC-MS chromatogram of each isolates and about 30 compounds were identified based on the library database. In the hexane crude, 17 compounds were identified for *T. cervina*, 14 compounds for *T. ljubarski*, 13 compounds for *T. velutina* and 21 compounds for *T. orientalis*, while in the chloroform crude extract 12 compounds were identified for *T. cervina*, 17 compounds for *T. ljubarski*, 15 compounds from *T. velutina* and 12 compounds for *T. orientalis*. The most common compound detected in the extract of the *Trametes* spp. were cyclohexane, heptane, octane, nonane, decane, undecane, 1-Butenyl methyl ketone, 1-Ethyl-4-methylcyclohexane, 2-Hexyl-1-octanol, 3-Hydroxy-3-methylvaleric acid, 2-Chlorocyclohexanol, n-Nonadecanol, tetratetracontane, hexatriacontane, tetrapentacontane and hexatriacontane respectively based on the library database. Tetrapentacontane (TCC1) and hexatriacontane (TCC2) which represented 48.01% and 19.61% of the total area was the major compound in chloroform extract of *T. cervina*, whereas tetracontane (TLC1) which represented 34.48% of the total area and diethylene glycol dibenzoate (TVC1) represented 13.13% of the total area was the major compound in chloroform extract of *T. ljubarski* and *T. velutina* respectively. Among the identified compounds, hexatriacontane which identified from *T. cervina*, *T. ljubarski*, and *T. velutina* and hexadecanoic acid from *T. orientalis*, were previously reported to have antimicrobial activity. Thus the metabolite profiling of the *Trametes* spp. not only potential to be used for their identification but also allowed the exploration of potential biological active compound from the species.

Keywords: Secondary metabolites, hexane and chloroform crude, *Trametes* spp., Sarawak, GS-MS.

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***Macodes limii*, the jewel orchid of Sabah: Flower, capsule and seed growth development**

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Abstract

Macodes limii is an endemic terrestrial orchid in Sabah, fascinated by the orchid hobbyist, not because of the small white brownish flower but their main attraction lies on the extraordinary foliage by having sparkling golden-yellow nerves transversely distributed on blackish to purplish green background and pinkish red beneath of the leaves. This orchid is grouped under Jewel Orchids, a group for orchids based on their captivating veins and colour on leaf. Flowers of *Macodes limii* are artificially pollinated and subsequent capsule development is carefully observed. Artificial pollination of *Macodes limii* provides an opportunity to study flower morphology. Dark red capsule were harvested between 21 days to 28 days after the pollination prior to capsule dehiscence. The seeds of *Macodes limii* contain only single embryo and seed coat to protect the embryo. To investigate the effect of light treatment on seed germination, the pod was surface-sterilized prior to seed culture on ½ MS medium. After week 30, *in vitro* asymbiotic germination of seed was found higher in 24 h dark incubation (14.24%) followed by 16 h light (1.07%) and no seed germination was observed in 24 h light.

Keywords: Asymbiotic seed germination, Jewel orchid, *Macodes limii*, Sabah endemic orchid, orchid morphology, light treatment.

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Development of bovine somatic cell nuclear transfer technology in MARDI

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Abstract

Bovine cloning by somatic cell nuclear transfer (SCNT) is an advanced reproductive biotechnology with many potential applications in livestock production. However, low efficiency of SCNT in producing animal clones is one of the major constraints of this technology. Therefore, this study was conducted at Gamete Physiology Laboratory in MARDI to develop a nuclear transfer protocol with regards to activation and development of enucleated-reconstructed oocytes subsequent to SCNT as well as parthenogenetic development of non-enucleated oocytes. Adult skin fibroblast cells were chosen as the donor karyoplasts as the source of DNA because these cells were easy to obtain and easy to culture and propagate. The results of the present study showed that 36.4% of SCNT-reconstructed embryos using bovine ear skin fibroblast cells as donor karyoplasts cleaved to the two-cell stage compared to 23.5% oocytes which cleaved parthenogenetically in the absence of sperm and fertilization. Furthermore, the SCNT-embryos produced from the procedures developed in the study, developed to the 16-cell stage. In comparison, the parthenogenotes were arrested at the 8-cell stage. The pregnancy rates of eight recipient dams based on the transfer of cloned and in vivo-derived embryos were both 25%. However, only in vivo-derived embryo developed to term but the cloned embryos were aborted naturally at 5 months of gestation. In conclusion, the developed SCNT protocol using ear skin fibroblast cells could be used to produce cloned bovine embryos. Further studies are needed to perfect this technology for the production of viable cloned bovine embryos and offsprings.

Keywords: Somatic cell nuclear transfer (SCNT), fibroblast cells, oocyte activation, bovine.

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Variation of leaf stomatal types and anticlinal wall pattern of Malaysian Sapindaceae species

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Abstract

Sapindaceae is one of the main angiosperm plant families and includes 150 genera with ca. 2000 taxa that widespread in tropical and subtropical regions of the world. A study on the variation of stomata and anticlinal wall pattern was undertaken on 43 taxa belonging to 19 genera of Sapindaceae in Malaysia. Results showed that there were 4 types of stomata with 4 types of anticlinal wall pattern exist in Malaysian Sapindaceae taxa. Stomata types consist of tetracytic, paracytic, staurocytic and anomocytic. While for the anticlinal wall pattern varies from sinous, wavy, slightly curvy and straight pattern. Majority of species showed homostomatic and hipostomatic stomata, except for *Lepisanthes amoena*, *Mischocarpus sundaicus*, *Nephelium cuspidatum* var. *robustum*, *Nephelium cuspidatum* var. *eripetalum* and *Trigonachras acuta* which showed heterostomatic stomata feature. Stomatal index ranging between 2.5% – *Litchi chinensis* and the highest showed by *Dodonaea viscosa* with 25.98%. Combination of variation in stomata type, anticlinal wall pattern and stomatal index found in this study have taxonomic value especially in species identification for Malaysian Sapindaceae members.

Keywords: Anticlinal wall, leaf stomata, Malaysia, Sapindaceae.

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New records of pteridophytes in summit region of Gunung Ledang, Johor

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Abstract

Gunung Ledang or Mount Ophir is the highest peak of the southern Peninsular Malaysia and gazetted as Johor National Parks. Studies on pteridophytes flora and diversity in Gunung Ledang, Johor has been done several times but none was documented validly except from Ridley, 1901. The objective of this study is to study the diversity of pteridophytes and prepare preliminary checklist of pteridophytes in the summit region of Gunung Ledang. Several field works had been carried out in November 2015 to January 2016, and five plots (20 m x 20 m) that systematically developed at different locations based on the wind direction (north, south, east, and west and peak of the mountain). A total of 27 species under 16 families and 21 genera were identified and recorded. The largest family is Gleicheniaceae (four species), followed by Sellaginellaceae and Pteridaceae (three species). Majority of pteridophytes are terrestrial (85%) while the remaining 11% are epiphytes and 4% are lithophytes. Plot C (south) is the higher richness of pteridophytes with 11 species. Comparison with previous records revealed there are 16 species as new records of Gunung Ledang. One species found is *Taenitis dimorpha*, which is endemic to Peninsular Malaysia. As this study reveals a total of 16 new records and an edermic species, therefore it is essential for Taman Negara Gunung Ledang to systematically and comprehensively study its pteridophytes flora so that its true status could be identified.

Keywords: New records, pteridophytes, diversity, summit region, Gunung Ledang.

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**An assessment of aboveground carbon stocks under forest plantation
of *Acacia* (*Acacia mangium*), in Kolapis B, Sabah**

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Abstract

The establishment of forest plantation in Sabah aims to meet the increasing demand for timber as well as enhanced the production capacity of degraded areas. Forest plantation has the ability to sequester carbon in their biomass and reduce the rate of increase of atmospheric carbon dioxide. Therefore, the establishment of forest plantation also been acknowledge as a potential ways in mitigating global warming issues. A study was conducted at Kolapis B Research Station, Sandakan to assess the aboveground carbon storage under forest plantation of *Acacia* (*Acacia mangium*) at different ages (6 and 15 years). Stands were planted in year 1994 with planting spacing 3 m x 4 m. A total of 17 plots (12 m x 16 m) were randomly established in year 2015, all trees within the plot were measured. Additional secondary data of diameter (DBH) and height measurement for year 2000 (6-years) obtained from 48 plots (12 m x 12 m) were used in this study. Allometric equation developed by Brown (1989) was used to estimate the aboveground biomass (AGB) value. Result from this study showed the average aboveground carbon density under forest plantation for 6 and 21 years old *Acacia* stand was 15.2 t C/ha and 44.9 t C/ha respectively . The increment of carbon stocks in a span of 15 years up to 66%. Factors such as tree health, stand growth performance and stand mortality rate were the main contributing factors to the varying carbon density between plots.

Keywords: Aboveground carbon stocks, forest plantation, *Acacia mangium*, Kolapis B, Sabah.

