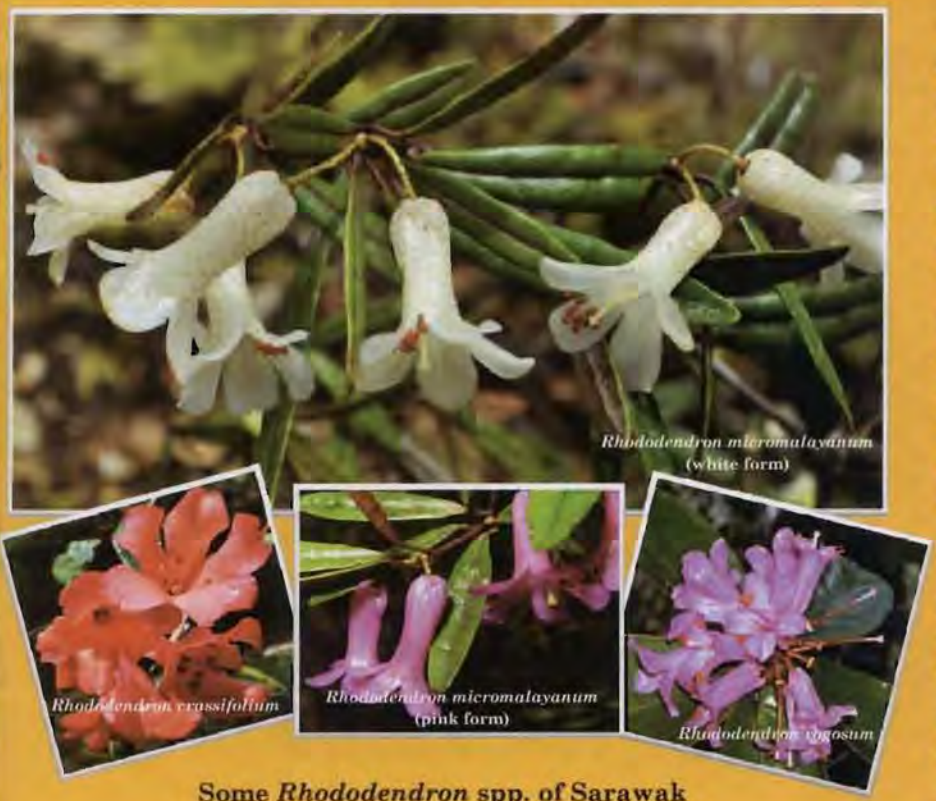
Research Bulletin

Faculty of Resource Science and Technology

Volume 1/ April 2011 ISSN 1511-0788



Some *Rhododendron* spp. of Sarawak
(photograph courtesy of Qammil Muzzammil Abdullah)

Contents

Dean's Message

Prof Dr Shabdin Mohd Long

A strategic planning programme attended by all faculty members was held recently to discuss initiatives toward UNIMAS achieving research university status by 2015. It is well recognized that good planning is the basis of good implementation and effective management to strategize various action plan to achieve our target. Full commitment of all staff is very important element to make sure everything that being planned will be achieved at the time frame given.

We will take all necessary action to increase the number of undergraduate and postgraduate students. One of the main strategies is by offering new programmes. The documentation is being finalized in order to offer at least four new programmes: Chemistry and Food Technology, Microbiology, Aquaculture and Science and Plantation Management, which will be offered in the 2012/2013 intake. The existing programmes have been strengthened by improving the curriculum in order to attract more students in the future. For postgraduate by research, our main focus is to increase number of PhD candidate and this require full support and commitment of academic staff. All academic staff with PhD must supervise at least one PhD candidate. We should take advantage on the Principal Investigator Fund provided by UNIMAS for PhD research. Ministry of Higher Education has also set up new grants scheme such as Exploratory Research Grant Scheme (ERGS) and Prototype Research Grant Scheme (PRGS) beside the existing Fundamental Research Grant Scheme (FRGS) with much higher ceiling limits. We should encourage our PhD student to apply for MyPhD scholarship offered by Ministry of Higher Education. We should take advantage on the opportunity offered by Ministry of Higher Education and perform quality research and produce excellent publication in well known and high impact journals.

My sincere hope that all academic staffs will show high commitment in order to achieve excellent performance in teaching, research, publication, consultancy and public services.

Please feel free to direct your enquiry to me at e-mail: lshabdin@frst.unimas.my or to the editorial members for further information.

Gas liquid mass transfer performance in stirred vessel retrofitted with Rushton turbine (RT), Concave-bladed disc turbine (CD-6) and their hybrids

Nurashikin Suhaili[1], Mohd Shamzi Mohamed[2] and Arbakariya Ariff[2]

[1]*Department of Molecular Biology*
[2]*Department of Bioprocess Technology, Faculty of Biotechnology and Biomolecular Sciences, UPM*

An efficient gas-liquid mass transfer process is the key factor in determining a good accomplishment of an aerobic bioprocess of which oxygen serves as one of its limiting growth factors. In stirred tank fermenter, application of multiple impeller configuration has been recognized as an effective approach to enhance the rate of oxygen diffusion due to high energy dissipation, more effective biphasic circulation, higher gas hold up capability and low shear effect resulting from lower requirement of agitation rate per impeller (Puthli *et al.*, 2005; Gogate *et al.*, 2000). Albeit numerous studies of multiple impeller system reported in the literature, direct comparative assessment of mixing system comprising of Rushton turbine (RT), CD-6 and their combinations is still rarely reported.

Oxygen transfer rate for four dual impeller systems comprising of RT and CD-6 (RT-RT, CD6-CD6, RT-CD6 and CD6-RT) was characterized based on volumetric mass transfer coefficient (k_La) measurement via static gassing out method in water and 0.35% (w/v) carboxymethylcellulose sodium (CMCNa) aqueous solution that represented Newtonian and non-Newtonian fluid respectively by using 2 liter stirred tank fermenter (Biostat B, B. Braun, Germany) which was equipped with a polarographic dissolved oxygen (DO) probe (InPro 6900, Mettler Toledo, Switzerland). All experimental runs were carried out at 30°C with a standardized working volume of 1.5 L. The stirring was varied from 150 to 900 rpm (2.5 to 15 s^{-1}) at airflow rate between 1.0 and 3.0 L min^{-1} (correspond to V_g of 1.256 x 10^{-3} to 3.768 x 10^{-3} ms^{-1}). Considering the effect of response time of DO probe used, the experimental k_La data were used as the preliminary guess value inputs to commence the non-linear regression fitting of Equation (1) in attaining optimized k_La values (Brown, 2001) through the use of Gauss Newton algorithm (MATLAB R2008a, MathWorks, USA).

$$C_p(t) = C_L\left[1+\frac{k_La}{k_p-k_La}e^{-k_pt}-\frac{k_p}{k_p-k_La}e^{-k_La t}\right] \quad \ldots(1)$$

C_p represents oxygen concentration in liquid as measured by DO probe (mol L^{-1}), C_L is equilibrium concentration of oxygen at gas phase (mol L^{-1}) and k_p denotes the probe time constant (s^{-1}). Subsequently, the optimized k_La values were further used for modeling the gas-liquid mass transfer correlation for the four impeller systems tested in this work based on the following relationship (Equation (2)) as proposed by Ozbek and Gayik (2001).

$$k_La = C_1\left(N^3D^2\right)^{\alpha}V_g^{\beta} \quad \ldots(2)$$

where N is agitation speed (s^{-1}) and D represents diameter of impeller (m). The influence of N^3D^2 which signifies the effects of agitation and impeller geometry, on k_La was studied at the abovementioned range of aeration rate. A significant enhancement of k_La profile was exhibited by dual CD-6 upon other impeller systems studied at almost all aeration rate tested. As for example at 2 L min^{-1}, the improvement of oxygen transfer capability brought by dual CD-6 was 5 to 49% and 18 to 65% higher than that achieved in fermenter fitted with the conventionally used RT-RT system in distilled water and 0.35% (w/v) CMCNa aqueous solution correspondingly.

