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ISSN. 0127 – 9394 http://rmc.upm.edu.my/synthesis

A Novel Protease for Biocatalysis

Bioremediation of Textile Dye

Compost Tea

Wildlife-logging Issues in the Tropical Rain Forest

RESEARCH NEWS OF UNIVERSITI PUTRA MALAYSIA **ISSUE 23 4TH QUARTER DECEMBER 2008**

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Scientists must be made aware of how important the impact of their work is and its possible applications on society and public opinion. It is hoped that this digest will provide the opportunity to interact particularly through feedback or direct mail to the scientist from either the private sector or by scientists from other government research institutions.

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Editorial

Future Directions of Research University – Breaking the Barriers

"Great things are not done by impulse, but by a series of small things brought together."

- Vincent Van Gogh (1853- 1890)

The above excerpt quoted from the world famous Dutch Post-Impressionist artist conveys that worthwhile achievements in every success story do not come easily without having to undergo the challenges and obstacles that lie ahead. While most people may be busy looking up at the prestigious universities like Oxford, Harvard, Cambridge, Yale and Princeton for their capability to secure "world class" status and ranking, yet how many of us do realise that the same principle to prevail those achievements still applies here? Nonetheless, how many of us are ready to adopt the principle and take up the challenge?

The designation as Research University (RU) is one of the proudest moments for Universiti Putra Malaysia (UPM) and at one fell swoop it gives high impact to its academia generally. Started as the School of Agriculture that was officially established on 21st May 1931 by John Scott, UPM was in the spotlight again after being successively the recipient of highest research grants from the government under the Eighth and the Ninth Malaysia Plan (RMK9). Impressive isn't it? Hence, here are the major challenges for the university and its academia: how to keep up with the new reputation as Research University, and how to fulfil the clients and public expectation with regards to the new status.

First and foremost the phrase "Research University" needs to be clearly defined and understood. Technically Research University is an expression used to indicate those universities that are proactive in research activities and also receiving high amount of research funding. The way that the university is organised expresses the freedom of that the academicians are allowed to carry out their researches. The research areas covered are unrestricted to only particular areas. In a nutshell, it is unlimited. It is therefore vital to ensure that the solidarity and cooperation from all academia is attained. Yet, that is another challenge!

It is also very important for a Research University to establish more international linkages and collaborations. Maintaining the relationship with the current existing collaborators by keeping up their expectation appears to be demanding. With the Research University status, the prospect is even wider. Regular visits of foreign consultants should be encouraged since they act as university watchdogs. Every single observation and remark made by the consultant should be taken into account. At this level, "hard feelings" should be put aside if there is any comment on weaknesses of the university. Perhaps the weaknesses, if any, can be used as the guidelines in setting up the benchmark in the future.

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Spotlight

Towards Internationalisation of Journals

The term internalisation can be defined as the process of integrating international standard dimensions into the governance, process and delivery of scholarly journals which include issues such as the objectives of the journal, the governance of the editorial board and its policy, the reviewing and publishing process, the delivery and distribution of published issues both print and electronic and the indexation status.

Internationalisation in some context has been defined as the ability of a scholarly journal to integrate an international dimension into its publication process, functions and delivery of articles so that ultimately the journal becomes accepted by authors internationally as the preferred channel to communicate their research as well the articles it publishes also becomes a frequent reference source to support authors' work.

Another attributes of an internationalised journal is the possibility of assessing its quality in terms of its impact factor. Articles published in the journals are being referenced by a sizeable number of globally published articles to give it an impact value irrespective of its value. This factor is applied relatively since the number of journals published in the various discipline varies. Fields such as mathematics and botany do not generate many articles and therefore achieve lower citations rate. Similarly, in the Arts and Humanities, it may take a longer time for an article to attract a meaningful number of citations when compared to areas such as the life sciences where the citations generally peak faster after a few years. Hence less weight is given to this factor for journals in the social sciences. In this case self-citation is also calculated. Besides the impact factor a newer measurement index is the h-index which is based on' the distribution of citations received by a given researcher's total publications.

The impact of a journal depends on how often articles in that journal are cited by other academic publications. The journal impact factor is a measure of the frequency with which the "average article" in a journal has been cited in a particular year. The impact factor will help you evaluate a journal's relative importance, especially when you compare it to others in the same field. The impact factor is calculated by dividing the number of current citations to articles published in the two previous years by the total number of articles published in the two previous years.

Although impact factor and related measurements are the best-known features of an international scientific journal, other characteristics are also of particular interest. The way a journal reflects the internationalised nature of science may be determined by many methods, one of which is based on the distribution of authoring and citing countries.

Managing Editor *ndeeps@admin.upm.edu.my*

WILDLIFE-LOGGING ISSUES IN THE TROPICAL RAIN FOREST

Forest Management

Moustached Babbler is a highly sensitive bird species and can be used as an indicator for forest health

In recent decades, there has been unprecedented growth in the scale and intensity of tropical forest management. Industrial forestry, both directly and indirectly, has wreaked havoc on the wildlife and the ecological integrity of tropical forests. While the mark of human intervention in modern times is quite apparent, forests have in fact been subject to some form of management. The wildlife of forests that we value so highly today is the result of varying intensities of human management over an extraordinarily long period. And the more we study even the most remote forests, the more surprised we are by the sophistication and extent of its management.

Just as human populations have exploded over the past century, the ability to manipulate, modify and replace tropical forests has changed considerably. In only a few decades, we have moved from low-intensity local management driven largely by efforts to meet local needs, to highly disruptive management driven by the desire to satisfy distant industrial needs. It is easy for us to forget that only since World War II have the chain saws and the heavy-tracked vehicles needed to clear and log tropical forests on a large scale become widely available. The unprecedented economic and technological growth of the second half of the twentieth century has totally changed the paradigm under which tropical forests exist and are managed. Most notably, our ability to manipulate forests in ways that can cause major environmental disturbance-has evolved far faster than the laws, institutions and traditions that previously served to safeguard the broader values of forests.

The international debate on forest conservation that is occurring under the auspices of the Convention on Biological Diversity and the Inter-governmental Forum on Forests has been important in helping us to change our perceptions about the nature of the threats to tropical forests and to think more clearly about possible solutions. In particular, this wide-ranging debate is helping to build a scientific and popular consensus that forestry alone may not be the cause of the problems, and that good forestry, in fact, may be part of the solution. Many of the problems we are wrestling with today in forest management have resulted from the appropriation of huge tracts of forest to single operators for extraction of a single product: timber. In contrast, forest management in the future will have to achieve a balance in access to all forest goods and services, reflecting the needs and demands of multiple stakeholders. Hopefully, we are moving toward an era in which "ecosystem management" will be the guiding principle of field managers rather than just the rhetoric of planners.

Wildlife Management

The management of wildlife is central to any new era of tropical forestry. Tropical forests harbor the majority of the world's animal species, perhaps 70 to 80 percent of all species. This wildlife is immensely valuable to humankind for a wide variety of goods and services. Wildlife has significant and diverse-and yet still little understood-values in the overall functioning of a forest ecosystem. Wildlife contributes to the livelihood of forest-dwelling people, providing an important source of food, and it has a range of aesthetic and ethical values-even for people who will never visit or encounter these species firsthand.

Reconciling conservation of the full spectrum of forest wildlife values with competing pressures to manage forests for production of industrial products as well as other land uses will require a quantum leap in our understanding about the complexity of forest systems. It will require an increase in our understanding of forest wildlife and how people in different sectors of society value its conservation, for economic, spiritual and other reasons. Ultimately, we must capture these values in our economic decision-making about forest management and land use.

Inevitably, multiple-use management of forests must be included in the portfolio of measures needed to meet the challenge of conserving the world's forest wildlife. At the same time, forestry practice will have to be based on more sophisticated application of ecological knowledge. Most wildlife management will require that forest practitioners have the ecological skills and training to make sound decisions. Clearly, we will be faced with much uncertainty about the impact of different management interventions on forest wildlife. Therefore, good forest management will have to be adaptive, marked by continuing negotiations among all users of the forest and careful monitoring of key measures or indicators of wildlife health.