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**Vegetative propagation of *Eucalyptus pellita* via stem cutting at Kolapis B Research Station,
Lungmanis Forest Reserve**

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Abstract

Vegetative propagation via stem cutting was used to produce planting material for commercial planting. Stem cuttings were collected from 8 different provenances from a total of 14 provenances of *Eucalyptus pellita* at Kolapis B Research Station. The number of cuttings made per provenance was between 4 and 7 cuttings, and roughly about 5 cm long each. The cuttings from each provenance will be divided into groups with different rooting media namely river sand and peat moss, and treated with hormones and another group will be left untreated. Data recorded were the occurrence of rooting, the number and length of roots. The temperature, relative humidity (RH) and the rainfall rate are also recorded.

Keywords: *Eucalyptus pellita*, vegetative propagation, stem cutting.

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Diet composition and feeding habits of *Acetes japonicus* (Decapoda: Sergestidae) in estuarine waters of Tanjung Dawai, Kedah, Malaysia

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Abstract

This study describes the diet composition and feeding habits of sergestid shrimps *Acetes japonicus*. The stomach contents of 330 specimens, captured from the Estuary of Tanjung Dawai, Kedah from June 2008 - May 2009 were analysed. Analysis on the percentage of numerical abundance (C_i) showed that plant matter (28.18%) and crustacean appendages (18.70%) as the two highest values amongst the eight categories of feeding items. In addition, percentage frequency of occurrence (F_{pi}) values of phytoplankton, zooplankton, algae, plant matter, appendages of crustacean, debris, unidentified items and sand-mud were 3.54%, 7.05%, 5.07%, 27.44%, 17.42%, 15.80%, 8.94% and 19.81% respectively. Based on the food composition found in the stomach, it could be concluded that *A. japonicus* is a bottom feeder omnivorous.

Keywords: *Acetes japonicas*, stomach contents, Malaysia.

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Some additional record of ferns in Sabah

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Abstract

Sabah was previously reported 743 species of ferns through Said (2005), and this Sabah's checklists were continues to grows with several findings by times. Some additional records of ferns from Sabah are presented in this paper. We reported six (6) new records of ferns for the flora of Sabah. Type information, distribution, voucher specimens and taxonomic notes are provided for each newly recorded species. Future studies will be pursued on the ferns of Sabah with the main objectives to provide and preparing a floristic account.

Keywords: Ferns diversity, new record, Sabah.

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Diversity of macrobenthos in the mangrove forest of Kuala Sibuti, Miri, Sarawak

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Abstract

The diversity of mangrove macrobenthos assemblages at mangrove forest of Kuala Sibuti, Miri, Sarawak was investigated for northeast monsoon and inter monsoon season. The aim of this study was to determine the diversity and composition of macrobenthos in the Kuala Sibuti mangrove forest. Sampling was carried out at 3 different locations during each monsoon. In macrobenthos assemblages, bivalves (49%) was the most diverse and abundant followed by gastropods (23%), polychaetes (17%) and crustaceans (10%). A total of 25 species of macrobenthos have been recorded during the study period. Studies found that sediment texture plays an important role in the ecology of benthic invertebrates. Polychaete was found be influenced by the percentage of soil texture, while temperature and pH have had little influence on the macrobenthos assemblages in this mangrove forest ecosystem.

Keywords: Mangrove, macrobenthos, Kuala Sibuti, Sarawak.

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Abstracts Domain Ecology

Copper removal using *Ochrobactrum* species isolated from contaminated wastewater

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Abstract

Bacterial metal removal has received considerable attention recently, due to the potential use of microorganisms for treatment of contaminated wastewater. Removal and recovery of heavy metal ions from polluted wastewaters has appeared to be the potential alternative method for conventional treatment of contaminated wastewater. The purpose of the present work was to study the removal capacity of toxic metal from contaminated wastewater by using *Ochrobactrum* sp. isolated from contaminated wastewater using different pH and temperature. Bacteria species have a high surface area to volume ratio, due to their small size and thus, they can offer a large contact interface that would interact with metals ion. The interactions between metal ions and functional groups on the cell wall of the biomass were observed using SEM and EDX analysis. The results indicated that bacterial isolate *Ochrobactrum* sp. is a suitable biosorbent for the removal of Cu(II) ion from metal polluted wastewater and might be applicable to the development of possibly cheap biosorbent for removing and recovering copper from effluents.

Keywords: Copper, *Ochrobactrum*, metal-polluted soils.

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Influence of climate change on malaria occurrence in North Central Nigeria

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Abstract

Malaria is a preventable, treatable and life threatening infectious disease transmitted by bites of female anopheles mosquitoes. The prevalence of malaria may not be due to human ecological factors alone but also to some extent climatic predictors which have been associated with the occurrence of vector borne diseases. The main objective of this study is to examine the complex relationship between meteorological variables and malaria occurrence in Nigeria. Data on reported and diagnosed malaria cases in Nigeria for the period between 1997 and 2014 were used in this study. Rainfall, temperature and relative humidity exhibited various levels of influence on reported cases as they were significance predictors. The results show more reported and diagnosed cases of malaria in the months of June, July and August which are the months of peak rainfall. Monthly correlation analysis indicated an inverse relationship between malaria occurrence and rainfall in dry season while the reverse is true for the rainy season. An increase in monthly temperature increases the number of malaria cases in the months of April to July while an inverse relation was observed in the remaining months of the year. Relative humidity displayed an inverse relationship at the commencement and ending of the rainy season. Negative binomial GLM revealed every unit increase in rainfall corresponds to a 1.001 (95% CI, 1.001-1.002) times increase in malaria risk while the relative risk of having malaria decreases by 4.7% for every extra unit increase in temperature; 0.9530 (95% CI, 0.922-0.986). Afforestation, reduction in emission of greenhouse gases, avoidance of bush burning are recommended as mitigation measures for reducing the influence of climate change on malaria occurrence.

Keywords: Link function, malaria, meteorological variables, negative binomial regression, Nigeria.

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Ecological disturbance and prevalence of dengue in Malaysia: Way out

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Abstract

The supposed habitat of dengue vectors (*Aedes aegypti* and *Aedes albopictus*) had been greatly altered due to the rapid pace of urbanization and globalization. These two species of mosquitoes have developed an incredible ability to adapt to their new ecological niche which is among human beings. Dengue virus has become the most communicable viral diseases in Malaysia because of afore mentioned adaptation. We propose to elaborate on how disturbance of ecology has led to the continual spread of dengue virus and how it can be curtailed based on some research. For any species of mosquitoes to complete its life cycle in terms of reproduction, two important elements are essential: vertebrate blood and water. The shortage of these two elements will lead to the shortage in reproduction and minimize the potential outbreak of dengue virus. New vector control tools include biological control: the use of crustaceans and guppy fish that feeds on mosquito larvae, use of genus *Toxorhynchites* which feed on other species of mosquitoes. Traditional methods used are enforcement of environmental control measures and appropriate management of waste disposals. Chemical and physical control such as fogging, space repellents and use of insecticide treated nets are all needed to minimize dengue vectors and as well prevent them from reaching the essential elements for reproduction thereby protecting the public from the virus.

Keywords: Dengue vectors, ecological disturbance, urbanization, control tools.

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Median lethal concentration (LC₅₀) and morphological effects of tributyltin chloride (TBTCI) on male and female *Artemia salina*

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Abstract

Elevation of tributyltin (TBT) compounds in marine environment could affect organisms at any life stages. The present study aimed to determine median lethal concentration (LC₅₀) and morphological effects of tributyltin chloride (TBTCI) on adult males and females of brine shrimp (*Artemia salina*). Individuals of adult males and females of *A. salina* were exposed to different concentrations of TBTCI. Morphological conditions of every *A. salina* individuals were observed under a microscope. Results showed the LC₅₀ of TBTCI toxicity in male *A. salina* was 146.99 ngL⁻¹ and for the female was 94.72 ngL⁻¹. The LC₅₀ of TBTCI was significantly different among different sexes. There was also a significant difference in some morphological characters of males and females exposed to different TBTCI concentrations. These morphological changes include their total length, head width, abdominal width, and tail width after the 24 h exposure to TBTCI. These results suggested that suspensions of the TBTCI were toxic to *Artemia*, most likely due to the formation of benign TBTCI aggregates in water. However, the mortality increased with extended exposure to 24 h. Highest mortality occurred at 200 ngL⁻¹ TBTCI; 43.33% for male and 90% for female (LC₅₀ < 150 ngL⁻¹) for both. Depended on these findings, the female was more sensitive for TBTCI toxicity test when compared to male. These effects were attributed to changes in morphological characteristics of the body *A. salina*.

Keywords: *Artemia salina*, antifouling biocides, bioassay, organotin, toxicity.