In relation to the effects of aeration rate on k_La, the most dominant profile of oxygen transfer rate was also portrayed by dual CD-6 stirrer in both fluid systems with superiority of up to 30%. It is noticed that, the presence of one CD-6 in dual impeller system was found to be insufficient to promote a notable difference of oxygen transfer rate with that attained in RT-RT system. This is based on the interchangeable and comparable k_La profiles exhibited by the hybrids of RT and CD-6 as compared to the profiles of dual RT system. The remarkable enhancement of oxygen transfer rate promoted by dual CD-6 system in the variation of N^3D^2 factor and aeration rate may be explained by the combined effects of the concave blades in the lower and upper region of the 2 liter vessel that able to minimize the streamlining impacts more efficiently than dual RT system and even the hybrids that consist only one CD-6 impeller. This therefore ensures better gas circulation and absorption within the contacting fluid (Gimbun *et al.*, 2009).

Correlations for gas-liquid mass transfer under different dual impeller configuration of RT and CD-6 were established based on Equation (2). The mean values of the correlation coefficients are presented in Table 1. Correlation of mass transfer proposed for each impeller configuration was plotted well within the determination coefficient, R^2, values ranging from 0.93 to 0.97 and with mean error of less than 20%. Experimental data for all combinations fitted accordingly to their respective models with error limits of approximately within ± 25 %. Furthermore, the coefficient values obtained from

this study were found to be in reasonable agreement with some relevant data as published in the literature.

Table 1: Values of mass transfer correlation constants for different dual impeller combinations of RT and CD-6

Fluid System	Impeller combination	Mass transfer coefficient $k_La = C_1(N^3D^2)^{\alpha}(V_s)^{\beta}$			Mean Error (%)	Determination Coefficient (R^2)
		C_1	α	β		
Water	RT-RT	0.1048	0.3473	0.2739	8.21	0.9721
	CD6-CD6	0.1393	0.4093	0.2972	7.87	0.9346
	RT-CD6	0.0811	0.3928	0.2360	11.40	0.9658
	CD6-RT	0.0651	0.4010	0.2371	9.85	0.952
0.35% (w/v) CMCNa	RT-RT	0.0053	0.4591	0.0682	15.59	0.9474
	CD6-CD6	0.0231	0.4744	0.2354	10.35	0.9643
	RT-CD6	0.0072	0.4645	0.0936	12.38	0.9534
	CD6-RT	0.0071	0.5366	0.1115	19.57	0.9644

The use of CD-6 impeller as mixing component offers a promising potential in aerobic fermentation culture due to its reliable oxygen transfer competence especially when compared to the typically used Rushton turbine. Development of mass transfer correlation for a specific fermenter design provides us with useful insights in optimizing k_La variables such as agitation speed, aeration rate and impeller geometries/configurations. Such knowledge may be used to further improve the productivity of aerobic fermentation culture in stirred tank fermenter.

References

Brown, W.A. (2001). Developing the Best Correlation for estimating the transfer of oxygen from air to water. *Chemical Engineering Education*, Spring 2001. pp. 134-147.

Gimbun, J, Rielly, C.D. and Nagy, Z.K. (2009). Modelling of mass transfer in gas-liquid stirred tanks agitated by Rushton turbine and CD-6 impeller: A scale-up study. *Chemical Engineering Research and Design* 87: 437-451.

Gogate, P.R., Beenackers, A. and Pandit, A.B. (2000). Multiple impeller system with a special emphasis on bioreactors: a critical review. *Biochemical Engineering Journal* 6: 109-144.

Ozbek, B. and Gayik, S. (2001). The studies on the oxygen mass transfer coefficient in a bioreactor. *Process Biochemistry* 36: 729-741.

Puthli, M.S., Rathod, V.K. and Pandit, A.B. (2005). Gas-liquid mass transfer studies with triple impeller system on a laboratory scale bioreactor. *Biochemical Engineering Journal* 23: 25-30.

Synthesis of new organotin(IV) complexes and evaluation of their effect for fungal wood decay resistance

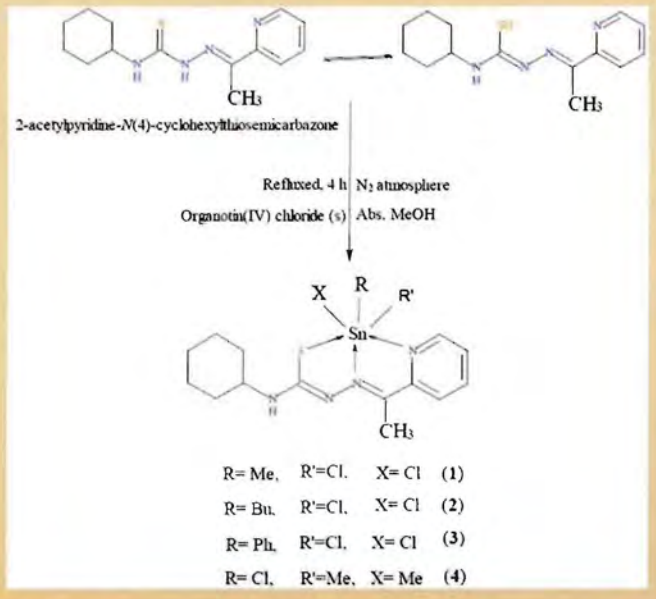
Md Abdus Salam[1], Md Abu Affan[1], Fasihuddin B Ahmad[1], Ismail Jusoh[2], Rahman,M.R.[3] and Islam, M.S.[3]

[1]Department of Chemistry, [2]Department of Plant Science & Environmental Ecology and [3]Faculty of Engineering

Organotin compounds are chemical compounds based on tin with hydrocarbon substituents. In recent years organotin(IV) compounds have found extensive use as agrochemical fungicides, biocides and antifouling agents (Pellerito *et. al*, 2001 and Hanif *et. al*, 2010), even if their toxicity and their environmental effects are now limiting their uses. Over the years, wood has been treated with variety of chemicals such as styrene, epoxy resins, urethane, phenol formaldehyde and vinyl or acrylic monomers to change its physical and mechanical properties. Plasticized wood (PW) is subject to fungal and termite attacks due to wood component being employed in the polymeric matrix. Many studies have been carried out on the decay resistance of wood and wood polymer composites (Khavkine *et. al*, 2000). Tributyltin oxide (TBTO) and tri-*n*-butyltin naphthenate (TBTN) has been extensively used as wood preservatives (Blunden *et. al*, 1990).