Damage to the forest ecosystem can be minimised through new research findings

Future Research

Many challenges still remain. We are at an early stage of acquiring the knowledge and skills needed to better understand the implications of forest management practices on wildlife (i.e. wildlife management is one of the youngest profession in the world). Much more research will be needed, including a great deal of empirical observations of changes in wildlife populations. Current issues such as forest ecosystem health due to forest harvesting need to be addressed. In addition to investigating the effects of logging on wildlife, our main research is looking at the suitability of using wildlife to provide direct indication to the health of the forest ecosystem. In other words, the effectiveness at conserving the wildlife will also indicate the success in safeguarding ecosystem functions and biodiversity as a whole. As such, it means that the maintenance of the key components of biodiversity with respect to their significant ecological roles may be an option that aids in the sustainable management and the long-term productivity of forests.

However, using wildlife species (e.g. understorey birds) as indicators of forest ecosystem health is still in its infancy stage. Further studies would need to be concentrated on factors or habitat requirements that influence the existence of a species in certain forest conditions as well as their changing patterns over time. This would further aid in effective management of forests that are crucial for various human necessities. Future generations of scientists and practitioners will need to acquire more knowledge to establish new forestry techniques that adequately address wildlife conservation needs. Efforts to achieve true sustainable forest management are still facing complex technical, biological, social, and political hurdles. One step towards breaking the old paradigms of forest exploitation would be to provide foresters and politicians with empirically derived information showing:

- The impacts of present logging practices on the environment
- Cost-effective options for balancing timber and biodiversity conservation issues RMC

- **GOLD** *UPM Invention, Research & Innovation Exhibition (PRPI 2007).*
- **GOLD** *Malaysia Nature Society, 1996.*
- ***Travel Award** – The Rokyal Society London, UK, 1996, 1998.*
- ***Excellent Service Award** – 1999 and 2004.*

Award Winner

Landmark Publications

Zakaria, M. and R. Zamri. 2008. Immediate Effects of Selective Logging on the Feeding Guild of Understorey Bird Species Composition in Peninsular Malaysia. *Malaysian Forester* 71(2):139-151.

Zakaria, M. 2006. Understorey Bird Species as Indicators of Tropical Forest Ecosystem Health. *Journal of Ornithology* 147(5):113-124.

Zakaria, M., Leong, P.C. and Yusuf, M.E. 2005. Comparison of Species Composition in Three Forest Types: Towards using Bird as Indicator of Forest Ecosystem Health. *Journal of Biological Science* 5(6):734-737.

Styring, A.R. and Zakaria, M. 2004. Effects of Logging on Woodpeckers in a Malaysian Rain Forest: the Relationship between Resource Availability and Woodpecker Abundance. *Journal of Tropical Ecology* 20:495-504.

Zakaria, M. & Francis, C.M. 2001. The Effect of Logging on Birds in Tropical Forests of Indo-Australia. In: Fimbel R.A., Grajal A. & Robinson J.G. (Eds.). The Cutting Edge: Conserving Wildlife in Logged Tropical Forests. Columbia University Press, New York. pp. 193–212.

Expert's snapshots

Assoc. Prof. Dr. Mohamed Zakaria Hussin is well known internationally and nationally as one of the few leading Wildlife Ecologists and Ornithologists in the Asian region. He has established a research unit in the Faculty of Forestry, UPM named as Wildlife Ecological Research Unit (WILDER) that plans and manages wildlife research. As recognition to his research, he has been invited by the world renowned Wildlife Conservation Society based in New York to write a chapter on the effects of logging on birds for their book. The 808-page booken entitled "The Cutting Edge: Conserving Wildlife In Logged Forest" has been published by the Columbia University Press, New York in December 2001which is already available in the market worldwide and has become the main reference book for wildlife research. Zakaria has also been appointed as regional representative to the International Ornithological Union in 2005 and as a member in Asian Ornithological Union in 2006. Currently, he is studying the effects of habitat disturbance particularly logging on birds and investigating indicator species for forest ecosystem health. Findings of the research have been used in many government agencies (e.g. Forest Department, Wildlife Department, Department of Environment) management and development plans and have also been used by consultancy firms to predict the impacts of proposed development projects on wildlife. Zakaria can be reached via email at mzakaria@putra.upm.edu.my

RNPeptiZyme: A Novel Protease for Biocatalysis in Organic Solvents

Figure 2: Zones of lysis on skim milk agar. Pseudomonas aeruginosa strain K was grown and screened qualitatively for the protease production on skim milk agar containing (g/L): skim milk powder, 12.0 and nutrient agar, 13.8. The plate was incubated at 37°C for 24 h. Proteolytic enzyme produced by strain K hydrolysed the skim milk and formed clearing zones around the colonies on skim milk agar plate

Figure 1: RNPeptiZyme, a purified organic solvent-tolerant protease from Pseudomonas aeruginosa strain K

Proteases are important in biotechnological and industrial applications. From economical and technological point of view, microbial proteases are the commercial enzymes which have found wide applications in various industries, ranging from detergent, leather, silk, bakery, soy processing, meat tendering and brewery. Considering overall properties of different microbial proteases and their evaluations, the organic solvent-tolerant strain K protease, which carried a commercial label, RNPeptiZyme, is an excellent and valuable source of enzyme with regards to their novel properties such as pH and temperature stabilities among the mesophilic proteases. Needless to mention, the tremendous stability in various organic solvents which routinely posed detrimental damages to biological substances, enzymes in particular, is the most fascinating and important property possessed by this biocatalyst.

The success story of RNPeptiZyme was embarked on discovery of a locally isolated benzene-toluene-ethylbenzene-xylene (BTEX) tolerant bacterium as well as polycyclic-aromatic-hydrocarbons (PAHs) degrader, *Pseudomonas aeruginosa* strain K, as an extracellular organic solvent-tolerant protease producer. The formulations of physical and nutritional factors affecting the enzymes production, recently, have led to the optimised and bulk production of protease from *P. aeruginosa* strain K. The crude fraction of strain K protease was tolerant up to at least 50% (v/v) of benzene, *n*-hexane, 1-decanol, isooctane and n-hexadecane and displayed a great stability in the presence of 25% (v/v) *n*-decane and n-dodecane. Due to an overwhelming interest to explore the astonishing property possessed by this enzyme, it was further purified to homogeneity by two steps of purification techniques, namely ammonium sulfate precipitation and anion exchange chromatography. Organic solvents such as isooctane, *n*-hexadecane, *n*-dodecane and *n*-decane (25% v/v) enhanced the activity of RNPeptiZyme by 85%, 83%, 78% and 59%, respectively. This characteristic has served as an added value to the enzyme since several well-known proteases such as thermolysin and chymotrypsin were not sufficiently stable in organic solvents. In addition, the enzyme also exhibited outstanding stabilities of 1.11, 1.82, 1.50, 1.75 and 1.80 times in 1-decanol, isooctane, *n*-decane, *n*-dodecane and *n*-hexadecane, respectively, after 14 days of incubation at 37°C. Thus, the finding concerning the incredible stability of RNPeptiZyme towards organic solvents which typically posed a detrimental effect on enzyme has laid further information to support the application of RNPeptiZyme in synthetic industries, particularly, peptide synthesis. RNPeptiZyme was recognised as an alkaline metalloprotease with an optimum pH of 10.0 and temperature of 70°C. Further investigation has unveiled that this enzyme was activated by a range of metal ions such as Mg^{2+}, Mn^{2+}, Zn^{2+} and Sr^{2+}, as well as some tested denaturing agents and surfactants, for instant, 6M urea, Triton-X-100 and Tween 20. RNPeptiZyme was capable of hydrolysing all the soluble and insoluble substrates tested such as casein, azocasein and haemoglobin as well as large molecules such as azocoll.

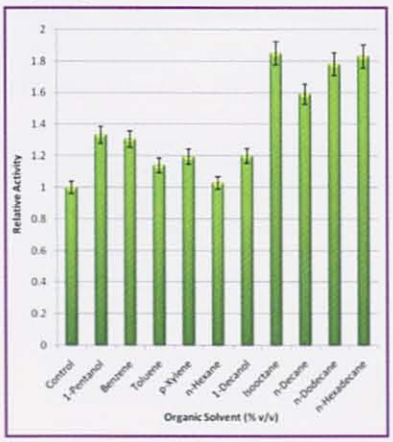

Figure 3— Organic solvent stability of the purified protease. One mL of organic solvent was added to 3.0 mL of the purified protease and incubated at 37°C, 150 rpm for 30 min. The protease activity measured without the presence of organic solvent was taken as 1.0 (control).