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Resistance capability of indigenous and non-indigenous bacteria species on 3,4-dichloroaniline

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Abstract

3,4-dichloroaniline (3,4-DCA) is commonly be used in the chemical industry and it is also a by-product of aniline-derived herbicides such as diuron, linuron and propanil. However, 3,4-DCA exhibits higher toxicity than its parent compound and persistent in soils, water and groundwater. The aim of study was to investigate three TBT-resistant bacteria which are *Klebsiella* sp., *Acinetobacter* sp., *Citrobacter* sp. to evaluate their resistancy towards 3,4-DCA. *Pseudomonas* sp. isolated from non-TBT-polluted area was used as a positive control. Respiratory inhibitory activity of 3,4-DCA on three bacteria strains were assessed by employing MTT-bioassay. Results showed, *Citrobacter* sp. is the most tolerable bacteria amongst three strains with the IC₅₀ value of 7.83 mg/L followed by *Acinetobacter* sp. (7.55 mg/L), *Klebsiella* sp. (7.09 mg/L) and *Pseudomonas* sp. (7.02 mg/L). Due to that, potential TBT-degrading bacteria, *Klebsiella* sp. is not preferable bacteria to degrade or utilize 3,4-DCA mainly because of the structure and resistancy bacteria itself. Thus, future studies are recommended in order to remediate this highly persistant compound in solving environmental problems associated contamination.

Keywords: Biocides, 3,4-dichloroaniline, LC₅₀, MTT bioassay, resistant bacteria.

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**Assessment of soil properties on *Nepenthes ampullaria* density in tropical lowland forest:
A case study in Imbak Canyon, Sabah, Malaysia**

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Abstract

Identifying the appropriate soil properties and plants association are important to the success of sustainable forest management projects. A study on the relationship between soil properties and *Nepenthes ampullaria* in primary lowland tropical forest was conducted in Imbak Canyon Conservation Area (ICCA), Sabah, Malaysia. Here we assessed the soils properties in relation to the density of *N. ampullaria* and its association with other plants. A total of 30 plots of 10 x 10 m were established and six soil samples per plot were analyzed for their pH value, soil moisture, soil organic matter and trace element. A survey on other plants associated with *N. ampullaria* was conducted within the sample plots. All plants associated with the *N. ampullaria* found in the mixed dipterocarp forest, primary forest where the soils was acidic and poor in nutrient content. Families of plant found associated with *N. ampullaria* were higher in Annonaceae, Dipterocarpaceae, Myrtaceae, Phyllanthaceae, Meliaceae and followed by other family in smaller quantity. These plants show well adaptation to the poor soils of their environment. We found the lowland primary rainforest in Imbak Canyon habitats provide a unique natural micro-habitat within the forests and the opportunity to better identify the role of soil ecosystem function in tropical soils.

Keywords: Soil properties, primary forest, lowland tropical forest, natural micro-habitat, soil ecosystem.

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Histological studies and immunohistochemistry for activated caspase-3 in Javanese medaka (*Oryzias javanicus*) exposed to different concentrations of zinc pyrithione (ZnPT)

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Abstract

The uses of organotin biocides have been completely banned utilized as active biocides in antifouling paints since the early 1960s. The effectiveness of Zinc pyrithione (ZnPT) against bacteria, fungi and algae make them as one of the organic biocides replacements for organotin compound in antifouling paints. ZnPT also widely used as active ingredients in anti-dandruff shampoos or as additive in cosmetics and dermatitis treatment. This study investigates the ecotoxicological effect of zinc pyrithione in a new model fish species known as Javanese medaka (*Oryzias javanicus*) under sublethal level and the effects of ZnPT exposure on the gonads via histological studies and evaluated quantification of apoptosis in tissue sections using antibodies that specifically recognize activated caspase-3. Zinc pyrithione caused non-specific and reversible tissue alterations in liver, kidney and gonad of exposed organisms. Then, gonadal staging of gonad in exposed organism shows significantly different from control group. Study also showed that the oocytes at their different stages of maturation get affected differently at various concentration of ZnPT. With accumulating knowledge of the molecular mechanisms of cell death and the discovery of the caspases as key mediators of apoptosis, more direct and earlier measurements of apoptosis in tissue sections have emerged. Apoptotic cells were quantified and apoptotic indices were calculated following identification of apoptotic cells by morphological analysis activated caspase-3 immunohistochemistry. The results indicated that activated caspase-3 immunohistochemistry was an easy, sensitive, and reliable method for detecting and quantifying apoptosis in this model. Activated caspase-3 immunohistochemistry is therefore recommended for the detection and quantification of apoptosis in tissue sections.

Keywords: Antifouling, zinc pyrithione, Javanese medaka, histological alteration, metallothionen.

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Raining challenges: An ecological lament in *Ferngully: The Last Rainforest*

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Abstract

In recent times, environmental issues have come to the fore in various international platforms. Many governments have decried the large scale of deforestation taking place all over the globe. However, the main cause of ecological damage is attributed to none other than human beings themselves. This paper explores the destruction of the ecological balance and the attempt to restore the environment in the animated film *Ferngully: The Last Rainforest*. This film revolves around an enchanted part of a forest inhabited by fairies that fiercely protect their turf and are desperate to save their habitat from destruction by humans. Toynbee's 'challenge and response' approach is applied in the study of environmental upheaval as portrayed in the film in the belief that the challenges can be taken head-on by dealing with plausible strategies. Closer to home, Malaysia is affected to a large extent by global warming which is a direct consequence of ecological imbalance resulting in extreme heat waves, hazardous haze conditions and heavy flooding. The responses to such challenging climatic calamities need to be addressed. Measures are being taken by various government bodies and non-governmental organizations (NGOs) to implement ways to restrain further harm to Mother Nature but more needs to be done.

Keywords: Challenge and response, deforestation, ecology, *Ferngully*.

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Factors that influence the abundance of orchids in the coastal heath forest in Setiu, Terengganu

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Abstract

Coastal heath forest is characterized with a sparse stunted vegetation is frequently being neglected by public due to the nutrient-poor soil and harsh condition. Surprisingly, many interesting plant species grow within the patchy vegetation and extreme weather including a number of orchids. The occurrence of orchids in this forest is quite abundant, even not high in diversity. However, information about the ecological conditions of the orchids is rather limited. Therefore, this study was initiated to investigate the factors that associate with the occurrence of orchids in this ecosystem. We sampled orchid individuals, environmental and soil parameter from ten vegetation clumps in the coastal heath forest in Kampung Bari, Setiu, Terengganu. A multiple correlation test and Canonical Correspondence Analysis (CCA) were performed to see the relation between number of orchid individuals and the parameters. Result from multiple correlation test showed none of the tested parameters were correlate with the orchid's abundance. However, CCA graph indicated that *Coelogyne foerstermannii* and *Phaleonopsis pulcherrima* prefer slightly higher soil pH, big canopy cover, and high temperature. Meanwhile, light intensity, relative humidity and soil moisture showed a positive relation with *Denrobium crumenatum* and *Cymbidium rectum*. The study suggests that the effect of a large vegetation cover should be considered in orchid conservation planning.

Keywords: Vegetation cover, soil pH, BRIS ecosystem, Gelam forest.

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**Effect of imazapyr-based herbicide on vasculogenesis In developing
Java medaka (*Oryzias javanicus*) embryo**

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Abstract

Vasculogenesis, the process of blood vessel formation by a de novo production of endothelial cells during embryogenesis is an important measure to evaluate developmental toxicity. This study evaluated the effect of Imazapyr, a widely used herbicide in agriculture on vasculogenesis in Java medaka embryo. The fish embryos were exposed to five concentrations of Imazapyr-based herbicide (3.0 ppm, 6.0 ppm, 9.0 ppm, 12.0 ppm) and a control under static renewal condition. Prior to the exposure test, normal pattern of vasculogenesis of the fish embryo was recorded using Motic stereomicroscope with Motic 3.0 attached camera. During the exposure period, we observed and recorded the effect of Imazapyr-based herbicide on the primary vascular development (vasculogenesis) of Java medaka embryo throughout the incubation period. The abnormalities found were formation of abnormal patterns of sinus venosus, common cardinal vein and marginal vein, absence of erythrocytes and blood clotting in the veins. Abnormalities in vasculogenesis started to commence in 6.0 ppm Imazapyr-base herbicide and became more pronounced at higher exposure concentrations. The higher the exposure concentrations the earlier the abnormalities in vasculogenesis appeared. Based on the results, Java medaka embryos are suitable as a model organism for testing vasculogenesis impairments due to environmental pollutants. Furthermore, as other medaka fish, Java medaka has the common pattern for the development of the primary vascular system that can represent other vertebrates.

Keywords: *Oryzias javanicus*, test organism, vasculogenesis, environmental pollutant.