From the literature survey revealed that no such attempt has been made to study the efficiency of the organotin(IV) compounds with heterocyclic thiosemicarbazone ligands as wood preservatives against fungi. With this view in mind and in continuation of our earlier work on the biological studies (Affan *et. al*, 2009), in this report we describe the synthesis of heterocyclic-*N*(4)-substituted thiosemicarbazone ligand and its organotin(IV) complexes and to investigate the rate of decay resistance of untreated wood and plasticized wood against the white-rot fungi. The organotin(IV) complexes with substituted thiosemicarbazone ligand have been synthesized as shown in Scheme 1. The research found that the treated wood containing organotin(IV) compounds is effective in providing resistance against white-rot fungi.

Four new organotin(IV) complexes of the type $[MeSnCl_2(APCT)]$ (1), $[BuSnCl_2(APCT)]$ (2), $[PhSnCl_2(APCT)]$ (3) and $[Me_2SnCl(APCT)]$ (4) have been synthesized and characterized successfully. Among them, the methyltin(IV) complex (1) has also been characterized by single crystal X-ray analysis (Fig.1). The $[MeSnCl_2(APCT)]$ (1) complex was found to adopt a distorted octahedral arrangement around the tin atom.



Scheme 1. The reaction scheme for the synthesis of organotin(IV) complexes **(1-4)**.

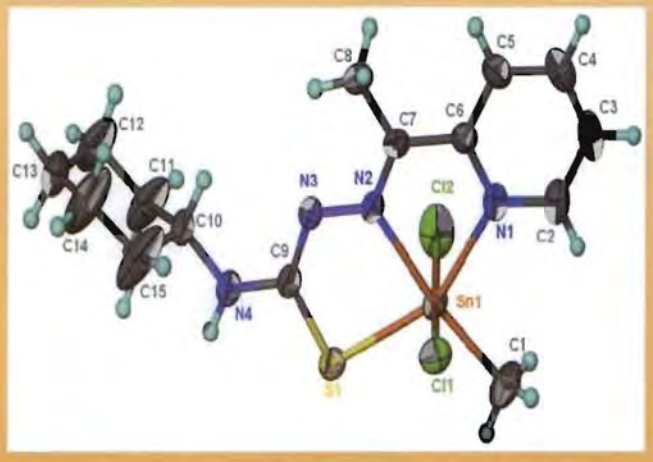


Fig. 1: Molecular structure of [$MeSnCl_2$(APCT)] **(1)**

Fungal wood decay resistance test

Wood decay resistance were carried out Standard Method of Accelerated Laboratory test of natural decay resistance of wood ASTM D 2017 (American Society for Testing and Materials, 2001 ASTM D 2017., Vol.4.10 Wood pp.322-326), where highly resistance heartwood experiences (0-10) % weight loss, resistance wood experiences (11-24) % weight loss, moderately resistance wood experiences (25-44) % weight loss and non-resistance wood experiences weight loss greater than 45%. In this study white-rot (*polyporous versicolor* L.ex. Fr.) ATCC No. 12679 was used to study the efficacy of ligand and its organotin (IV) complexes against the Borneo wood decay. In this work, raw Borneo wood species namely *Artocarpus Elasticus* was selected and it is easily obtainable from the Borneo forest, Sarawak. Wood species were chemically treated with the heterocyclic-*N*(4)-substituted thiosemicarbazone ligand and its organotin(IV) complexes **(1-4)** using an autoclave in order to convert them into plasticized wood (PW). The temperature and pressure were used at 120 °C and 85 kPa for 2 hours. The fungal attacked on plasticized and untreated wood and the weight loss due to fungal attack for untreated wood and plasticized wood are given in Fig. 2 -3, respectively.

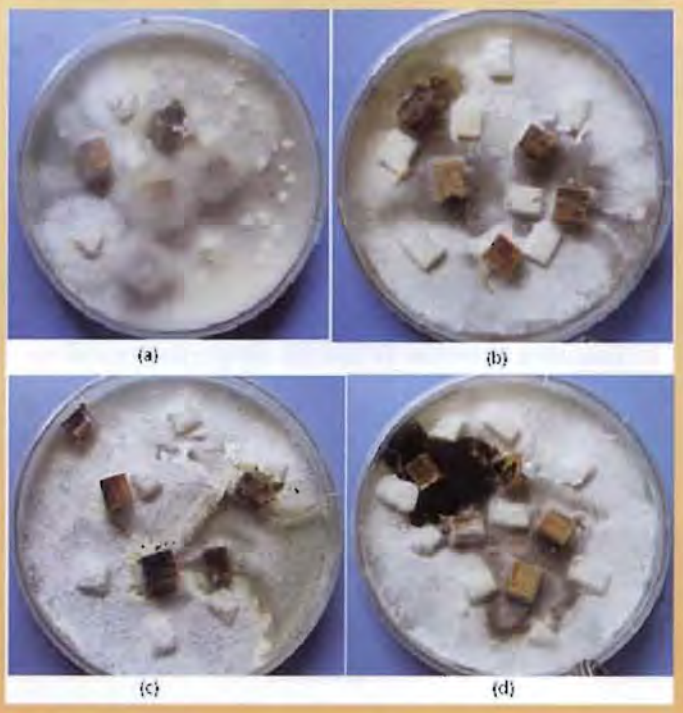


Fig. 2: Fungal attack on plasticized wood of (a) HAPCT (b) [$MeSnCl_2$(APCT)] (c) [$BuSnCl_2$(APCT)] and (d) [Me_2SnCl(APCT)]

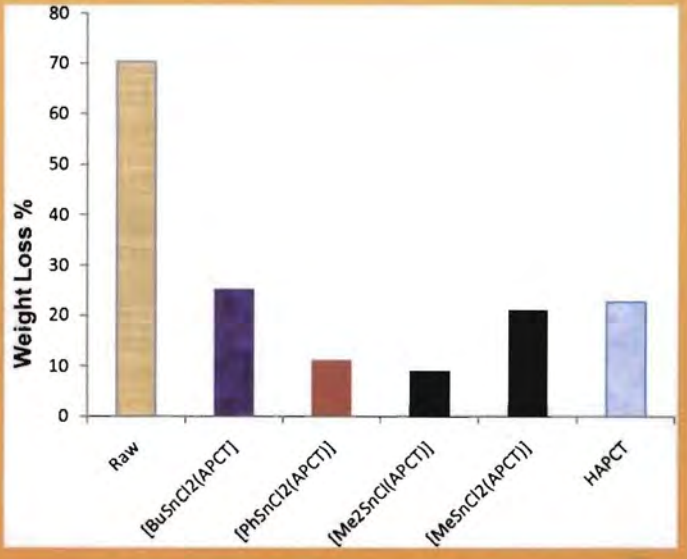


Fig. 3: Weight loss of untreated wood (raw) and plasticized wood after exposure to the decay fungus *polyporous versicolor* (white-rot fungus) for 12 weeks

The results showed that both the untreated wood and plasticized wood (PW) were affected by the exposure to the decay fungi *polyporous versicolor*. The decay test was terminated after 12 weeks when the reference blocks obtained a weight loss of 70%. The plasticized wood of [Me_2SnCl(APCT)] (**4**) complex was less affected by the *polyporous versicolor* fungi compare to the plasticized wood of complexes (**1-3**). The result also showed that generally all raw wood species were non resistant to decay exposure. In this study it was observed that all the organotin(IV) treated wood samples have increased decay resistance. However, the compound containing plasticize wood of [Me_2SnCl (APCT)] (**4**) enhance the decay resistance and decrease the weight loss of less than 10%. It can be concluded that compounds with bulky R group showed higher resistance to white-rot (*polyporous versicolor*) fungi decay exposure. From the results of our preliminary laboratory test, the preservation of Borneo wood seems the most promising possibility using the newly synthesized organotin(IV) compounds.