No doubt, RNPeptiZyme, with such tolerance to diverse organic solvents, alkaline pH and high temperature, in addition to broad range of substrate specificity and activation in denaturing agents and surfactants, is definitely a perfect choice of biocatalyst to replace the utilisation of hazardous chemicals in industries towards a better and sustainable environment. RMC

Landmark Publications

Rahman, RNZA., Geok, LP., Basri, M., and Salleh, AB., (2006). An organic solvent-stable alkaline protease from Pseudomonas aeruginosa strain K: Enzyme purification and characterisation. *Enzyme and Microbial Technology*, 39: 1484-1491.

Rahman, RNZA., Geok, LP., Basri, M., and Salleh, AB., (2005a). Physical factors affecting the production of organic solvent-tolerant protease by *Pseudomonas aeruginosa* strain K. *Bioresource Technology*, 96: 429-436.

Rahman, RNZA., Geok, LP., Basri, M., and Salleh, AB., (2005b). An organic solvent-tolerant protease from Pseudomonas aeruginosa strain K: nutritional factors affecting protease production. *Enzyme and Microbial Technology*, 36: 749-757.

Geok, LP., Razak, CNA., Rahman, RNZA., Basri, M., and Salleh, AB., (2003). Isolation and screening of an extracellular organic solvent-tolerant protease producer. *Biochemical Engineering Journal*, 13: 73-77.

- GOLD *International Exposition of Research & Innovation of Institutions of Higher Learning (PECIPTA 2007)*
- Bronze *Innovation Award, Biotechnology Asia 2006*
- Patent-pending: *Malaysian PI 20034117* • Trademark: *Malaysian #06-21545.*

Reader Enquiry

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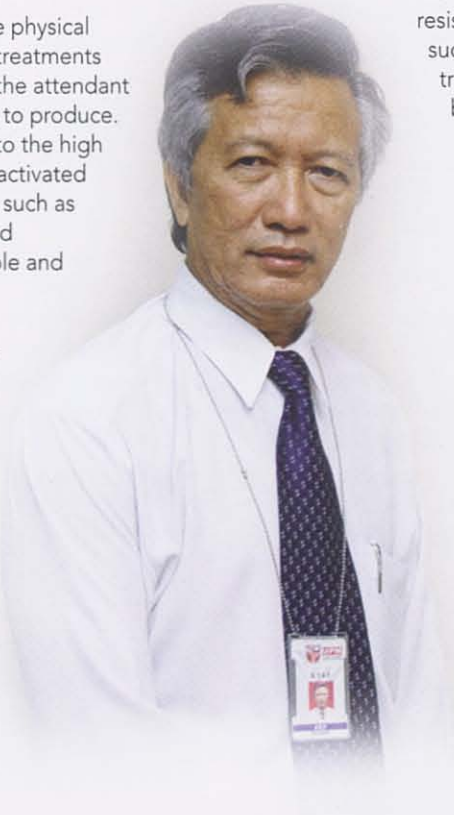
Bioremediation of Textile Dye Polluted Water Using Xenoclean-Azo®

Figure 1: Dye effluent draining into a nearby river from a textile company in Kelantan

The modern world will be a drab and colourless place without the use of synthetic dyes. Indeed, synthetic dyes have largely replaced natural dyes, especially in the textile industry largely due to their generally superior qualities such as range of colours, colour intensity, ease of manufacture, fastness, and resistance to fading by physical, chemical and microbial agents.

Despite the advantages of synthetic dyes over natural dyes, synthetic dyes present their own new set of problems. The most obvious problem is aesthetic pollution of waterways caused by the presence of dyes leached from textile factories since they are visible even at low concentrations (Fig.1). In addition, the presence of dyes could also potentially reduce the amount of sunlight reaching the bottom of rivers and lakes and thus affects the ability of water plants to carry out photosynthesis. Another more insidious problem is production of potentially carcinogenic aromatic amine compounds from the partial cleavage of synthetic dyes, especially from the azoic dye group.

Current azo-dye removal methods usually involve physical and/or chemical treatments. However, chemical treatments produce large amounts of chemical sludge with the attendant disposal problems while ozone is very expensive to produce. Physical treatments are also very expensive due to the high operating expenses to produce and regenerate activated carbon. For these reasons, biological treatments such as utilizing the biodegradative ability of bacteria and ligninolytic fungi are being investigated as a viable and cost effective alternative.



The process that utilizes microorganisms or their enzymes to biotransform the contaminated environment to their original state is called bioremediation. Fungi, such as Phanerochaete chrysoporium and Tinctporia sp., both belonging to the ligninolytic white-rot family, are among the first to have been shown to have the ability to degrade azo dyes. Until recently however, most published research, including those that have been done in Malaysia has focused on these temperate species while ignoring the rich biodiversity available in our tropical country. At UPM, a white rot fungus known as Isolate 5-UPM has been shown to have impressive dye degrading ability (Fig. 2). Actual textile industrial effluents from Kelantan have been collected and experimented with Isolate 5-UPM and positive results were obtained. The blue-colored effluent turned colorless within 3 days after being incubated in the presence of immobilized Isolate 5-UPM. This isolated white-rot fungus is known to be resistance to other recalcitrant present in the effluent such as heavy metals. As Malaysia is blessed by its tropical location and possesses one of the richest biodiversity in the world, more white-rot fungi should be screened for better degradation of azo-dyes. Studies on the by-products produced form the dye-degradation should be carried out to ensure full detoxification of effluent. Mass production of Isolate 5-UPM and its enzyme can be used to treat large-scale industrial effluents directly. RMC

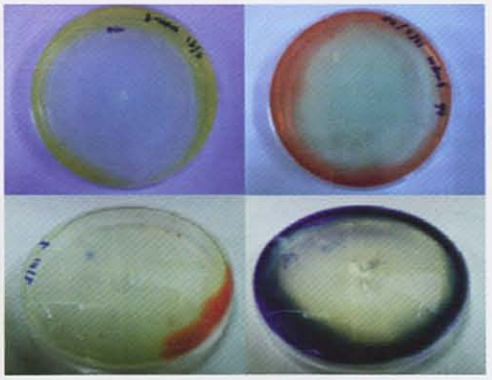


Figure 2: Clearing zones on screening medium indicating azo-dyes degrading ability. [Isolate 5-UPM 7 days old culture]

Award Winner

● GOLD *International Exposition of Research & Innovation of Institutions of Higher Learning (PECIPTA 2007)*

Reader Enquiry
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Compost Tea: A Disease Management Tool for Organic Vegetable Production

Diseases from phytopathogenic fungi often represent a serious limiting factor in successful crop production. Chemical pesticides that are generally used for their control may often lead to harmful environmental consequences and deterioration of soil quality, including the development of resistance in fungal species through their over-use.

Therefore increasing interest has arisen in recent years in the use of bioactive natural organic substrates featuring fungicidal properties, such as compost or compost teas, as environmentally safe alternatives to chemicals. Previous studies have demonstrated that compost as a soil amendment or in the form of foliar sprays are able to control soil and air-borne plant diseases caused by various phytopathogenic micro-organisms.

Compost teas are prepared by brewing mature compost with microbial supplements as additives in water to extract the nutrients, humic substances and beneficial micro-organisms. The mixture is mechanically aerated to create aerobic conditions in the solution. The compost provides the source of microbes, and the microbial food catalyst amendments promote the growth and multiplication of microbes in the extracts. Active components of compost teas comprised of yeasts, bacteria, fungi and chemical antagonists. It manages plant pathogens through microbial competition, antagonism, induced resistance and antibiosis. The supply of soluble nutrients and humic substances promote plant growth reducing the predisposing effect to pathogens.

Compost tea can be applied as a foliar spray, seed treatment: by soaking seeds in compost tea prior to planting or as a soil drench: to inoculate rhizosphere at transplant and seedling stage; or base of full-grown plants. Foliar application of compost teas improved establishment and colonising ability of antagonists in the phyllosphere and enhance the effectiveness of disease control with added advantage of using small volume of antagonist preparation as it can be enhanced further by fortification with *Trichoderma* spp. preparation. There was a reduction in disease severity of fruit and vegetables such as muskmelon, *okra, luffa, brassica, kangkong* and cucumber caused by various fungal pathogens treated with compost teas prepared from empty fruit bunch (EFB) and rice straw (RST) composts. The disease symptoms were delayed as shown by the low epidemic rates.