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Bioavailabilities of Mn and Cd in the in-vitro human gastrointestinal tract from the consumption of contaminated wild water spinach and health risk assessment

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Abstract

Edible aquatic plants from heavily metals-polluted ponds may put human health at risk if they were consumed. Therefore, assessment studies on the bioavailabilities of Mn and Cd in contaminated water spinach (*Ipomoea aquatica*) by in-vitro gastrointestinal extractions and their health risks are presented in this paper. Mature plants grown in contaminated hydroponic solution under greenhouse conditions were harvested. Digestions in human stomach and small intestine were simulated and carried out on the edible plant shoots (stems and leaves). The precision and accuracy were assessed by standard reference material (peach leaves, SRM 1547). Atomic absorption spectroscopy (AAS) was employed to determine metal concentrations in the plant samples. The results indicated that plant forms greatly differed in their metal bioavailabilities, e.g. cooked samples (CHS) and dried samples (DHS) had higher bioavailabilities of Mn and Cd than raw (RHS) and in gastric and intestinal extractions, respectively. Moreover, it was also found that metal bioavailabilities varied between the gastric and intestinal extractions, e.g. total Mn and Cd bioavailabilities were found to be highest in the intestinal and gastric extractions, respectively. Health risks exist among adults in Selangor, Malaysia if they consumed Cd-T2-contaminated cooked plants which as shown by the hazard quotient (HQ) and health risk index (HRI).

Keywords: Water spinach, bioavailability, Mn, Cd, gastrointestinal, health risks.

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Determination of Mn and Pb uptake by vetiver grass (*Vetiveria zizanioides*) with different shoot length in artificial running water system

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Abstract

Vetiveria zizanioides has been known as a phytoremediation agent and widely uses in water conservation works. However, there is a need to improve performance of this plant in removing pollutant in water system. Therefore, this study was conducted to measure Water Quality Index (WQI) improvement in the system installed by vetiver grass (VG) with trimmed and untrimmed shoot, identify rate of metal uptake and visual changes of VGs exposed in high concentration of lead (Pb) and Manganese (Mn). Artificial water system was setup by installing Class III water samples taken from pond within Universiti Putra Malaysia (UPM). Plants were exposed to 15 mg/L of Pb and Mn (192 h) and harvested at different time intervals. The WQI of water samples has improved to class II after treated with VGs. Independent sample T-test found that no significant different of Pb and Mn concentration between trimmed and untrimmed plants, but there were significant different of those metal concentration between root and shoot of VGs ($p < 0.05$). Higher concentration of Pb detected in root while in shoot, higher Mn concentration. Chlorosis of the plant leaves was seen on day 6 for trimmed and day 7 for untrimmed. No chlorosis observed on VGs in control experiment. This study found that VG have great potential in improving WQI for running water and have good tolerance ability to high level of Pb and Mn despite no differences in metal uptake between plants with trimmed and untrimmed shoot. Metal accumulation in different organ varied significantly depending upon the role of the metal.

Keywords: Vetiver, Water Quality Index, phytoremediation, metals, lead, manganese.

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The influence of water physicochemical parameters on fish occurrence in peat swamp, paddy field and oil palm plantation of north Selangor peat swamp forest, Selangor, Malaysia

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Abstract

This study investigates the influence of water physicochemical parameters on fish occurrence in peat swamp, paddy field and oil palm plantation of north Selangor peat swamp forest, Selangor, Malaysia. Fish samplings and water physicochemical analyses were conducted on June 2015, October 2015 and January 2016. A total of 1,382 individual fish belonging to 10 families, 15 genera and 20 species were collected. Family Cyprinidae (eight species) had the highest representatives, followed by Bagridae (three species) and Osphronemidae (two species). The most abundant species was *Barbonymus schwanefeldii* (169 individuals), while the least abundant was *Wallago leerii* (one individual). The paddy field and oil palm plantation area recorded higher fish species diversity and richness compared to peat swamp. The water physicochemical parameters such as pH, dissolved oxygen, ammonia, phosphate, sulphate and chlorine showed no significant difference between paddy field and oil palm plantation, but significantly different from the peat swamp. However, no significant difference was observed for temperature between the three habitats. This study revealed that each habitat has different water quality parameters that were associated with the fish occurrence.

Keywords: Water physicochemical parameters, fish occurrence, conservation, peat swamp forest, Malaysia.

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Heavy metals in wild Indonesian shortfin eel, *Anguilla bicolor bicolor* (McClelland 1844) and giant mottled eel, *Anguilla marmorata* (Quoy & Gaimard 1824) in the northwest of Peninsular Malaysia

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Abstract

This study reports the heavy metal assessment of Cu, Zn, Fe, Ni, and Pb from wild collected *Anguilla bicolor bicolor* and *Anguilla marmorata* in the northwest of Peninsular Malaysia. There was no significant difference between the mean readings of heavy metal concentrations for both *Anguilla* species for the muscle tissue. However, for the liver, Cu, Zn and Fe concentrations reading showed noticeable differences between both species. The heavy metals concentration measured from both species were higher in the liver, compared to the muscle, with the exception of Ni. All of the heavy metals in the muscle for both species are lower than the minimum permissible limits set by several international guidelines and standards for safety consumption, with the exception of Ni and Pb. However, for liver, all of the readings exceeded the permissible limit. This study reveals that *A. marmorata* and *A. b. bicolor* obtained from the northwest of Peninsular Malaysia contain considerable amount of toxic metals which could raise a concern with prolong consumption of the two species.

Keywords: Heavy metals, *Anguilla bicolor bicolor*, *Anguilla marmorata*, Peninsular Malaysia.

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Relationships between otolith dimension, age and somatic growth of *Anguilla bicolor bicolor* (McClelland 1844) collected from northwest of Peninsular Malaysia

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Abstract

This study reports the relationships between otolith dimension, age and somatic growth of *Anguilla bicolor bicolor* in northwest of Peninsular Malaysia. The length–weight relationship of the eels was recorded at $W = 0.0001L^{3.659}$. There were significant relationships between all of the equations established between selected otolith dimension, age and somatic growth. The equations derived from this study could help in future study on population dynamics, stock assessment and conservation of this species. This is the first study of these relationships for *A. b. bicolor* in this country.

Keywords: Relationships, otolith dimension, age, somatic growth, *Anguilla bicolor bicolor*.

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Bioavailability of heavy metals (Zn, Cu, Pb and Fe) in surface sediments of the Malacca River, Malaysia

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Abstract

Untreated chemical wastes from industrial and domestic areas could be the point sources of the metal contamination in the surface sediments of the Malacca River. Four different sampling sites along the Malacca River were chosen due to the nearby industrial and urban activities. The aqua-regia method and the sequential extraction technique were used to extract total- and bioavailable-concentration of heavy metals in the sediments. Concentrations of heavy metals were determined by an Atomic-Absorption Spectrophotometry (AAS). Results of heavy metals in the sediments showed that the mean concentration of Cu (367.8 µg/g) exceeded the Sediment Quality Guidelines (SQGs), thus potentially being able to affect the benthic macro-fauna adversely. The concentration of Zn (152.9 µg/g) and Pb (22.52 µg/g) were lower than Interim Sediment Quality Guidelines (Low). Geofractionation of the metals in the sediments showed that the Cu in sediments from anthropogenic sources had more than 93% bioavailability ([oxidisable-organic]>[exchangeable]>[acid-reducible]). In contrast, Zn, Pb and Fe were dominantly in the form of the lithogenic fraction by 55.4%, 97.4% and 93.8%, respectively with order of extraction [residual] > [oxidisable-organic] > [acid reducible] > [exchangeable] fraction.

Keywords: Geofractionation, bioavailability, heavy metals, sediments, Malacca River.

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Preliminary survey of zooplankton community in a fast flowing river

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Abstract

Sedim River is a pristine, fast flowing and high energy river ecosystem. Due to the non-stop clear water of the river, it is a popular tourist destination and most well-known for rafting activity. It is one of the major tributaries of Muda River system in Kedah, north western part of Peninsular Malaysia. The present study aimed to providing baseline information of freshwater zooplankton (Rotifera, Cladocera and Copepoda) in the river. Zooplankton samples were collected by towing plankton net over 3 m horizontal distance. A total of 21 taxa were recorded and Rotifera contributes the highest number of species. The most diverse genus is *Lecane* followed by *Mytilina*, *Anuraeopsis*, *Proalides* and *Trichocerca*. Physico-chemical variables including temperature, conductivity, total dissolved solid, dissolved oxygen, pH and velocity were determined *in-situ* and there is no significant difference was found between the sampling stations ($P>0.05$). Zooplankton abundance was positively correlated with dissolved oxygen and pH whereas negatively correlated with temperature, total dissolved solid and conductivity. All sampling locations appeared to be unpolluted based on physico-chemical measurements. This study reveals that environmental variables were the main factor governing the structure of zooplankton community in the water body.

Keywords: River, Peninsular Malaysia, zooplankton, Rotifera, physico-chemical.

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Performance of broiler kampung chicken reared under enclosed environment

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Abstract

In Malaysia, enclosed housing system with fan and pad cooling systems have been successfully employed in the broiler industry. Broiler kampung chicken however are generally raised in an extensive or semi-intensive production system. The purpose of this study was to evaluate of the growth performance of broiler kampung chicken raised under enclosed and open housing systems. Broiler kampung chicken raised in enclosed house were significantly heavier and had superior feed efficiency than those under open system. The average body weight at 12 w was 2278 g and 2082 g for enclosed and open system, respectively. Feed conversion ratio (FCR) for open and enclosed system was 3.32 and 3.08, respectively. Enclosed housing system has a great potential for large-scale commercial broiler kampung chicken production in Malaysia. This system provides greater biosecurity features with benefits of improved performance and efficient use of space.