Acknowledgements

Financial supports by the Ministry of Science, Technology and Innovation (MOSTI), Malaysia (No. 06 -01-09-SF0046). The authors are also thankful to the Faculty of Engineering, UNIMAS.

References

Pellerito, L. and Nagy, L. (2001). *Coord. Chem. Rev.* 626: 161–167.

Hanif, M., Hussain, M., Ali, S., Bhatti, M. H., Ahmed, M. S., Mirza, B. and Stoeckli-Evans (2010). *Polyhedron* 29: 613–619.

Chavkine, M., Kazayawoko, M., Law, S. and Balatinecz, J. J. (2000). *International Journal of Polymeric Materials* 21(4): 171-177.

Blunden, S. J. and Hill, R. (1990). *Applied Organometallic Chemistry* 4(1): 63-68.

Affan, M. A., Fasihuddina, B. A., Liew, Y. Z., Foo S. W. and Ismail, J. (2009). *Journal of Scientific Research* 1 (2): 306-316.

ASTM D 2017 (2001). Standard methods of accelerated laboratory test of natural decay resistance of wood. *American Society for Testing and Materials* 4(10): 322-326.

Preliminary study on the accumulation of heavy metal concentration in edible mollusk from Sungai Sematan estuary

Nur Atiqah Mohamad Yusoff and Shabdin Mohd Long

Department of Aquatic Science

Heavy metals are a major anthropogenic contaminant of estuaries and coastal water due their toxicity, persistence and ability to accumulate in biota (Beldi *et al.*, 2006). Heavy metal contamination may retain in the water body and taken up by organisms such as plankton, mollusk, and fish and finally transferred to human through food consumptions. They could pose major environmental and health problems to the aquatic system (Jonnalagadda and Mhere, 2000). It may damage the ecosystem especially marine habitat. Mollusks are usually used as indicator for heavy metal pollution because it tend to accumulate metals in their body tissue (Shabdin and Rosniza, 2010).

Mollusk such as clams, mussels, cockle and oyster are widely reported in literature as biomonitors for heavy metal pollution due to their abundance, sedentary, easily collected and weighed (Yap and Cheng, 2006). Mollusk also tolerant to vary salinity and pH values in the estuaries (O' Leary and Breen, 1997). Mollusk are filter feeder organisms which having a sessile lifestyle that makes it ideal to monitor the changes in metal concentration at a fixed position (Astudillo *et al.*, 2005). Furthermore, edible mollusk such as "lokan", "kepah", green mussels and cockles are commercial species which can be found in both estuaries and coastal waters. They also provide important sources of protein (Yap *et al.*, 2008). Due to its economic importance, mollusks are used as to monitor heavy metal contamination worldwide (Beldi *et al.*, 2006).

Mollusk such as clams, mussels, cockle and oyster are widely reported in literature as biomonitors for heavy metal pollution due to their abundance, sedentary, easily collected and weighed (Yap and Cheng, 2006). Mollusk also tolerant to vary salinity and pH values in the estuaries (O' Leary and Breen, 1997). Mollusk are filter feeder organisms which having a sessile lifestyle that makes it ideal to monitor the changes in metal concentration at a fixed position (Astudillo *et al.*, 2005). Furthermore, edible mollusk such as "lokan", "kepah", green mussels and cockles are commercial species which can be found in both estuaries and coastal waters. They also provide important sources of protein (Yap *et al.*, 2008). Due to its economic importance, mollusks are used as to monitor heavy metal contamination worldwide (Beldi *et al.*, 2006).

A study had been performed to obtain the preliminary data on heavy metal pollution in certain edible mollusk in the estuary area of Sungai Sematan, Sarawak. This estuary locates at the western part of Sarawak. Environmental parameters such as pH, salinity, temperatures, turbidity, conductivity, dissolved oxygen were obtained *in-situ* using Horiba Multi parameter Model W-2030. Water samples were brought back to the laboratory for nutrient analysis, biochemical oxygen demand, total suspended solid and heavy metal analysis using flame Atomic Absorption Spectrophotometer

(AAS) model 3110 of Pelkin Elmer. Results of environmental parameters results are shown in Table 1.

Table 1: The environmental parameters of Sungai Sematan

Parameter	Unit	Total
Temperature	°C	25.95±0.67
pH		6.31±0.63
Dissolved Oxygen	mg/l	7.31±0.94
Total Suspended solid	mg/l	46.56±29.28
Biochemical Oxygen Demand	mg/l	3.30±0.79
Chemical Oxygen Demand	mg/l	30.30±17.58
Ammonium-Nitrogen	mg/l	0.16±0.19
Turbidity	NTU	24.41±17.00
Salinity	PSU	3.60±3.86

All the environmental parameters results were compared with the Malaysian Interim National Water Quality Standard (INWQS) and revealed that the water quality of Sungai Sematan estuary was slightly polluted.

Table 2 shows concentration of heavy metals in the water sample from the estuary of Sungai Sematan. The relative dominance of the heavy metals in the water was observed in the following sequence: Mn > Cr > Cu > Cd > Zn.

Table 2: Concentration of heavy metals in the water sample from the estuary of Sungai Sematan

Metals (mg/l)				
Mn	Cr	Cu	Cd	Zn
0.087±0.019	0.062±0.014	0.025±0.006	0.018±0.001	0.013±0.018

Mean concentration of heavy metals in the tissue of mollusk collected from Sungai Sematan estuary is shown in Table 3.

Table 3: Mean concentration of heavy metals in the tissue of mollusk collected from the estuary of Sungai Sematan.

	Heavy Metal (mg/kg)				
Mollusk species	Cd	Cr	Cu	Zn	Mn
Meretrix meretrix	0.23± 0.14	0.96 ± 0.43	0.46 ± 0.38	13.99 ± 7.30	1.66 ± 1.20
Polymesoda expansa	0.27± 0.17	0.18 ± 0.10	0.52 ± 0.35	14.72 ± 2.33	3.77 ± 6.94
Nerita lineata	0.19± 0.18	0.18 ± 0.13	0.61 ± 0.36	8.72 ± 0.22	1.51 ± 0.64
Cerithidea obtusa	0.12± 0.22	0.22 ± 0.52	0.42 ± 0.26	11.2 ± 0.18	0.92 ± 0.42
Crassostrea virginica	0.17± 0.18	0.18 ± 0.13	0.61 ± 0.36	11.6 ± 0.12	1.62 ± 0.36
Malaysian Food Act (1983) (mg/kg)	1	-	30	100	-

In future, data on the heavy metal pollution for water and mollusk will be determined from the other estuaries to compare the concentration of heavy metal between the sites. Furthermore, the gathered information will be able to design specific pollution prevention or remediation program.