Observations on growth performance indicated that compost teas significantly enhanced the growth of vegetables in terms of shoot and root length, number of leaves and leaf area and total yield. This biological approach in disease management being environmentally safe has the potential of becoming an alternative/complement to fungicides in conventional and organic farming systems. Problems of handling and disposal of agro – waste residues (EFB and RST) can be solved partially by converting them into useable resources. Research into these beneficial product illustrate that they can be part of the answer to increasing ecological concerns. RMC

Landmark Publications

a) Yuvarani, R., Sariah, M. and Yasmeen, S. 2009. Development of microbial starter for the production of microbial-enriched compost tea. Submitted *Crop Protection*: (under review)

b) Yasmeen Siddiqui, Sariah Meon, Razi Ismail , Mawardi Rahmani. 2009. Bio-potential of compost tea from agro-waste to suppress Choanephora cucurbitarum L. the causal pathogen of wet rot of okra. *Biocontrol* , 49:38-49.

c) Yasmeen Siddiqui, Sariah Meon, Mohd R. Ismail, Asgar Ali. 2008. Trichoderma -fortified compost extracts for the control of Choanephora wet rot in okra production. *Crop Protection* , 27: 385-390.

d) Yasmeen Siddiqui, Sariah Meon, Razi Ismail, Mawardi Rahmani, Asgar Ali. 2008. Bio-efficiency of compost extracts on the wet rot incidence, morphological and physiological growth of okra (Abelmoschus esculentus [(L.) Moench]). *Sc Horticulturae* , 117:9-14

- GOLD *UPM Invention, Research & Innovation Exhibition (PRPI 2008).*
- SILVER *UPM Invention, Research & Innovation Exhibition (PRPI 2007).*

Reader Enquiry

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Anti-hypertension and Anti-atherogenic Herbal Tea and Functional Ingredients from Oil Palm Leaves

Oxidative stress has been associated with the development of hypertension. Increasing amount of super oxide depletes nitric oxide (NO), which accounts for the biological actions of endothelial-derived relaxing factor. Previous study (Abeywardena et al, 2002) showed that oil palm frond extract (oil palm leaves tea) caused endothelial dependent vasorelaxation in isolated aorta preparations.

Recently, oil palm leaves tea was tested for the in vivo effect on the ability to reduce blood pressure (BP) in two different hypertensive rat models i.e. spontaneously hypertensive rats (genetically hypertensive rats) and nitric oxide deficient rats (NODR). Adding N-nitro-L-Arginine Methyl Ester (L-NAME) into the drinking water induced nitric oxide deficiency in the normotensive rats, causing endothelial dysfunction and subsequently hypertension. Rats were fed with oil palm leaves extract for 12 weeks. The anti-hypertensive drug, captopril, was used as a reference for this study. BP was measured weekly and the reduction/increment was observed closely.

The oil palm leaves extract significantly attenuated the increment in BP of endothelium dysfunctional hypertensive rats to the normal range comparable to that of captopril but did not reduce the BP of genetically hypertensive rats. This indicates that oil palm leaves extract reduces BP via endothelial dependent mechanism possibly by reducing oxidative stress and as result increases the bioavailability of NO, as it did not intervene with the active sympathetic nervous system that is predominant in genetically hypertensive rats. Relative heart weights and tissues histology were significantly better in genetically hypertensive rats plus oil palm leaves extract compared to untreated genetically hypertensive rats, indicating that it has organ protective effects in these rats although BP was not affected.

The lipid-lowering and anti-hyper cholesterol activities of oil palm leaves extract were also investigated. Rats fed with high-cholesterol diet supplemented with oil palm leaves extract for 12 weeks, showed lower body weight gain as compared to rats on high cholesterol diet alone. High cholesterol diet caused a significant increase in body weight, total plasma cholesterol, plasma triglycerides (TG), compared to normal diet control rats, which was significantly reduced with oil palm leaves extract supplementation. High cholesterol diet rats supplemented with oil palm leaves showed a trend of increased plasma high density lipoprotein cholesterol (HDL-C), and lower AI (atherogenic index) compared to those without oil palm leaves extract supplements. These oil palm leaves extract showed significant hypolipidemia, antioxidative, lower AI and cholesterol lowering effect and were a potential functional food for reducing degenerative diseases risks.

The consumption of oil palm leaves tea with hypercholesterolemic diet improved the lipid profile and reduced weight gain and indicated that oil palm leaves tea may help reduce cardiovascular disease risk. RMC

● **Bronze** *UPM Invention, Research & Innovation Exhibition (PRPI 2007)*

Reader Enquiry
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Down Memory Lane

(Newsmakers around the campus)

1. **HEALTH FIRST!:** APP '07 Health cluster winner Prof. Dr. Abdul Hamid Abdul Rashid from the Medical & Health Science Faculty receiving his award from the Vice Chancellor.
2. **IT'S MINE!:** Prof. Dr. Arbakariya Ariff from Biotechnology and Biomolecular Science, the winner of APP '07 Applied Science cluster.
3. **VIRTUOUS:** A/P Dr. Mohamed Othman *(right)* with one of his post graduate students giving their best pose!
4. **SHE'S THE MAN!:** Dr. Zanariah Abdul Majid receiving a gold medal for her R&D project, "Direct Block Software for Solving Higher Order Ordinary Different Equations".
5. **HE DID IT AGAIN!:** Dr. Wan Manshol Wan Zin from Malaysian Nuclear Agency presenting an award to gold medallist A/P Dr. Ishak Aris.
6. **LISTEN CAREFULLY!:** A/P Dr. Lai Oi Ming from the Faculty of Biotechnology and Biomolecular Science demonstrating her product to the juries.
7. **CONSCIENTIOUS:** The Academic Writing Workshop with Prof. Anthony Leong is packed with attentive crowd.
8. **LAUGHTER IS THE BEST MEDICINE!:** *(from left)* Prof. David Min and Prof. Yusof Ibrahim treasuring the moment together.
9. **LESSONS OF THE DAY:** *(from left)* Prof. Mark Orbe and Prof Emeritus Gary McLean, the guest speakers of the Academic Writing Workshop held at UPM.
10. **DELIGHTFUL:** Prof. Irene Ng's speech wins the heart of the participants!

ResearchHAPPENINGS

11. **TAKE A BREAK!:** Prof. Datin Paduka Dr. Khatijah Yusoff, Prof. Irene Ng and Dr. Nayan Kanwal enjoying their meal.
12. **WHOLEHEARTED:** Prof. Mark Orbe receiving a souvenir from Prof. Md. Salleh Hj. Hassan before leaving UPM.
13. **HOW INNOVATION TRANSFORMS:** Dr Nayan Kanwal and Prof. Emeritus Paul Siegel in a demo prior to his presentation.
14. **FOR THE RECORD:** The UPM representatives and Prof. Tomlinson after the MOU signing ceremony.
15. **SWEET TASTE OF SWEAT:** Prof. Dato' Mohamed Shariff Mohd. Din smiles gleefully as he collecting his reward from Dato' Seri Mohamed Khaled Nordin.
16. **CHECK THIS OUT!:** *(from left)* Prof. Jane and Dr. Peter Mather scrutinising the UPM Hallmark Journal, Pertanika.
17. **SHARING THE PASSION:** Prof. Dzolkhifli Omar delivering his keynote address during his inaugural lecture.
18. **PUBLICITY MEANS YES:** UPM's delegation during their visit to UPENA, UiTM, Shah Alam.
19. **SMART MOVE:** Speakers at the Scientific Publications Seminar 2008 at Cititel Hotel, KL.

The Horseshoe Crab and their Use in Human Cardiac Disorders

Marine natural products have always been a source of new leads for the treatment of many deadly diseases such as cancer, acquired immuno-deficiency syndrome (AIDS) etc. The pharmacology of marine compounds such as anti-helminthes, anti-bacterial, anti-coagulant, anti-diabetic, anti-fungal, anti-inflammatory, anti-malarial, anti-platelet, anti-protozoa, anti-tuberculosis and anti-viral activities affecting the cardiovascular and nervous systems are highly encouraging. Several molecules isolated from various marine organisms such as micro organisms, algae, fungi, invertebrates and vertebrates are currently under an advanced stage of clinical trials. Some of them have already been marketed as drugs. A number of marine peptides have been isolated in recent years which exhibit potent biological activities and many of the compounds showed promising anticancer activity. Didemnin was the first marine peptide that entered in human clinical trials in USA for the treatment of cancer, and other anticancer peptides such as kahalalide F, hemiasterlin, dolastatins, cemadotin, soblidotin, didemnins and aplidine have entered in the clinical trials.