Keywords: Enclosed house, feed conversion ratio (FCR), kampung chicken, performance.

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***Nepenthes* species of Mount Trus Madi in Sabah Borneo: Current population status and future observation plan**

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Abstract

Nepenthes is a genus of carnivorous tropical pitcher plants that mostly occur in the Malesian region. This poster highlights the *Nepenthes* species that can be found on Mount Trus Madi located in Sabah. Ten plots were set up along one of the established summit trails to collect current baseline data, which will be ultimately used to determine the species composition, population density, dispersion pattern and population structure of the *Nepenthes* species on Mount Trus Madi. A total of 631 pitcher plants belonging to three species and one natural hybrid were enumerated from all plots. *Nepenthes tentaculata* is the most abundant and widely distributed pitcher plant with higher density and frequency among the plots. *Nepenthes macrophylla* and its hybrid *Nepenthes x trusmadiensis* are endemic to the upper montane forest of the mountain. Their population is restricted to the area and vulnerable to tourism impact, habitat disturbance and climate change. The baseline data from these findings are important to provide a current and in-depth insight into the status of the *Nepenthes* community, and enable further effective management and monitoring plans.

Keywords: *Nepenthes*, Mount Trus Madi, population, distribution.

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**Tree species diversity and composition of secondary forests in
Ulu Segama-Malua forest complex, Sabah**

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Abstract

Pristine forests in tropical Sabah has been in the decline due to various human activities especially logging in the past and currently, conversion to agricultural land. The recovered forests or secondary forests may not completely mimic the initial pre-disturbance state of the pristine forests. But secondary forests are dominating the landscape and gaining importance in biodiversity conservation as wildlife refuge, migration corridors and alternative food source for wildlife. A study on the floristic of a secondary forest after 27 years of selective logging was conducted in Ulu Segama-Malua forest complex near the Danum Valley Conservation Area in Sabah. Thirty 0.09 ha plots were established within the study site and all trees >3 cm DBH were enumerated. Species diversity and composition, tree density, basal area and dominance (represented by importance value, IV) were calculated. Shannon Wiener index averaged 2.916 ± 0.199 which indicated an intermediate value for tree species diversity in the secondary forest. A total of 177 species, 95 genera and 46 families were recorded. The most speciose tree families were Dipterocarpaceae (26 species) and Euphorbiaceae (25 species). The dipterocarp genus, *Shorea*, contributed a high diversity of species composition. In terms of basal area, tree density and IV, the tree families Dipterocarpaceae and Euphorbiaceae were the most dominant. Results of this study showed that the logged over Ulu Segama-Malua forest complex is still regenerating, as implied by the high dominance of pioneer species, particularly *Macaranga*. Due to previous selective logging, a high dominance of Dipterocarpaceae was observed which enhances the value as well quality of the forest.

Keywords: Tree species diversity, composition, secondary forests, Ulu Segama-Malua forest complex, Sabah

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**Phytoremediation of heavy metals (Pb, Zn, Fe, Cu, Mn) in controlled running water system
by using vetiver grass (*Vetiveria zizanioides*)**

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Abstract

This study was conducted to identify phytoremediation potential of vetiver grass (*Vetiveria zizanioides*) for removal of five heavy metals (Lead (Pb), Zinc (Zn), Iron (Fe), Copper (Cu) and Manganese (Mn)) in controlled running water system. Plants with different root length (10 cm, 20 cm and 30 cm) were exposed to a concentration of Pb, Zn, Fe, Cu and Mn (10 mg/L) in flowing water system (0.0012 m³/s) and harvested at different time intervals (24, 48, 72, 96, 120, 144 and 168 h). The initial concentration (10 mg/L) depicted a decreasing trend from 24 h up to 168 h of the experiment. The highest amount of heavy metal uptake by the plant was Fe (95.8% removal) with the concentration left was 0.42 ± 0.004 mg/L by 168 h. This was followed by Zn with 75% removal (2.55 ± 0.03 mg/L left in the water), Pb; 50% removal with 4.97 ± 0.007 mg/L remain, Mn (33% removal and 6.70 ± 0.006 mg/L remain) and the least uptake is Cu (25% removal with remaining 7.46 ± 0.005 mg/L in the water). In general, removal of the heavy metals from water follow the order of Fe > Zn > Pb > Mn > Cu. Heavy metals were detected in the roots after 24-hours of exposure with level in roots were higher compare to level in the shoots. Based on the ANOVA, no significant different in uptake of Zn, Pb, Fe and Cu by different root length in the running water except for Mn. The morphological changes particularly the change in leaf colour of the plants (chlorosis effect) was observed specifically after 6 days of the experiment for plants with 10 cm root length and the chlorosis effect was seen at day 7 for plants with root length of 20 cm and 30 cm. This study shows Vetiver grass has great potential for phytoremediation of wastewater polluted with Pb, Zn, Fe, Cu and Mn in running water.

Keywords: Phytoremediation, heavy metals, vetiver grass (*Vetiveria zizanioides*):

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Determination of drinking water and wastewater quality in cattle farms

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Abstract

Water plays an important role in any livestock production system as it as an essential medium for animal metabolism as well as an important cleaning medium. It is important that the quality of the drinking water is maintained at a certain level so as to lessen the possible adverse effects on the animals. According to the National Water Quality Standards, any water source with a classification of Class III and less is deemed suitable for animal consumption. At the same time, most cattle farms in Malaysia do not do proper treatment of their wastewater before releasing them into water bodies such as drains, rivers and lakes. In this study 7 cattle farms were selected and both drinking water and wastewater samples were collected for analysis. The water samples were analysed in-situ and at the lab for the following 15 parameters; dissolved oxygen, pH, salinity, electrical conductivity, turbidity, biological oxygen demand, chemical oxygen demand, total suspended solid, total dissolved solid, ammoniacal nitrogen, nitrate, phosphates, total coliform, iron and magnesium content. The results were then compared with the National Water Quality Standards and the overall classification for each water sample was decided. The results for drinking water were as follows; 1 (14.29%) Class II, 2 (28.57%) Class III, 2 (28.57%) Class IV and 2 (28.57%) Class V. Meanwhile, all the wastewater samples were categorized as Class V.

Keywords: Drinking water, wastewater, National Water Quality Standards.

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Abstracts Domain Genetics

Cross-species microsatellite amplification of river terrapin (*Batagur affinis*)

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Abstract

Batagur affinis (river terrapin or "tuntung") is one of the world's most critically endangered species. It is distributed across Sumatera, Malaysia, Thailand and Cambodia. Its population number is declining in the wild because of habitat destructions and its economic value (i.e. exotic delicacies for eggs and meat). Hence, many reintroduction efforts had been done. Yet, the wild populations are not improving. One of the possible reasons behind this failure is possibly due to low genetic diversity in this species. Thus, population genetics study should be conducted. In this preliminary population genetics study, a total of 33 microsatellite primers from other freshwater terrapin (i.e. *B. trivittata* and *Podocnemis unifilis*) were screened and optimised for 30 samples of river terrapin from Kemaman, Terengganu using touchdown protocol and followed by gradient protocol. Among those 33 primers, 23 primers were able to cross-amplify with *B. affinis* and optimised for annealing temperature (51 – 70°C). Those 23 primers will be used for future population genetics study using samples from both Bota Kanan, Perak and Kemaman, Terengganu.

Keywords: *Batagur affinis*, cross species, microsatellite markers, population genetics, primer screening and optimization.

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Identification of Simple Sequence Repeats (SSR) loci in *Vanda* Mimi Palmer expressed sequence tag database as potential marker(s) suitable for screening fragrance-related vandaceous and non-vandaceous orchids

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Abstract

Vanda Mimi Palmer (VMP) was largely cultivated for its intoxicating fragrance, huge commercial value and potential. It is a hybrid produced by crossing *Vanda* Tan Chay Yan and *Vanda tessellate*. Since fragrance characteristics of vandaceous orchids could not be determined based on the vegetative parts when the flowers are absent, our study is targeting on producing markers to detect their fragrance characteristics without the inflorescence. In our previous study, 2132 ESTs were generated from the VMP floral cDNA library. A total of 2,195 primer pairs were designed based on the mined EST-SSRs and primer pairs with amplicon size ranging from 100bp to 400bp and SSRs with three to five repeats were selected. A total of hundred and fifty primer pairs were chosen for PCR optimization performed using genomic DNA of VMP. Only 39 primer pairs were successfully optimised showing single banding pattern on 7% polyacrylamide gel (PAGE) and sent for sequencing. Three amplicons (obtained using the three primer pairs designated as P106, P117 and P140) showed the presence of the expected SSR. The primers were tested on genomic DNA extracted from other fragrant vandaceous and non-vandaceous orchids, and successfully amplified identical target region as in VMP. The presence of highly conserved and similar EST-SSRs sequences might serve as evidence of structural conservation and relationships across orchid species. Hence, we suggest these three primer pairs can be utilized to detect other vandaceous and non-vandaceous orchids

Keywords: *Vanda* Mimi Palmer, fragrance, expressed sequence tag, vandaceous orchids.