References

Astudillo, L.J., Chang Yen, I. and Bekele, I. (2005). Heavy metals in sediments, mussels and oysters from Trinidad and Venezuela. *International Journal of Tropical Biology* 53: 41-53.

Beldi, H., Gimbert, F., Maas, S., Scheifler, R. and Soltani., N. (2006). Seasonal variations of Cd, Cu, Pb and Zn in the edible mollusc *Donax trunculus* (Mollusca, Bivalvia) from the gulf of Annaba, Algeria. *African Journal of Agricultural Research* 1: 85-90.

Jonnalagadda, S.B., and Mhere, G. (2000). Water quality of the Odzi River in the Eastern Highlands of Zimbabwe. *Journal of Environmental Health* 35: 2371-2376.

Malaysian Food Act (Act 281) and Food Regulation. (1985). Kuala Lumpur. International Law Book and Services

O'Leary, C., and Breen, J. (1997). Metal levels in seven species mollusc and seaweed from the Shannon Estuary. *Biology and Environment*, 97, 121-132.

Shabdin Mohd. Long and Rosniza Ramli. (2010). *Kekunci siput dan kerang-kerangan perairan Pantai Malaysia Timur*. Universiti Malaysia Terengganu, 21030 Kuala Terengganu, Terengganu, Malaysia.

Yap, C.K., and Cheng, W.H. (2006). Heavy metal concentration in *Nerita lineate*: the potential as a biomonitor for heavy metal bioavailbility and contamination in the tropical intertidal area. Department of Biology. Faculty of Science, Universiti Putra Malaysia, 43400 UPM, Serdang, Selangor, Malaysia.

Yap, C.K., Hatta, Y., Edward, F.B., and Tan, S.G. (2008). Comparison of heavy metal concentrations (Cd, Cu, Fe, Ni and Zn) in the shells and different soft tissue of *Anadara granosa* collected from Jeram, Kuala Juru and Kuala Kurau, Peninsula Malaysia. *Journal of Tropical Agriculture* 31: 205-215.

Cuticular hydrocarbon of *Epilachna indica* from Kota Samarahan, Sarawak

Rizoh Bosorang[1], Zaini B. Assim[2] and Sulaiman Hanapi[1]

[1]Department of Zoology and [2]Department of Chemistry

Hydrocarbon compounds found in large proportion of cuticular wax are phenotype's products of insects (Page *et al.*, 2002), and these compounds varied in every species examined. The universality of wax layers occurrence in insects give advantages to be used as a marker for insects' identification. If a cuticular wax is to be used as a basis of systematic studies in insects, it is clearly essential to have an understanding of the extent to which cuticular wax varies within a well-recognized species. This paper reports the distribution of cuticular waxes from five different body part and three different development stages of *E. indica* (Fig. 1) as basis of cuticular wax variation.

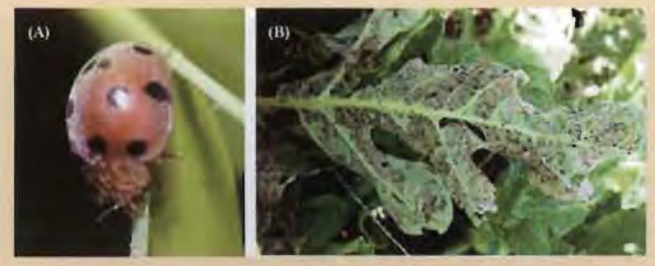


Fig. 1: Adult *Epilachna indica* (A) and infected eggplant by *E. indica* (B).

All sample examined were extracted and subjected to gas chromatography-mass spectrometry (GC/MS) analysis according to Page *et al.* (1990). Seventy out of 120 peaks in gas chromatogram were recognized as cuticular hydrocarbon profile of *E. indica*. Hydrocarbons were made up over 95% of the cuticular lipids peak areas detected with *n*-alkanes covered 21.05% of total hydrocarbons extracted, ranging from *n*-octadecane (*n*-$C_{18}H_{36}$) to *n*-octatriacontane (*n*-$C_{38}H_{76}$).

Development stages

The patterns of cuticular hydrocarbons at different development stages did not show similarity on the cuticular hydrocarbons compositions, but this pattern supported that all samples (larvae, pupae and adult individuals) belong to *E. indica* (Fig. 2). The differences of hydrocarbons proportions in immature and mature stages proposed that each development stages produced different amount and type of hydrocarbons for at least one compound for certain function. It was reported that hydrocarbons synthesized at any life stage are used primarily in the next developmental stage (Young and Schal, 1997). There is possiblity of insects using their cuticular hydrocarbons as a chemical signal to measure and indicate their development levels.

Body parts

Five different body parts of *E. indica* adult (hind wings, elytra, head, legs and abdomen) showed similar distribution patterns and were consistent for different body parts (Fig. 3). The similarity of cuticular hydrocarbon distribution pattern in the five different body parts that the adult insects produce hydrocarbons which are then distributed to all body parts. Thus, each body parts of insects can be used as source of cuticular hydrocarbons of the particular species and would be useful in forensic study.

Some quantitative differences on the proportion of at least one compound were observed between five different body parts of *E. indica*. However, this observation cannot conclude that each of the insect body secretes a specific hydrocarbon. Slight variation in body parts of insects might not reflect the specificity of respective compounds on different body parts but merely distributed for nest mate or species recognition (Whitlow, 2003).

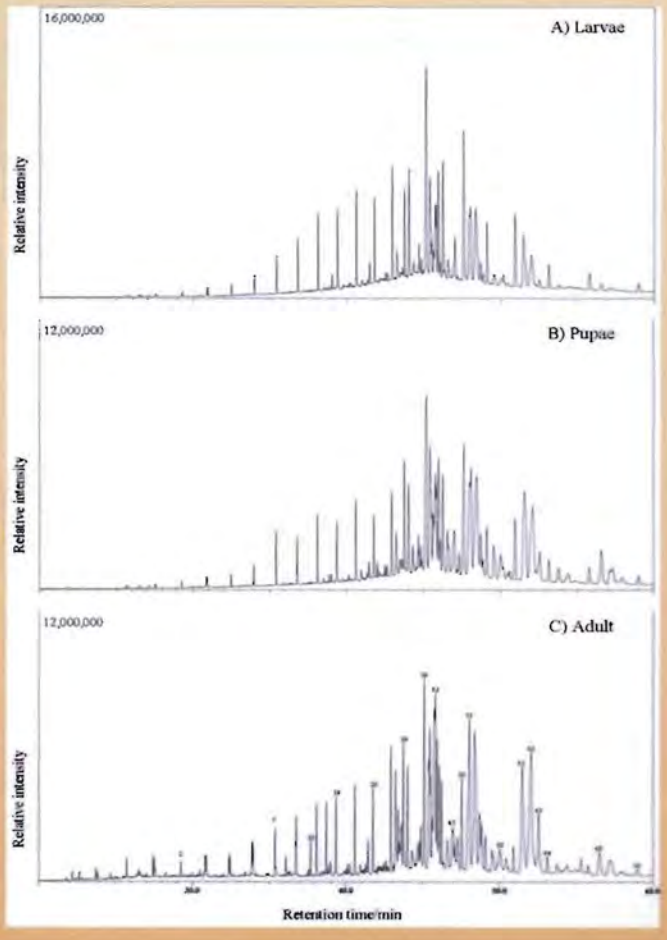


Fig. 2: Total ion chromatogram (TIC) from GC/MS analysis of cuticular hydrcarbon from different development stages of the *E. indica*.