Cardiac disorders and congestive heart failure has been remaining among most prominent health challenges despite many breakthroughs in cardiovascular medicine. In fact, despite successful approaches to prevent or limit cardiovascular disease, the restoration of function to the damaged heart remains a formidable challenge. For those suffering from common, but deadly, heart diseases, stem cell biology represents a new medical frontier. Researchers are working toward using stem cells to replace damaged heart cells and literally restore cardiac function. The destruction of heart muscle cells, known as cardiomyocytes *(Figure 1)*, can be the result of hypertension, chronic insufficiency in the blood supply to the heart muscle caused by coronary artery disease or a heart attack, the sudden closing of a blood vessel supplying oxygen to the heart. Despite advances in surgical procedures, mechanical assistance devices, drug, therapy and organ transplantation, more than half of patients with congestive heart failure die within five years of initial diagnosis. Researches have shown that therapies such as clot-busting medications can re-establish blood flow to the damaged regions of the heart and limit the death of cardio-myocytes. Scientist have been exploring ways to save additional lives by using replacement cells for dead or impaired cells so that the weakened heart muscle can regain its pumping power.

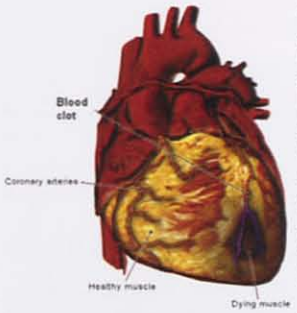

Figure 1: Destruction of heart muscle cells, known as cardiomyocytes

The experimental application of hematopoietic stem cells for the regeneration of the tissues in the heart has recently been demonstrated. In this demonstration, a heart attack was induced in mice by tying off a major blood vessel, the left main coronary artery. Through the identification of unique cellular surface markers, the investigators then isolated a selected group of adult primitive bone marrow cells with a high capacity to develop into cells of multiple types. This way the cardiac tissue can be regenerated in the mouse heart attack model through the introduction of adult stem cells from mouse bone marrow.

Cardiac myocytes are the first cells to differentiate during the development of a vertebrate embryo and a wide range of molecules take part in various steps in this process. New advances in cardiomyocyte regeneration are being made in human embryonic stem cell research and because of their ability to differentiate into any cell type in the adult body. Embryonic stem cells are another possible source for cardiac repair cells. The first step in this application was demonstrated in 2000 by a team led by Itskovitz-Eldor. In this experiment human embryonic stem cells can reproducibly differentiate in culture into embryoid bodies made up of cell types from the body's three embryonic germ layers. Among the various cell types noted, the physical appearance of cardiomyocytes, showed cellular markers consistent with heart cells and demonstrated contractile activity similar to cardiomyocytes when observed under the microscope. Several reports suggest that bone marrow (BM), derived hematopoietic stem cells, mesenchymal stem cells and mononuclear cells exhibit a high degree of differentiation of plasticity and thus could potentially be used to regenerate infarcted myocardium in humans.

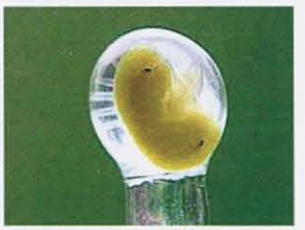

Figure 3: Fluid between the outer envelops and embryo of the fertilised eggs—Peri-vitelline fluid

Figure 2: The horseshoe crab

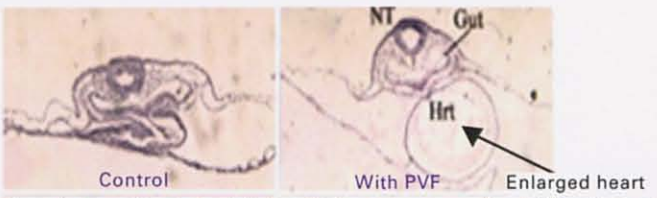

Figure 4: A constituent of peri-vitelline fluid can enhance growth and differentiation of chick embryonic heart

The horseshoe crab *(Figure 2)* has been useful to human in different ways for the past several decades. The fertilised eggs of the horseshoe crab contain various valuable factors. The fluid between the outer envelops and embryo of the fertilised eggs is known as peri-vitelline fluid which contains important primitive types of proteins *(Figure 3)*. While exploring biologically active molecules from marine sources, I observed that a constituent of peri-vitelline fluid can enhance growth and differentiation of chick embryonic heart *(Figure 4)*. The factor - a novel lectin - has been purified and identified by our research group as the promising cardiac promoting molecule. This molecule influences cardiac development by increasing the number of cells constituting the heart and by modulating the expression of several cardiac development regulatory genes in chick embryos. Using mouse embryonic stem cells the cardiac myocyte-enhancing capacity of this molecule extends to mammals and its effects can be blocked using methylated sugars. This molecule may prove to be an important tool in the study of cardiomyocyte differentiation.

Our initial study also showed that the peri-vitelline fluid possessed pro-angiogenic activities in an in vitro study. This has been demonstrated that peri-vitelline fluid either alone or in combination with pro-angiogenic factors, improve differentiation of CD34+ stem cells into myocytes. Therefore, it is suggested that peri-vitelline fluid contains an active component enhancing the differentiation of stem cells in myocytes which could be useful for therapeutic application in ischemic cardiopathy and vascular diseases. It has also been demonstrated that in presence of peri-vitelline fluid a significant improvement in the differentiation of CD34+ cell in to myocyte. The peri-vitelline fluid also stimulates cardiovascular regeneration in experimental model. The possibility of shunting of bone marrow progenitor cells towards cardiomyocyte differentiation has also been observed.

This present study thus opens up entirely new possibilities using peri-vitelline fluid of the horseshoe crab for medical application to improve stem cell differentiation into cardiomyocytes on severe ischemic diseases which cannot be improved by classic therapy. Though along Malaysian coast, three valuable species of the horseshoe crab are found but unfortunately not much work has been done on their bio-medical potential. Hence it is prudent on our part to put our sincere efforts to know more about this amazing creature.

Reader Enquiry
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This is the third part of the continuing series of this feature article.
The second part was published in Synthesis Issue 22 (September 2008).

Guidelines for Pollution in Drinking Water

Mohammad Reza Mohammad Shafiee, Mohamad Pauzi Zakaria, Nayan Deep S. Kanwal, Mahyar Sakari, Pourya Shahpoury Bahry and Alireza Riyahi Bakhtiari

Water pollution is one of the major and serious health threats to the environment as well as human beings.

There are several pollutants that are a threat to the drinking water and they can be classified in six categories, i.e.

- Microorganisms;
- Disinfectants;
- Disinfection byproducts;
- Inorganic chemicals;
- Organic chemicals; and
- Radionuclides

These form the potential pollutants to human drinking water worldwide. The current guideline provides necessary information on these threats. The first three categories have been covered in the previous issue(s) of Synthesis. Information on the fourth category that focuses on Inorganic chemicals is provided in this issue.

Inorganic Chemicals

Contaminant	MRDLG[1] (mg/L)*	MRDL[2] (mg/L)	Potential Health Effects from Ingestion of Water	Sources of Contaminant in Drinking Water
Antimony	0.006	0.006	• Increase in blood cholesterol; • Decrease in blood sugar	• Discharge from petroleum refineries; • Fire retardants; ceramics; • Electronics; • Solder
Arsenic	0	0.010 as of 01/23/06	• Skin damage or problems with circulatory systems, and • May have increased risk of getting cancer	• Erosion of natural deposits; • Runoff from orchards; • Runoff from glass & electronics production wastes
Asbestos (fiber >10 micrometers)	7 million fibers per liter	7 million fibers per liter	• Increased risk of developing benign intestinal polyps	• Decay of asbestos cement in water mains; • Erosion of natural deposits
Barium	2	2	• Increase in blood pressure	• Discharge of drilling wastes; • Discharge from metal refineries; • Erosion of natural deposits
Beryllium	0.004	0.004	• Intestinal lesions	• Discharge from metal refineries and coal-burning factories; • Discharge from electrical, aerospace, and defense industries
Cadmium	0.005	0.005	• Kidney damage	• Corrosion of galvanised pipes; • Erosion of natural deposits; • Discharge from metal refineries; • Runoff from waste batteries and paints
Chromium (total)	0.1	0.1	• Allergic dermatitis	• Discharge from steel and pulp mills; • Erosion of natural deposits
Copper	1.3	Action Level=1.3	• Short term exposure: Gastrointestinal distress • Long term exposure: Liver or kidney damage • People with Wilson's Disease should consult their personal doctor if the amount of copper in their water exceeds the action level	• Corrosion of household plumbing systems; • Erosion of natural deposits

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NewsBriefs

More Medals Brought Back from Belgium!