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Phylogenetic relationships of the *Tetraponera rufonigra* (Jerdon) from selected urban area inferred from mtDNA COI marker (Hymenoptera: Formicidae)

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Abstract

Tetraponera rufonigra is known as Semut Selangor in Malaysia. They are from family Formicidae and widely distributed in urban area. Interestingly, they inhabit in a unique nesting habitat included on branches and dead stems of various kind of plants. Furthermore, some populations of *T. rufonigra* have different sizes and colours. Hence, this study attempts to elucidate the phylogenetics relationships of the *T. rufonigra* populations collected from several locations in urban areas of Eastern Penang Island. On the other hand, *T. grandidieri* was selected as outgroup. Samples were collected from different locations focusing on Georgetown, Gelugor, Batu Uban, Bayan Baru, Bayan Lepas, Jelutong, Air Hitam, Batu Maung areas and others. Species were collected via hand picking and baiting method. For molecular study purpose, tissues were extracted from five individuals per locality. The mitochondrial deoxyribonucleic acid (MtDNA) sequences of partial cytochrome oxidase I (COI) region was used to infer the phylogenetic relationships of *T. rufonigra* populations by Polymerase Chain Reaction (PCR) and DNA sequencing. Phylogenetic analyses of COI (552 base pairs) used four methods, namely, Maximum Parsimony (MP), Neighbour-Joining (NJ), Maximum Likelihood (ML) and Bayesian method resulted in similar supported clade with minimal change in branching order. No cryptic species were found between the-groups as all samples were monophyletic with their own species identity.

Keywords: Tetraponera, COI, phylogenetic relationship, monophyletic, PCR-DNA sequencing.

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**Cross-amplification of Y chromosome-specific markers isolated from horse (*Equus caballus*)
in Malayan tapir (*Tapirus indicus*)**

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Abstract

This study was conducted to evaluate the cross-amplification of six Y chromosome-specific markers that were isolated from horse (*Equus caballus*) in Malayan tapir (*Tapirus indicus*). All the six markers failed to yield positive results in Malayan tapirs with no amplification (Eca.YM2), and with amplification of single band (Eca.YP9) or multiple bands (Eca.YJ10, Eca.YH12, Eca.YE1 and Eca.YA16) in both male and female individuals. Twelve faecal samples were collected from five male individuals of Malayan tapir and stored in three different storage methods (frozen, DET and 80% ethanol). DNA was extracted using a modified protocol of Zhang et al. (2015), yielded DNA concentrations that were not statistically different among the three storage methods based on one-way ANOVA test. Scoring of molecular markers was not carried out because none of the six markers gave a positive result and therefore this step was discontinued.

Keywords: Cross amplification, horse, Malayan tapir, storage methods, Y chromosome-specific markers.

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The *sfp*-type 4'-phosphopantetheinyl transferase Ppt1 of *Cochliobolus miyabeanus* controls development and pathogenicity

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Abstract

In filamentous fungi, the *sfp*-type 4'-phosphopantetheinyl transferase Ppt1 is required for activation of some of the enzymes for lysine biosynthesis, and peptide/polyketide secondary metabolites. *Cochliobolus miyabeanus* is a pathogen of brown spot disease on rice. In this study, *C. miyabeanus* *PPT1* mutants were derived from the wild-type (WT) strain WK1C (ATCC 56640, MAT1-2). The *PPT1* gene was deleted using the split marker method. The 5' and 3' flanking sequences of the predicted open reading frame of each target gene were amplified from WT using two specific primer sets (CmPPT1UF1, CmPPT1UR1, CmPPT1DF1 and CmPPT1DR1) that matched the upstream and downstream *PPT1* gene flanking sequences. Transformation of *C. miyabeanus* was carried out as previously described (Inderbitzin *et al.*, 2010; Oide *et al.*, 2006), with a slight modification. Deletion of the *PPT1* in the rice pathogen, *C. miyabeanus* was verified by Polymerase Chain Reaction (PCR) amplification using three diagnostic primer sets. Three independent *C. miyabeanus* mutants (*Cmppt1*-1, *Cmppt1*-4 and *Cmppt1*-8) were generated. Growth of all *Cmppt1* mutants was reduced to 50.5% compared to WT and their colony surfaces were hydrophilic. In addition, *ppt1* mutants of *C. miyabeanus* were also reduced in tolerance to oxidative stress and iron depletion. As expected, mutants were albino since they cannot produce the polyketide melanin and were auxotrophic for lysine because they lack an α -amino acid reductase. Interestingly, the yielded strains were significantly reduced in virulence to rice. Because *C. miyabeanus ppt1* mutants make no or very few conidia, virulence was tested by inoculating a mycelial suspension of the mutants with supplemental lysine into rice leaves. At 10-day post inoculation, WT had developed large dark brown necrotic areas (6.10 ± 1.41 mm) surrounded by chlorotic halos. *Cmppt1* mutants caused much less damage and appeared as light brown patches without obvious chlorosis (3.69 ± 0.86 mm), in most cases.

Keywords: phosphopantetheinyl transferase, *Cochliobolus miyabeanus*, brown spot, rice, transformation.

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Identification of novel rice genes influencing starch digestibility

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Abstract

Rice is one of the most versatile crops cultivated worldwide. It serves as the primary dietary source of carbohydrate for most Asians. Eating and cooking qualities of rice are influenced by the physiochemical properties of starch in endosperm, primarily by the amylose. Rice with improved carbohydrate qualities could offer potential as dietary strategy for preventing and managing several chronic diseases, thus promoting population health. Glycemic Index (GI) is a concept used to compare the blood glucose raising responses to carbohydrates of different foods in response to consumption of equal quantities of glucose as a reference. Consumption of low GI food was found to have a beneficial effect in lowering postprandial glucose responses. In this study, twelve healthy individuals were asked to consume rice from five different lines and their blood samples were collected to determine glucose and insulin responses. Data obtained from the *in vivo* results of our study revealed two of the rices as low GI and the remaining three as intermediate. Sequence differences between three of the rices in the Waxy gene have been uncovered. Transcriptomic analysis also identified differences between high and low GI cultivars. Development of markers and *In vitro* test should enable the rapid development of low GI varieties optimized to Malaysian condition.

Keywords: Glycemic Index (GI), Waxy (Wx), Postprandial glucose response.

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Newborn kids performance of imported meat type goats under tropical climate in Malaysia

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Abstract

Kidding performance is one of the key to measure the effectiveness of selected breed performed under local tropical climate. Usually some indicator such as birth weight, sex and kidding size were calculated. The objective of this study was to compare the kid performance in four goat breeds: Boer, Savanna, Kalahari and crosses under the local climate. A total of 277 newborn kids of the four goat breeds were selected in this study. The measurement of birth weight, sex and kidding size from each kid were collected. All samples were analyzed using One-way ANOVA and frequency analysis. The highest mean birth weight recorded was 3.12 ± 0.06 kg, 3.12 ± 0.10 , 2.70 ± 0.10 and 3.27 ± 0.08 from Boer, Savanna, Kalahari and Cross breeds, respectively. In conclusions, the results of this study indicate that the imported goat from South Africa and Australia could produce comparable kidding performance as in the countries of origin.

Keywords: Goat, breed, kidding, natural mating, semi intensive.

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Identification of indigenous Katjang breed by microsatellite markers

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Abstract

The characterisation of animals using PCR-based microsatellite markers is informative, economical and useful to elucidate genetic diversity within and among breeds. The determination of genetic variability in four goat breeds in Malaysia, namely the indigenous Katjang goat and the exotic Jamnapari, Boer and Savanna goats, was successfully analysed using 26 microsatellite markers recommended by FAO/ISAG and four microsatellite loci from other studies. The number of detected alleles ranged from three to seven in Katjang goats, four to nine in Jamnapari and Boer goats, and two to ten in Savanna goats. Two out of the 30 microsatellite markers showed different high allele frequencies in Katjang breed that could be used to identify purity of breeds. Two alleles at loci ILSTS029 (154 bp) and OarFC48 (154 bp) showed high frequencies and specificity in Katjang breed with values of 0.45% and 0.56%, respectively. The findings suggest that combination of both alleles can be used as potential markers for traceability of local indigenous Katjang goat.

Keywords: Diversity, goat, traceability, variability.