Cuticular hydrocarbons are found in all life stages of insects and are biologically very stable. However, the cuticular hydrocarbon composition of the larvae or the pupae is seems to be not static but changes over time. If these changes occur as part of the development of larvae into adults and if this can be incorporated into a model, these hydrocarbons could be a very useful tool in estimating the age of a larvae or pupae and hence could increase the potential use of hydrocarbons in forensic entomology.

References

Page, M., Nelson, L.J., Haverty, M.I. and Blomquist, G.J. (1990). *Ann. Entomol. Soc. Am.* 83: 892-901.

Page, M., Nelson, L.J., Forschler, B.T. and Haverty, M.I. (2002). *Comp. Biochem. Physiol.* B 131: 305-324.

Whitlow, V.V.S. (2003). Msc Thesis, Uni. der Albert Ludwigs, 133pp.

Young, H.P. and Schal, C. (1997). *Ann. Entomol. Soc. Am.*, 90(5): 655-663.

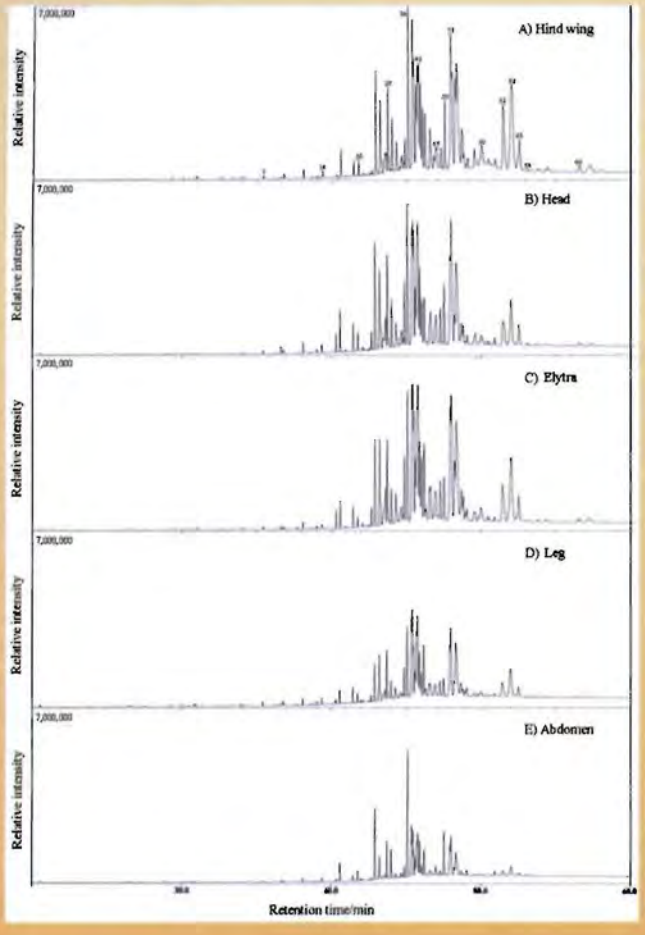


Fig. 3: TIC obtained from GC/MS analysis of cuticular surface lipids from different body parts of the *Epilachna indica*.

Sago waste for oil spill removal

Rafeah Wahi, Zainab Ngaini and Odilia Sofie Lasi

Department of Chemistry

Improper treatment and disposal of used oil from small scale business such as restaurants and vehicle workshops has become a problem in Malaysia. Cooking oil, lubricating oil, metal cutting oil, machine and mineral oil are common used oil discarded into the water system. Used oil composed mainly of hydrocarbons and considered as toxic liquid wastes due to presence of heavy metals such as lead, cadmium, zinc, arsenic, as well as aromatic and naphthenic compounds (Gourgouillion *et al.*, 2000). Synthetic products that are most commonly used as sorbents in the remediation of oil spills have highly oleophilic and hydrophobic properties but degrade relatively slower compared to minerals and organic vegetables. In addition, the residues are non-biodegradable which could contaminate the environment (Annunciado *et al.*, 2005). In view of this, Environmental Laboratory (II) in FRST UNIMAS has studies on the use of sago waste, which is abundantly available in Sarawak, for oil spill removal and investigate the ability of sago waste to remove used engine oil (UEO) and diesel using various adsorption systems, namely dry, wet static and wet-dynamic systems.

Sago waste, which was obtained from Mukah, Sarawak was grinded (Fig.1) and particles size 500μm) and 300μm were selected, characterized (Table 1) and applied for sorption in dry (oil only system), wet (oil on water system) and wet-dynamic system (oil on water system, stirred).

Fig. 1: Ground sago wastes

Table 1: Proximate analysis of sago waste

Type of size	Apparent density (kg/m^3)	Moisture content (%)	Ash content (%)	Combustible matter (%)
Coarse	527.570±27.751	16.699±0.086	4.062±0.207	82.105±4.816
Fine	500.300±0	14.928±0.184	6.193±0.130	78.976±0.112

Effect of contact time on sorption capacity

The sorption capacity of sago waste on two different types of oil (UEO and diesel) was found to be increased with the sorption period (Fig. 2). Sorption of diesel was much higher compared to used engine oil. However, the increase in sorption capacity of sago waste on diesel was not as consistent as that of used engine oil. This could be attributed to the nature of diesel as light-weight hydrocarbon oil that tends to evaporate readily after exposure to atmosphere.

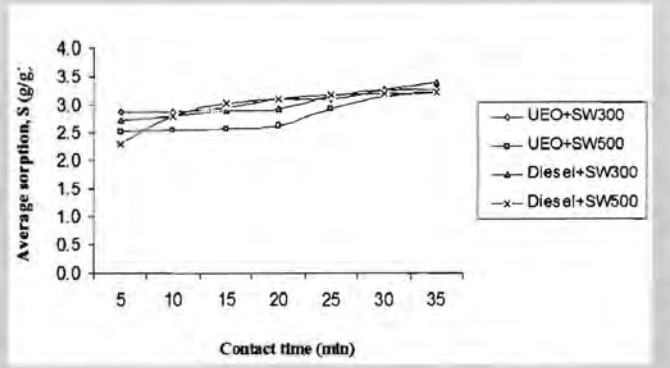


Fig. 2: Sorption of oil by sago waste

Effect of contact time on sorption capacity

Studies on the effects of sago waste particle sizes to the sorption capacity of oil (Fig. 2) indicated that smaller particle sizes (300 μm) gave greater sorption compared to bigger particle sizes (500 μm). The increase in total surface area for smaller particles provides more sorption sites for the oil. In other words, there are more interactions and van der Waals forces between oil and smaller fiber surfaces (Shukla *et al.*, 2002). Sorption capacity will increase if the sorbent has the capability of drawing the oil into the material matrix, which implies a porous structure (Annunciado *et al.*, 2005).