SERDANG, 24 NOV – After facing through lots of obstacles and the spirit of never give up, six researchers from Universiti Putra Malaysia (UPM) had finally paid off when they successfully grabbed 9 medals in Brussels Innova 2008 in conjunction with the '57th International Innovation' exhibition held in Belgium recently.

Head of Malaysian delegation, Associate Prof. Dr. Ratnasamy Muniandy stated that UPM's success in bagging a special award medal, five gold medals and three silver medals had firmly positioned UPM as the top recipient among the Malaysian delegation.

"Malaysian gave other products especially from Russia and Hungary a good run for their money due to the comparable quality. 405 products from 30 countries were put up for contest with 34 products are from Malaysia (6 IPTAs and 1 research institute)," he added.

Associate Prof. Dr. Lai Oi Ming from the Faculty of Biotechnology and Bimolecular Sciences seized three medals including the special award, 'World International Property Organisation for the Best Invention' produced by 'Women for the product, 'Novel Catalyst for Production of Acylglycerol Esters' which secured a gold medal as well. She claimed that the novel catalyst will significantly reduce the production cost of Acylglycerol Esters and it can be reused and regenerated for many cycles.

On the other hand, the second gold medal receipient got the award for 'the Novel Process for Production of Diacylglycerols from Vegetable Oil'; where it is the functional oil known as DAG yielded from vegetable oil hydrolysed in a control manner by using an immobilised lipase as biocatalyst. According to him, both products are the fruitful outcome of the collaboration done with Sime Darby Sdn. Bhd.

While the third gold medal was awarded to Prof. Dr. Raja Noor Zaliha Raja Abd. Rahman from the same faculty with her product, '205y Lipase: A New Novel Organic Solvent Tolerant Enzyme for Industrial Applications' which is a solvent-tolerant enzyme utilised widely in the industry of detergent, cosmetics, pharmaceutical and paper manufacturing. "This project competently reduces cost and the country does not have to rely on imported enzymes," she said. In addition, she also claimed the silver medal through 'RNPeptiZyme ™:A New Novel Protease For Biocatalysis In Organic Solvents' which is a new biocatalyst to be applied in synthesis, skin, and foods industry and its potential as cleaning agent in detergent.

Prof. Dr. Azni Idris from the Faculty of Engineering, on the other hand, had also won the fourth gold medal for his product, 'New Bio-coagulant Using Fungi for Treating Polluted Water and Wastewater' where he has developed BioFloc, a non-chemical substance used for river water treatment.

The fifth gold medal was won by Assoc. Prof. Dr. Ishak Aris from the same faculty together with Prof. Dr. Azni for the work of 'Animated Robotic Language For Children- ANROLAN™' which is a special programming language package developed to assist children as early as six to program robot's movement.

Another silver medal brought home was awarded to Assoc. Prof. Dr. Shuhaimi Mustafa from the Halal Products Research Institute for his product, 'Rapid, Specific and Cheap Real-Time Halal Verification Kit' which is able to detect porcine of DNA in food products.

Another silver medal was awarded to Assoc. Prof. Adzir Mahdi from the Faculty of Engineering for his product 'Multi-wavelength Brillouin-Erbium Fibre Laser,' which is a laser system called 'Brillouin-erbium' to produce multi-wavelength in the same laser cavity at more effective and lower cost.

The Brussels Innova 2008 really put our remarkable UPM researchers at par with the most outstanding researchers from all over the world. Hooray for them!

UPM wins at the British Invention Show (BIS) 2008

LONDON, 18 Oct – Three researchers from the Faculty of Engineering, Universiti Putra Malaysia (UPM) had hit their big success by winning 5 medals including two special grand awards at the British Invention Show (BIS) recently.

Assoc. Prof. Dr. Abdul Rashid Mohamed Shariff won the special award; the 'Diamond Award' under the category of the 'Natural Earth'. He also won the gold medal for the same product, 'GIS-Based System for Paddy Precision Farming.'

"This product is related to the use of agricultural technology similar to for the paddy planting which is able to optimise the use of fertilisers and pesticides and can also maximise the potential on the production of the paddy," he said.

Dr. Norhafizah Abdullah also won the 'Double Gold Award' for the Industrial category. She also managed to grab the gold medal for the 'Supercritical Anti Solvent for Nano-particles Encapsulation' product. It is a discovery to a new method in encapsulating drugs into miniature sizes through the application of 'Supercritical Fluid Anti Solvent' (SAS).

The third gold medal won by UPM was by Assoc. Prof. Dr. Sabira Khatun, for her product 'Intelligent Traffic Management System' (ITMS) with 'Smart Auto Driven Vehicle' (SDAV).

For this year, the BIS had accommodated a total of 131 research projects world wide, with 38 projects from the Malaysian Public Institute of Higher Learning (IPTA) while UPM had tendered three participations.

Hail Our UPM Researchers 'Heroes' For Gold Medals and One Bronze from iENA 2008!

NUREMBERG, Nov 2nd – Our stupendous UPM researchers did it again when they managed to bring back gold and bronze medals. The 'International Exhibition of Ideas- Inventions-New Products (iENA) 2008'.

Deputy Dean (Graduate and Research), Faculty of Engineering, Prof. Ir. Dr. Norman Mariun won a gold medal for his research product entitled 'Ohmic Heated Pasteuriser.'

Another outstanding winner, Prof. Dr. Suhaila Mohamed received a gold metal for her research product 'CardioMate-functional Food Seasoning for Cardiovascular Health.' "The outcome of this

product has effectively aided the recovering of diabetes, high blood pressure, high cholesterol, atherosclerosis (the ruin of blood vessels), obesity, kidney related diseases as well as combating different types of cancer in the animal studies,".

The bronze medal went to Dr. Alyani Ismail for his product 'Compact 'Butterfly-shaped' Ultra-wide Band Microwave Filter.'

The Head of Delegation, Assoc. Prof. Dr. Ratnasamy Muniandy said that an estimated of 50 percent of Malaysian products have pompously won the gold medals.

Seven institutes of higher learning (IPTAs) including one research institute took part in this year's exhibition which was held from 30th October to 2nd November at the Nuremberg Exhibition Centre, Germany.

UPM Wins BIOMALAYSIA Gold

Universiti Putra Malaysia (UPM) researcher, Assoc. Prof. Dr. Lai Oi Ming won the Bio-Inno Awards gold medal at the BioMalaysia Exhibition 2008.

Dr. Lai, who is a lecturer at UPM's Faculty of Biotechnology and Bimolecular Sciences, won the award for the production of "Palm-based Anti Obesity Functional Oil" which is known as DAG that reduces body weight and fat.

"The usage of this oil will help one to lower their appetite for food and can cut lipid levels in blood,". She also won a silver medal for the same.

UPM also won bronze through Prof. Dr. Asmah Rahmat from the Faculty of Medicine and Health Sciences for the product called "Strobilanthes Cripus Juice (SCJ): High in Antioxidant and Great Potential for Wound Healing for Diabetic Patients".

BioMalaysia 2008, which was held at the Kuala Lumpur Convention Center from 7 – 9 October was organised by the Ministry of Science, Technology and Innovation (MOSTI) and co-organised by BiotechCorp, was officiated by the Prime Minister, Dato' Seri Abdullah Ahmad Badawi. The Minister of Science, Technology and Innovation, Datuk Dr. Maximus Johnity Ongkili gave away the prizes to the winners.

The exhibition, with its theme 'Strengthening Value Creation in Biotechnology', focused on aspects of agriculture, health management and industry biotechnology and served as a sound platform for researchers to establish industrial networking in biotechnology within and beyond the country.