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Compatibility study of selected jackfruit clones through hybridization

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Abstract

Breeding perennial crops take longer durations to bear result especially dealing with vegetative propagated tropical fruits. Jackfruit is one of the fruit types that were domesticated in Malaysia. Even though it is a tropical crop, establishment on the field was a major setback because the crop face major disease problem. The breeding program for jackfruit was started in 2012 with the objective of resistance to bacterial wilt. Bacterial wilt disease is one of serious constraint in Malaysia's jackfruit industry. This economically important disease caused by *Erwinia carotovora* has adversely affected the potential of marketable yield due to high tree mortality and reduce fruit quality. Many clones have been evaluated for commercial planting since 2001, but most of them are susceptible to this disease especially after four or five years planting. To date, there is no jackfruit variety known to have resistance against bacterial wilt disease. Due to lack of resistance varieties in jackfruit commercial clones, conventional breeding approach by using wild type cultivar is proposed as an alternative method to develop a new variety with enhanced resistance against this disease. One potential candidate cultivars have been identified from farmer's orchard which was known as Renggam jackfruit. Pollen grains were collected from Renggam, transferred and crossed into selected commercial jackfruit via hybridization method by using assisted pollination technique. Several crossing series of each potential commercial clone with Renggam have been fruiting, harvested and sown seeds into soil for germination. Here, we report the percentage of successfully fruit setting on different crosses. Conclusively, our results indicated that the crossing technique on jackfruit produce 90% successful rate of fruit set.

Keywords: *Artocarpus heterophyllus*, jackfruit, new varieties, tolerance, bacterial wilt.

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Abstracts Domain Physiology

Behavioral alteration in the male adult zebrafish (*Danio rerio*), after exposure to raw multi-walled carbon nanotubes (MWCNTs)

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Abstract

Carbon nanotubes, which had been discovered in 1991, comprise of two different types of variety; the single walled carbon nanotubes (SWCNTs) and multi walled carbon nanotubes (MWCNTs). Both of these differ in their structures, depending on the number of graphene layer forming the concentric tube. To date, published research related to the carbon nanotubes by using zebrafish as the model organism, were mainly focused on the toxicity effects of carbon nanotubes on the developing embryos. Most of these studies mainly concentrated on the use of SWCNTs as the toxicant. It is likely due to the fact that purified SWCNTs are more toxic than the purified MWCNTs. Nevertheless, it is hard to determine the exact toxicity effects of the carbon nanotubes, since different preparation methods will likely yield different results. In this study, we were investigating the toxicity effects of different concentrations of raw MWCNTs (control, 1 μ g/L, 10mg/L and 100mg/L) on the anxiety-like behavior of the male adult zebrafish, by using the light-dark plus maze paradigm. Prior to the experiment, the MWCNTs were dispersed in the distilled water for 60 minutes by using the bath sonicator. Then, each of the fish replicates was exposed to different concentrations of MWCNTs about 60 minutes before it was transferred into a black holding cup (placed at the center of the plus maze), for acclimatization period. After 5 minutes, the holding cup was removed and the movement of the fish was recorded by using a camera situated at the top of the maze. The recording was then used for the analysis purpose. The parameters measured include the latency to enter the arms and the mean duration per visit.

Keywords: Carbon nanotubes, toxicity, MWCNTs, zebrafish, anxiety-like behavior.

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Lethal dose and clinical signs of *Streptococcus agalactiae* in Javanese medaka (*Oryzias javanicus* Bleeker 1854)

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Abstract

This study was conducted to determine the lethal dose and clinical signs of *Streptococcus agalactiae* in Javanese medaka. Javanese medaka was collected in Sungai Pelek, Sepang and brought to the laboratory for acclimatization. The fish were then challenged from 10^2 - 10^5 CFU/ml of *S. agalactiae* via intraperitoneal injection. Mortalities and clinical signs were observed until 10 days of exposure, while the dead fish were collected for bacterial isolation and histological analyses. Lethal dose 50% (LD₅₀) of *S. agalactiae* in Javanese medaka was determined at 6.5×10^3 CFU/mL. Most of the infected fish showing lethargy, erratic swimming, exophthalmia, opacity and necrosis at the injection site. The histopathological changes were mainly generalised congestion of the internal organs. *Streptococcus agalactiae* were successfully isolated from the dead fish. Results showed that Javanese medaka was susceptible towards *S. agalactiae* infection and could be a potential alternative organism for study of streptococcosis in fish.

Keywords: Javanese medaka, *Streptococcus agalactiae*, test organism, lethal dose, clinical signs.

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**Growth performance of catfish, *Clarias gariepinus*,
fed with different ration of spirulina, *Arthrospira platensis***

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Abstract

Spirulina was commercially used as a supplement in nutrition due to its high nutritional content. Improving the feed formulation using combined commercial fish feed with spirulina to the cultured fish might alleviate the fish's growth performance. This study was conducted to determine the growth performance (weight gain, specific growth rate (SGR), feeding efficiency (FE), feed conversion rate (FCR)) of catfish, *Clarias gariepinus*, fed with different ration of spirulina, *Arthrospira platensis*. Five experimental diets were developed by manipulating the percentage of spirulina in the fish feed containing 0% (control), 1%, 3%, 5% and 7% of home grown spirulina. All the catfish fry were bought from local fish farm and were acclimatized prior to the experiment. The fry were randomly selected with 30 fry per cage in triplicate. Each diet was fed to the fry twice daily *ad libitum* (5%-13% of body weight) for 90 days. All the growth parameters were recorded. Catfish with diet of 7% spirulina significantly higher in weight gain and SGR compared to control, but not with other treatment groups. Standard length, percent of survival, and FE of the catfish were increased with the increasing percentage of spirulina, but were not significantly different between all the diet groups. However, the FCR were decreased as spirulina percent increase in the diet, but also not significantly different between all the treatment groups. This study concludes that utilization of spirulina in the diet increase the growth performance of catfish.

Keywords: *Arthrospira platensis*, *Clarias gariepinus*, catfish, growth performance, spirulina.

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Zebrafish (*Danio rerio*) vs. Javanese medaka (*Oryzias javanicus*), who is more anxious?

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Abstract

Anxiety disorders are prevalent neuropsychiatric conditions that affect human emotion and cognitive functions. Increasing incidence of anxiety in the society caused global economic burden. The causes of anxiety are still unfathomable. Also, anxiety treatment using modern drugs are associated with different types of negative effects. These two situations increased the use of animal models for toxicological and neuropharmacological studies. In this context, a Malaysian native fish species, Javanese medaka (*Oryzias javanicus*) offer an opportunity to be developed as a model organism for neurotoxicology and neuropharmacology study. In general, anxious zebrafish (*Danio rerio*) will spend more time in the dark while, bold zebrafish will spend more time in the light. However, currently there is no empirical evidence for this particular condition in Javanese medaka. Since the zebrafish has been established to model anxiety, we will compare anxiety responses in the zebrafish and Javanese medaka to measure the sensitivity of these two species for the assessment of anxiety-related responses. To evaluate anxiety in these two different species, we study the anxiety response of zebrafish and Javanese medaka when introduced to novel environment light/dark plus maze. The aquatic light/dark plus maze is a behavioral testing battery developed based on the tendency of fish to seek dark backgrounds (or avoid light backgrounds) in unfamiliar environments. Fish behavior was observed in the light/dark plus maze for 5 minutes. Based on our preliminary study, we found medaka spend more time in light as compared to the zebrafish.

Keywords: Zebrafish, Javanese medaka, anxiety, novel environment, light/dark plus maze.

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Dipeptidyl peptidase IV (DPP IV) inhibitory activity screening of *Momordica charantia*, *Taraxacum officinale* and *Trigonella foenum-graecum* extracts in vitro

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Abstract

Diabetes, a globally popular disease which attracted the attention of many researches worldwide to discover a non-toxic and side effect free remedy for this disease. Inhibition of DPP IV enzymes has been adopted as one of the strategies in recent years in controlling diabetes. DPP IV inhibitor inhibits the dipeptidyl peptidase enzyme which degrades several incretin hormones that are vital in the production of insulin and managing the blood glucose level. Thus, the present study was designed to investigate the DPP IV inhibitory effects of plants having antidiabetic property. *In vitro* DPP IV inhibition was evaluated by the specific inhibitory activity of *Momordica charantia* (whole fruit), *Taraxacum officinale* (whole plant) and *Trigonella foenum-graecum* (seed) extracts prepared with heat treatment using petroleum ether, acetone, ethanol and water as solvents. Among the tested plants *T. officinale* and *M. charantia* acetone extracts exhibited strong DPP IV activity inhibition, with 78.88% and 54.13% respectively. The present study is the first report on screening of DPP IV inhibitory activity of *T. officinale*, *M. charantia* and *T. foenum-graecum* extracts. This could provide a new insight into DPP IV inhibitors from plants that could be useful for treatment of type 2 diabetes.

Keywords: Diabetes, DPP IV inhibitor, *Momordica charantia*, *Taraxacum officinale*, *Trigonella foenum-graecum*.