Effect of sorption system on sorption capacity

The sorption capacity employing three sorption systems was increased with the increase of contact time (Fig. 3). The sorption capacity of sago waste has followed the general trend of wet dynamic > dry > wet static. The sorption of oil is relatively higher in dynamic system due to prolonged turbulence in water that will give higher sorption capacity (Annunciado *et al.*, 2005). Statistical analysis by One Way ANOVA test also confirmed on the significant difference ($p < 0.05$) in sorption capacity of three different types of systems.

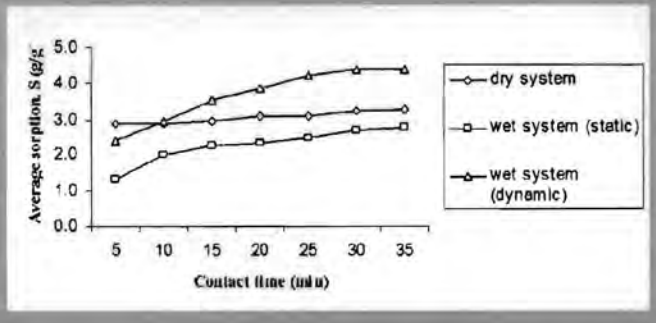


Fig. 3: Sorption of oil by sago waste for different type of system

Water uptake

All sorption systems showed an increase in water uptake with increasing contact time (Table 2). The water uptake for dynamic system is higher as compared to the static system. The sorption of sago waste on oil in dry system is better as compared to the static system. This is in agreement with previous reports on raw baggase, which has shown the effectiveness of adsorbing oil alone from a non aqueous environment. In fact, both sago waste and raw baggase consist of cellulose and lignin which has the capability to adsorb hydrophilic and hydrophobic materials (Said *et al.*, 2008) that contribute to high sorption capacity.

Table 2: Sorption of sago waste in the different system

Sorption time, min	Dry system	Static system		Dynamic system	
	Average oil sorption, g/g	Average sorption, g/g	Water uptake by weight difference, %	Average sorption, g/g	Water uptake by weight difference, %
5	2.876	1.313	-75.3	2.412	-16.1
10	2.882	2.015	-64.3	2.943	2.1
15	2.957	2.256	-47.7	3.523	19.1
20	3.101	2.332	-43.7	3.861	24.5
25	3.106	2.471	-40.3	4.203	35.3
30	3.252	2.688	-42.0	4.386	34.9
35	3.276	2.766	-32.1	4.398	34.2

In conclusion, our study has preliminarily indicated that sago waste could be used to remove diesel and used engine oil. The sorption capacity of sago waste was higher in wet-dynamic system, while the optimum size of sago waste for oil sorption was 300μm. It is suggested that future work can be done via modification on the sago waste itself for optimum oil removal. This study has been financially supported by Ministry of Science, Technology and Innovation (MOSTI) and UNIMAS (Grant No: FRGS/02(04)/652/2007(17)).

References

Annunciado, T.R., Sydenstricker, T.H.D. and Amico, S.C. (2005). Experimental investigation of various vegetable fibers as sorbent materials for oil spill. *Marine Pollution Bulletin* 50: 1340-1346.

Gourgouillon, D., Schrive, L., Sarrade, S. and Gilbert, M.R. (2000). An environmentally friendly process for the regeneration of used oils. *Env. Sci. Tech.* 34(16): 3469-3473.

Said, A.E.A., Ludwick, A.G., and Aglan, H.A. (2008). Usefulness of raw baggase foe oil absorption: A comparison of raw and acylated bagasse and their components. *Bioresource Tech.* 100:2219-2222.

Shukla, A., Zhang, Y.H., Dubey, P., Margrave, J.L. and Shukla, S.S. (2002). The role of sawdust in the removal of unwanted materials from water. *Journal of Hazardous Materials* 95(1-2): 137-152.

Hypothetical protein-protein interaction models for a cancer-associated ribosomal protein, RPS3

Edmund Ui-Hang Sim and Chin-Ming Er

Department of Molecular Biology

The classical assumption on the role of ribosomal proteins has always been about their capacity as members of the ribosomal complex, of which is responsible for cellular protein biosynthesis. However, it has been more than a decade since the notion of extra -ribosomal functions among ribosomal proteins was first proposed. These extra-ribosomal functions include DNA repair, DNA replication, transcription, RNA splicing, apoptosis, developmental regulation, and cellular growth and differentiation (Wool, 1996). The presence of these functions means that ribosomal proteins, when dysfunctional, may contribute to congenital disorders or influence the development of cancer. Indeed, over the last ten years, numerous studies have provided evidence to the involvement of ribosomal proteins with inherited diseases and cancers.

In our previous study, we have identified 33 ribosomal protein genes to be differentially expressed (mostly up-regulated) in cases of colorectal cancer (Sim *et al.*, 2006). When similar studies were extended to nasopharyngeal carcinoma (NPC), we found early but novel evidence of two NPC-associated ribosomal protein genes (Sim *et al.*, 2008). To date, we have identified three more ribosomal protein genes that are significantly de-regulated in NPC situation (Sim *et al.*, 2010).

Although the list of cancer-associated ribosomal protein genes and the products encoded by them is rapidly expanding, very little is known about the molecular events and pathways mediated by these genes during organogenesis and tumourigenesis. Perhaps, in most cases, this is due to the challenging, technically-demanding and costly experiments needed to investigate such events. To circumvent this problem, Bioinformatics resources and tools can be used. The rapidly expanding database of known genes and the increasingly accessible programs for analysis of genes/ proteins functions provide a logical strategy to study hypothetical models of ribosomal protein-mediated pathways. Here, we show computer-generated protein-protein interaction models of a colorectal cancer-associated ribosomal protein (RPS3).

Protein sequence of RPS3 were obtained from GenBank (NCBI) database, and predicted 3D secondary structures were generated using applications within the 3D-JIGSAW server (http://www.bmm.icnet.uk/ ~3djigsaw/; by Bates *et al.*, 2001). The constructed model of the ribosomal proteins were submitted (as PDB files) to and processed by programs in the VAST server (http://www. ncbi.nlm.nih.gov/Structure/VAST/ vastsearch.html; by Gibrat *et al.*, 1996) in order to search for structural neighbours or interacting factors.