Pertanika paving the way!

Dr Nayan Kanwal, Executive Editor, Pertanika Journals along with other officials of Publication Division, RMC visited the University Publication Centre (UPENA), UiTM on 23 November 2008 with a view to publicise Pertanika Journals to other public universities in Malaysia.

The group comprising of Mr Azmi Mohd Noordin, Mr. Jamali Janib, Ms. Erica Kwan Lee Yin, Ms. Diyana Nawar Kasimon, Ms. Lailatul Zuraini Suhim and Mr. Zainal Abdul Kadir were all welcomed by Assoc. Prof. Dr. Hamidah Junid, Director, UPENA along with Assoc. Prof. Dr. Md. Ariss Abu Yamin, Deputy Director, UPENA and several other members.

Dr Nayan during his talk with UPENA officials introduced Pertanika journals and established a good reputation with UPENA.

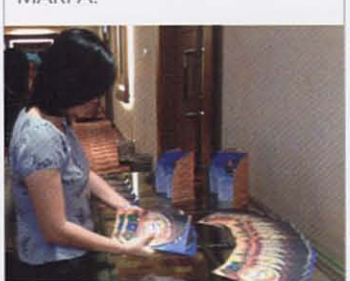
Scientific Publications Seminar 2008

"The current challenges of scientific publication should be faced with new and fresh strategies by local higher learning institutions in order to be at par with other top universities in the world," said Y. Bhg. Datuk Dr. Daud Mohamad, the Head of Director, Malaysia Nuclear Agency, in his officiating speech at the opening of the *"2008 Scientific Publications Seminar"*.

The two-day seminar, with its theme *"Mencetus Kemurniaan Karya"*, also stressed on current publication issues, among others were Electronic Publication and Marketing Scientific Publication.

The staff from the Research Management Centre (RMC), consisting of Dr. Nayan Kanwal, Mr Azmi Mohd Noordin, Mr Jamali Janib, Ms. Erica Kwan Lee Yin and Ms. Diyana Nawar Kasimon had attended the seminar held from 25 - 26 November 2008 at Cititel Hotel, Kuala Lumpur.

The seminar, which was packed with presentation of key-note addresses, papers and forums, was co-organised by MOSTI, Malaysia Nuclear Agency and MARPA.



Mr Azmi, Senior Assistant Registrar and Ms. Erica, Publication Officer (Pertanika Journals) took the opportunity to publicise Pertanika journals at the seminar.

Cyanide (as free cyanide)	0.2	0.2	• Nerve damage or thyroid problems	• Discharge from steel/metal factories; • Discharge from plastic and fertiliser factories
Fluoride	4.0	4.0	• Bone disease (pain and tenderness of the bones); • Children may get mottled teeth	• Water additive which promotes strong teeth; • Erosion of natural deposits; • Discharge from fertiliser and aluminum factories
Lead	zero	Action Level=0.015	• Infants and children: Delays in physical or mental development; children could show slight deficits in attention span and learning abilities • Adults: Kidney problems; high blood pressure	• Corrosion of household plumbing systems; • Erosion of natural deposits
Mercury (inorganic)	0.002	0.002	• Kidney damage	• Erosion of natural deposits; • Discharge from refineries and factories; • Runoff from landfills and croplands
Nitrate (measured as nitrogen)	10	10	• Infants below the age of six months who drink water containing nitrate in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue-baby syndrome.	• Runoff from fertiliser use; • Leaching from septic tanks, sewage; • Erosion of natural deposits
Nitrite (measured as Nitrogen)	1	1	• Infants below the age of six months who drink water containing nitrite in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue-baby syndrome.	• Runoff from fertiliser use; • Leaching from septic tanks, sewage; • Erosion of natural deposits
Selenium	0.05	0.05	• Hair or fingernail loss; numbness in fingers or toes; • Circulatory problems	• Discharge from petroleum refineries; • Erosion of natural deposits; • Discharge from mines
Thallium	0.0005	0.002	• Hair loss; • Changes in blood; • Kidney, intestine, or liver problems	• Leaching from ore-processing sites; • Discharge from electronics, glass, and drug factories

Definitions:

[1] Maximum Contaminant Level Goal (MCLG) - The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety and are non-enforceable public health goals.

[2] Maximum Contaminant Level (MCL) - The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to MCLGs as feasible using the best available treatment technology and taking cost into consideration. MCLs are enforceable standards.

*Units are in milligrams per liter (mg/L) unless otherwise stated. Milligrams per liter are equivalent to parts per million (ppm).

Antimony

Antimony is a metal found in natural deposits as ores containing other elements. The most widely used antimony compound is antimony trioxide, used as a flame retardant. It is also found in batteries, pigments, and ceramics/glass.

Short-term: United States Environment Protection Agency (US-EPA) has found antimony to potentially cause the following health effects when people are exposed at levels above the MCL for relatively short periods of time: nausea, vomiting and diarrhea. Long-term: Antimony has the potential to cause the following effects from a lifetime exposure at levels above the MCL and/or Antimony is a (known/potential drinking water) human carcinogen, or/no reliable data are available concerning health effects from long-term exposure to antimony in drinking water.

Arsenic

Arsenic is a semi-metal element in the periodic table. It is odorless and tasteless. It enters drinking water supplies from natural deposits in the earth or from agricultural and industrial practices.

Non-cancer effects can include thickening and discoloration of the skin, stomach pain, nausea, vomiting, diarrhea, numbness in hands and feet, partial paralysis, and blindness. Arsenic has been linked to cancer of the bladder, lungs, skin, kidney, nasal passages, liver, and prostate.

....to be continued in Synthesis Issue 24, March 2009.

Pertanika

Our goal is to bring high quality research to the widest possible audience

Pertanika is Indexed in Scopus & EBSCO

Pertanika is an international peer-reviewed leading journal in Malaysia which began publication in 1978. The journal publishes in three different areas — Journal of Tropical Agricultural Science (JTAS); Journal of Science and Technology (JST); and Journal of Social Sciences and Humanities (JSSH).

JTAS is devoted to the publication of original papers that serves as a forum for practical approaches to improving quality in issues pertaining to tropical agricultural research or related fields of study. It is published twice a year in **February** and **August**.

JST caters for science and engineering research or related fields of study. It is published twice a year in **January** and **July**.

JSSH deals in research or theories in social sciences and humanities research with a focus on emerging issues pertaining to the social and behavioural sciences as well as the humanities, particularly in the Asia Pacific region. It is published twice a year in **March** and **September**.

Why should you publish in Pertanika Journals?

Benefits to Authors

PROFILE: our journals are circulated in large numbers all over Malaysia, and beyond in Southeast Asia. Recently, we have widened our circulation to other overseas countries as well. We will ensure that your work reaches the widest possible audience in print and online, through our wide publicity campaigns held frequently, and through our constantly developing electronic initiatives via Pertanika Online and e-pertanika.

QUALITY: our journals' reputation for quality is unsurpassed ensuring that the originality, authority and accuracy of your work will be fully recognised. Our double-blind peer refereeing procedures are fair and open, and we aim to help authors develop and improve their work. Pertanika JTAS is now over 30 years old; this accumulated knowledge has resulted in Pertanika being indexed in SCOPUS (Elsevier) and EBSCO.

AUTHOR SERVICES: we provide a rapid response service to all our authors, with dedicated support staff for each journal, and a point of contact throughout the refereeing and production processes. Our aim is to ensure that the production process is as smooth as possible, is borne out by the high number of authors who publish with us again and again.

LAG TIME: Submissions are guaranteed to receive a decision within 14 weeks. The elapsed time from submission to publication for the articles averages 5-6 months. A decision of acceptance of a manuscript is reached in 3 to 4 months (average 14 weeks).

Call for Papers

Pertanika invites you to explore frontiers from all fields of science and technology to social sciences and humanities. You may contribute your scientific work for publishing in UPM's hallmark journals either as a ***regular article, short communication,*** or ***a review article*** in our forthcoming issues. Papers submitted to this journal must contain original results and must not be submitted elsewhere while being evaluated for the Pertanika Journals.

Submissions in **English** should be accompanied by an abstract not exceeding 300 words. Your manuscript should be no more than 6,000 words or 10-12 printed pages, including notes and abstract. Submissions should conform to the Pertanika style, which is available at www.rmc.upm.edu.my/pertanika/index.htm or by mail or email upon request.