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Xanthorrhizol inhibits cell proliferation, cellular cholesterol uptake in HT29 colon cells and adipogenesis in 3T3-L1 adipocytes

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Abstract

Hyperlipidemia is defined as the presence of either hypertriglyceridemia or hypercholesterolemia, which could cause atherosclerosis, cardiovascular diseases and certain cancers. Although hyperlipidemia can be treated by hypolipidemic drugs, they are limited due to lack of effectiveness and safety. Since flavonoids and tannins have been reported to possess antihyperlipidemic activity, it is believed that phytochemicals isolated from plants may decrease the lipid levels with lower side effects. Previous studies demonstrated that xanthorrhizol (XNT) isolated from *Curcuma xanthorrhizsa* reduced the levels of free fatty acid and triglyceride *in vivo*. However, antiproliferative activity of XNT and its ability to inhibit cholesterol uptake and adipogenesis are yet to be reported. In this study, the IC₅₀ values of XNT were 15.12 ± 0.68 µg/mL in HT29 cells and 35.07 ± 0.24 µg/mL in 3T3-L1 adipocytes, respectively. Cholesterol uptake inhibition study was conducted in HT29 colon cells using fluorescent cholesterol analogue NBD. The result showed that XNT (15 µg/mL) significantly inhibited the cholesterol uptake by up to 37.6 ± 1.53 % relative to control. On the other hand, higher concentration of XNT (50 µg/mL) significantly suppressed the growth of 3T3-L1 adipocytes (5.9 ± 0.58 %) compared to 3T3-L1 preadipocytes (80.42 ± 8.29 %). It was found that XNT (3.125 µg/mL) impeded adipogenesis by reducing lipid content of 3T3-L1 adipocytes for 25.37 ± 3.24 % comparable to positive control (quercetin), 20.07 ± 8.78%. We postulate that inhibition of cholesterol uptake, adipocyte number and adipogenesis may be utilized as treatment modalities to reduce the prevalence of lipidemia. To conclude, XNT could be a potential hypolipidemic agent and further studies could be done on its mechanism of action.

Keywords: Adipogenesis, cell proliferation, cholesterol, xanthorrhizol.

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Clinical evaluation of collagen-calcium alginate film along with therapeutic ultrasound massage for wound healing in cats

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Abstract

The study was aimed to evaluate the efficacy of collagen - calcium alginate as an accelerator of wound healing in clinical case of nine cats having non-healing chronic wound were present to (UVH) University veterinary hospital. Twenty four healthy female Sprague-Dawley rats weighing between 300 to 350 g were used in this study over a 20-day period. They were allocated randomly into 4 groups of 6 animals each. After the creation of 2 cm x 2 cm open wound, Group I was control treated with gentamycin ointment. Groups II, III and IV were treated with Therapeutic ultrasound massage, collagen-calcium alginate film and collagen-calcium alginate film with therapeutic ultrasound. On application, the collagen-calcium alginate film with therapeutic ultrasound was well accepted by the animals without any adverse reaction. On bacteriological examination, *Staphylococcus aureus*, *Pseudomonas*, *Escherichia coli*, *Proteus* and *Klebsiella* species were isolated from all the groups. Mean percentage of epithelialisation, wound contraction and total healing were significantly better in Group IV ($P < 0.05$). Collagen is a biocompatible protein that does not interfere with the body's normal immunologic response and can be used in non-healing chronic wounds, which require a trigger to stimulate the normal healing process. In extensive wounds when there is a lack of autologous tissue, biomaterials like collagen-calcium alginate may be beneficial and can be used.

Keywords: Collagen-calcium alginate, wound healing, wound contraction.

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**Diabetic management potential of *Pterocarpus marsupium* roxb.
on MSG obese albino mouse, *Mus musculus***

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Abstract

Obesity is a complex multifactor problem characterized by the excessive accumulation of adipose tissue. This increase leads to a disturbance in the general metabolic state and results in a number of clinical diseases such as non-insulin dependent diabetes mellitus, cardiovascular disease, hyperlipidemia and hypertension. In this study, the MSG diabetic mice (induced by monosodium glutamate) gained nearly 65% of its body weight during the 60 days of the experiment and the control mice gained only 29.5% of its body weight. The MSG injected animals also showed a higher Lee index. The treatment with the *Pterocarpus marsupium* distillate for 60 days had aided the diabetic mouse to regulate its blood glucose permanently. The treatment of the MSG diabetic mice with the heartwood of the *P. marsupium* crude extract had resulted in 66% of mortality in 120 days. The findings from the physiological, histological, endocrinological and molecular studies of this work had proved the antidiabetic potential of *P. marsupium* in MSG obese mice. At the same time, it was also clear that the crude extract, though it possesses a strong antidiabetic potential, had a deleterious effect in the MSG mice.

Keywords: Obesity, Lee Index, hyperlipidemia, endocrinological, histological.

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Impact on growth and nutritive value of King Napier grass treated with organic and inorganic fertilizers for animal feed

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Abstract

The aim of this study is to investigate the effect of organic, inorganic and mixture of organic and inorganic fertilizers on the growth and nutritive value in King Napier grass. The King Napier grass were assigned to seven treatments; Treatment 1, control (no fertilizer; n=9), Treatment 2 (50 N Kg/ha inorganic fertilizer; n=9), Treatment 3 (100 N Kg/ha inorganic fertilizer; n=9), Treatment 4 (50 N Kg/ha organic fertilizer; n=9), Treatment 5 (100 N Kg/ha organic fertilizer; n=9), Treatment 6 (mixture of inorganic and organic fertilizer with ratio 50:50 N Kg/ha; n=12) and Treatment 7 (mixture of inorganic and organic fertilizer with ratio 100:100 N Kg/ha; n=9). King Napier that were applied with mixture of organic and inorganic fertilizer (Treatment 7) were the highest than other treatments and showed high content of dry matter (DM;96%) and crude protein (CP;17.7%) and low amount of Neutral Detergent Fiber (NDF;61.7%), Acid Detergent Fiber (ADF;36.5%) and Acid Detergent Lignin (ADL;14.8%). Good quality forages with high essential nutrients can be indicated by having higher DM and CP content. Low NDF values are desired as it indicates that the forages has high quality and lower values in ADF and ADL indicates higher quality forages as ADF and ADL level decreased, the digestibility energy level increased. It could be suggested that applying mixture of inorganic and organic fertilizer with ratio 100:100 N Kg/ha could improve the quality and appropriate nutrient composition in Napier grass.

Keywords: Chemical analysis, fertilizer, inorganic fertilizer, King Napier grass, organic fertilizer.

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Antinociceptive activity of 2-benzoyl-6-(3-bromo-4-hydroxybenzylidene)cyclohexen-1-ol in mice

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Abstract

A novel compound from diarylpentanoids analogues, 2-benzoyl-6-(3-bromo-4-hydroxybenzylidene)cyclohexen-1-ol, was evaluated on its antinociceptive activity in mice through acetic acid-induced abdominal constriction test. Antinociception of 2-benzoyl-6-(3-bromo-4-hydroxybenzylidene)cyclohexen-1-ol was indicated by the reduction in the mean of the number of abdominal constrictions in the test groups compared to the control group. Acetylsalicylic acid (ASA, 100 mg/kg) was used as reference drugs while control group only received vehicle (5% DMSO: 5% Tween 20: 90% Distilled water) that used to dissolve the compound. The mice that received intraperitoneal injections of 2-benzoyl-6-(3-bromo-4-hydroxybenzylidene)cyclohexen-1-ol at 0.1, 0.3, 1.0 and 3.0 mg/kg showed 48.34%, 60.79%, 90.07% and 98.54% of inhibition respectively. Acetic acid injection in mice peritoneal cavity can promote the release of many inflammatory mediators such as prostaglandin, bradykinin, substance P, TNF- α , IL-1 β , IL-8 and other mediator, which will then stimulate primary afferent neurons to enhance the release of aspartate and glutamate. Hence, the result obtained from this chemical model of nociception suggests that the antinociceptive activity of 2-benzoyl-6-(3-bromo-4-hydroxybenzylidene)cyclohexen-1-ol may be linked partly to the inhibition of the inflammatory mediators.

Keywords: Acetic acid-induced abdominal constriction test, antinociceptive activity, diarylpentanoids analogues.

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Effectiveness of commercial pure stingless bee honey and propolis as antibacterial agent

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Abstract

Honey and propolis have remarkable properties, which has been enshrined in the Holy Quran. Scientific evident stated that honey and propolis are capable to heal the wounds, cure coughing and asthma and even as an anti-diabetic therapy. Honey and propolis that used in our study was collected from stingless bee in Bayu Kelulut Smart Digital Farm, Kedah. Then, the antibacterial study by disc diffusion assay on different Gram-positive and negative bacteria was carried out at the concentrated level. The findings revealed that stingless bee honey showed inhibition zone on the growth of *Klebsiella pneumoniae*, *Staphylococcus epidermidis*, *Salmonella typhi*, *Escherichia coli* and *Bacillus subtilis*. On the other side, stingless bee propolis also showed zone of inhibition towards *Staphylococcus epidermidis*, *Staphylococcus saprophyticus*, *Bacillus cereus* and *Bacillus subtilis*. Stingless bee honey and propolis play a role as natural chemotherapeutic agent against many bacterial infection and able to improve human health throughout their life.

Keywords: Stingless bee, honey, propolis, antibacterial, Gram-positive and negative bacteria.

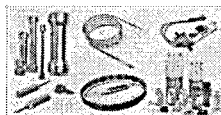
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