Papers should be double-spaced 12 point (Times New Roman fonts preferred). The first page should include the title of the article but no author information. Page 2 should repeat the title of the article together with the names and contact information of the corresponding author as well as all the other authors. Page 3 should contain the title of the paper and abstract only. Page 4 and subsequent pages to have the text - Acknowledgments - References - Tables - Legends to figures – Figures, etc.

Questions regarding submissions should only be directed to the Executive Editor, *Pertanika* Journals.

Remember, ***Pertanika is the resource to support you in strengthening research and research management capacity.***

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Tel: +603-8946 6192
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www.rmc.upm.edu.my/pertanika

UPM Researcher Wins Quality Award for Public Sector 2008

Prof. Dr. Mohd Hair Bejo bagged an award for Research Innovation of Public Sector and Private Sector 2008 which was held at Putrajaya Convention Centre (PICC), on 9th December 2008. Prof. Dr. Mohd Hair Bejo (Head of project) and the team of UPM researchers, Prof. Datin Paduka Dr. Aini Ideris and Assoc. Prof. Dr. Abdul Rahman Omar, received the award through their research on **"MyVAC UPM93 Infections Bursal Disease Vaccine"** that successfully commercialised by Malaysian Vaccines and Pharmaceuticals Sdn. Bhd. (MVP).

MyVAC UPM93, was a research conducted on vaccines to cure infectious bursal disease, (IBD) or Gumboro found in poultry caused by virulent strain of IBD virus that led to RM72mil economic loss per year in Malaysia. The loss is caused by the high mortality rate and immunosuppression in poultry. Treatment of IBD is ineffective as the disease can only be controlled and prevented by proper vaccination and biosecurity hence the researchers took the measure to commercialise a safer and effective MyVAC UPM93 IBD vaccine that freed poultry from farm diseases.

The vaccine has passed all the laboratory tests required such as tests for safety, sterility, back into virulent, virus titre and free from extraneous viruses. The trials proved MyVAC UPM93 IBD is safe, effective and able to induce high and protective levels of antibody to protect the chicken. The vaccine, which does not interrupt chicken weight gain and performance is currently available in the market and can be obtained from Malaysian Vaccines and Pharmaceutical Sdn. Bhd.

The award was presented by Prime Minister of Malaysia, Dato' Seri Abdullah Ahmad Badawi in conjunction with the 2008 Public Sector Quality Award Ceremony. Prof. Dr. Mohd Hair Bejo received RM10,000, an appreciation plague and certificate as well as from the Private Sector, Malaysian Vaccines and Pharmaceuticals Sdn. Bhd. (MVP).

Synthesis BACKISSUES

DECEMBER 2006 — Issue 15, 4th Quarter

Editorial: Managing Knowledge
Spotlight: Nation Building- the Role of Universities
Research Highlight: Knowledge transcends borders – Teaching and learning a critical success factor...

Regulars
- King Grass (hybrid Pennisetum) Silages- Quality and Digestibility
- Improvement Technology for Cocoa Butter Extraction Using Supercritical Fluid
- Trans- Free- Palm- Based Fluid Shortening
- Bluetooth Smart Remote Control and Sensor System (BLUESS)
- RAWAT: Rainwater Harvester
- The Fabrication and Comparison of NiZn Ferrite Cores via Sol-gel Technique and Solid State Reaction

Research Happenings
- NATPRO 2006
- PRPI 2006

Reportage
- NewsBriefs
- FactFile

MARCH 2007 — Issue 16, 1st Quarter

Editorial: Indicators of Research University Performance
Spotlight: Web Presence & Development
Research Highlight: Towards World-class University- What does it take to be a prestigious research institute?

Regulars
- New Materials for our Industries: PANGIUM EDULE REINW. (Kepayang)- Any Takers for Development of Products?
- NMFerit™: Formulation- Tailoring of the Ni- Mg-Ca-Co-Cu-Zn-Fe Ferrite System to Attain Extremely Low Magnetic-Energy Loss for High-Frequency Application
- The Adoption of Econet: The Internet-Based Malaysian Ecotourism Network and Site Rating Expert System
- RF Coaxial Cavity for Ignition
- Developing Ergonomics Seat for Commercial Vehicle in Malaysia: A Concurrent Approach
- A Family of Parallel Explicit Group Iterative Algorithm on Shared Memory Multiprocessors (SMPs) Architecture

Research Happenings
- IENA 2006
- BIS 2006
- MAITREX 2006

Reportage
- NewsBriefs
- FactFile

DECEMBER 2007 — Issue 17-19, 4th Quarter

Editorial: Realisation of Quality Research Management System
Spotlight: Reading a Scientific Paper
Research Highlight: Maximising Research Potential through Quality Academic Publishing- Experts from Six Prominent Global Universities Shares Their Experiences

Regulars
- A Computerised Digital Imaging Technique to Estimate Palm Oil Quality Based on Fruit Colour
- Natural Booster Kit for High Quality Microalgal Production
- A Long-term Triaxial Filtration Test System
- Oil Scan: Remote Oil Spill Detection, Classification and Trajectory
- An Enhanced Mobile IPv6 with Multicast Function and Hierarchical Design
- Why Children and Teenagers are Addicted to Computer Games? NEMD Model- Norma™ Engagement Multimedia Design Model

Research Happenings
- MTE 2007
- BIO International Convention 2007
- ITEX 2007
- INPEX 2007

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- NewsBriefs
- FactFile

MARCH 2008 — Issue 20, 1st Quarter

Editorial: UPM Honours its Researchers
Spotlight: What is a Citation Index?
Research Highlight: Shaping the First Class Professional

Regulars
- Periphyton-Bacterial Complex: A Novel System for Improving Water Quality and Shrimp Postlarvae Survival without Water Exchange
- DNA Vaccine for Enterovirus 71
- Converging Thermal Wave Probe a.ka. CTWaveProbe™
- A Novel Hybrid Spacecraft Attitude Control System
- Surface Plasmon Resonance Biosensor Chip for the Detection of GMOs
- New Prospective Polyurethane/ Clay Nanocomposite for Fire Retardant to Complying Sustainable Development

Research Happenings
- NATPRO 2008
- MTE 2008

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- NewsBriefs
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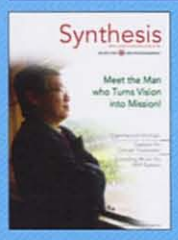
JUNE 2008 — Issue 21, 2nd Quarter



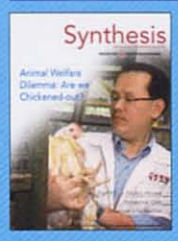
Editorial: Facts and Figures...
Spotlight: The Growing Importance of Research at Universities
Research Highlight: Meet the Man who Turns Vision into Mission!

Regulars
- Phenylalaline Ammonia Lyase, a Novel Marker for Colour in Commercial Orchids
- Harnessing a Natural Cyanide Generating System from Cassava Plant for Cancer Treatment
- An Efficient Mechanical Cell Disruptor for the Release of Hepatitis B Virus Capsid from Escherichia Coli
- Synthesis of Novel Glutamate-Zinc-Aluminium - Layered Double Hydroxide Nanobiocomposites
- Content-based Music Retrieval with N-Grams and a Music-friendly Interface

Research Happenings
- Geneva Palexpo 2008
- APC 2008
- Intellectual Property Day 2008
- I-TEX 2008

Reportage
- NewsBriefs

SEPTEMBER 2008 — Issue 22, 3rd Quarter



Editorial: R&D through Exhibitions!
Spotlight: Plagiarism = Kidnap
Research Highlight: Animal Welfare Dilemma: Are we Chickened-out?

Regulars
- ZeoPKC: An Additive to Control Ammonia Production in Poultry Houses
- Horseshoe Crab, a Fossil Invertebrate Cultured for the Future
- Intranasal Live-Vaccine – Alternative Concept for Control of Haemorrhagic Septicaemia in Cattle and Buffaloes
- New Distribution Records of Sergestid Shrimp, Acetes intermedius (Decapoda: Sergestidae) from Peninsular Malaysia with Notes on its Population Characteristics
- Environmental Significance of Natural Sources of Trifluoroacetic Acid (TFA)

Research Happenings
- PRPI 2008
- UPM-Elsevier Publishing Seminar 2008
- National Academic Award
- MIFB 2008
- INPEX 2008

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