The 3D-JIGSAW analysis reveal presence of 2 domains in RPS3 (Fig. 1), the first containing three a-helices and a cluster of three-stranded antiparallel b-sheet structure (within which one b-sheet strand has only one residue). The other domain comprises three a-helices and a four-stranded antiparallel b-sheet arrangement. Computational calculation by the VAST server found 152 and 35 possible structural neighbours (interacting factors) for Domains 1 and 2 respectively. In addition, 23 factors were predicted to form structural associated within both domains of RPS3. Among all these, only a few proteins were from human and these are the inhibitor of neuronal nitric oxide synthase (Fig. 2A), zinc finger protein 295 (Fig. 2B) and cocaine and amphetamine regulated transcript protein (Fig. 2C). Based on this finding, we predicted the roles of RPS3 as a regulator (by inhibition) of carcinogenic activator in the brain; co-factor of signal transduction pathway; and a regulator of DNA-dependent transcription. Our predictive models provide novel clues on the interacting factors of RPS3. This not only suggests possible segments of pathway(s) mediated by RPS3 in development, but provides useful information for designing functional studies of RPS3.

Fig. 1. Hypothetical 3D model of RPS3

References

Bates, P.A., Kelley, L.A., MacCallum, R.M. and Sternberg, M.J.E. (2001). Enhancement of Protein Modelling by Human Intervention in Applying the Automatic Programs 3D-JIGSAW and 3D-PSSM. Proteins: *Structure, Function and Genetics, Suppl* 5: 39-46.

Gibrat, J.F., Madej, T. and Bryant, S.H. (1996). Surprising similarities in structure comparison. *Curr Opin Struct Biol.* 6(3): 377-85.

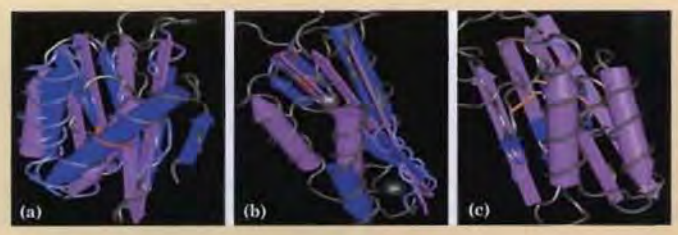


Fig. 2: Hypothetical protein-protein interaction model of RPS3 with predicted structural neighbours

Sim, E.U.H., Bong, I.P.N., Balraj, P., Tan, S.K., Jamal, R., Sagap, I., Nadeson, S., Rose, I.M., and Lim, P.K.M. (2006). A Preliminary Study of Differentially Expressed Genes in Malaysian Colorectal Carcinoma Cases. *Journal of Bioscience* 17(1): 19-37.

Sim, E.U.H., Toh, A.K.L. and Tiong, T.S. (2008). Preliminary Findings of down-regulated genes in nasopharyngeal carcinoma. *Asia Pacific Journal of Molecular Biology and Biotechnology* 16 (3): 79-84.

Sim, E.U.H., Ang, C.H., Ng, C.C., Lee, C.W., and Narayanan, K. (2010). Differential expression of a subset of ribosomal protein genes in cell lines derived from human nasopharyngeal epithelium. *Journal of Human Genetics* 55 (2): 118-120.

Wool, I.G. (1996). Extraribosomal functions of ribosomal proteins. *Trends Biochem. Sci.* 21: 164-165.

Uncovering hydrocarbon bioremediation potential in indigenous fungal genera

Mohd Farith Kota, Awang Ahmad Sallehin Awang Husaini, Hairul Azman Roslan and Azham Zulkharnain

Department of Molecular Biology

Improper management of chemicals, poor practices in chemical productions, accidents and lack of awareness for proper chemical disposal have led to ubiquitous contaminants of soils and waters around the globe (Juhasz and Naidu, 2000; Kanaly and Harayama, 2000; Meckenstock *et al.* 2004; Johnsen *et al.* 2005). For instance in Nigeria, approximately 20 million gallons of waste engine oil are generated annually from mechanic workshops within these countries and discharged carelessly into the environment (Faboya, 1997; Adegoroye, 1997). An efficient technology in term of cost and efficiency is highly demanded to eradicate this problem and bioremediation is the best candidate to restore our environment. Bioremediation is a process of using microorganisms to convert hazardous pollutants into less toxic compounds (Odgen and Adams, 1989; Kirch, 2008). It involves the manipulation process of molecular degradation of compounds through biological activity.

This study aims to reveal the hidden potential in fungi for the purpose of hydrocarbon bioremediation in contaminated soil. Five strains of indigenous fungi, known for hydrocarbon degradation, are obtained from oil contaminated soil and crude oil sludge from Miri, Sarawak and Brunei Darussalam. These strains are *Penicillin chermesinum* HDF2, *Aspergillus versicolor* HDF6, *Trichoderma virens* HDF7, *Aspergillus flavus* HDF8 and *Bionectria ochroleuca* BHDF7. To reveal the fungi's full potential, this research starts by choosing suitable bulking agent and determining whether fungi are able to grow and penetrate into the contaminated soil with or without bulking agent. The research then, proceeds with the selection of the best hydrocarbon degrading fungi on contaminated soil and optimization of parameters influencing the speed of the hydrocarbon bioremediation. Then, the bioremediation of hydrocarbon contaminated soil will be carried out under optimum experimental conditions with several post-bioremediation tests to evaluate its efficiencies.

Five different bulking agents have been used to grow each of the five strains of fungi. The bulking agents are sawdust, sago waste, oil palm empty fruit bunch (OPEFB), rice husk and mixture of it all. After five days, all five strains of fungi showed visible growth on sago waste (Fig. 1).

Fig. 1: Growth of Aspergillus *flavus* HDF8 (left) and *Trichoderma virens* HDF7 (right) on sago waste after 5 days.

The experiment proceeded into the next stage where the fungal strains sensitivity towards hydrocarbons is screened. The five fungal strains were inoculated onto Potato Dextrose Agar (PDA) together with 2% (v/v) of crude oil. After 7 days, *Penicillin chemesinum* HDF2, *Trichoderma virens* HDF7 and *Aspergillus flavus* HDF8 showed high tolerances towards hydrocarbon based on their growth observation as they managed to grow into almost full plate in plates containing crude oil (Fig. 2).

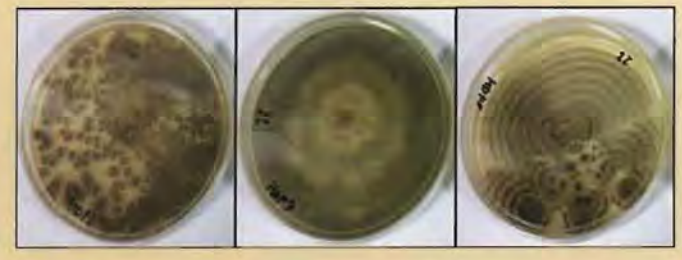


Fig. 2: *Penicillin chemesinum* HDF2 (left), *Trichoderma virens* HDF7 (middle), and *Aspergillus flavus* HDF8 (right) showed high tolerance towards crude oil when inoculated onto Potato Dextrose Agar (PDA) containing 2% (v/v) crude oil.

These three fungi strains will be tested for their efficiency at laboratory scale hydrocarbon bioremediation. Inoculums size, moisture content, and effect of activators will be optimized and the evaluation of hydrocarbon degradation will be evaluated through High Performance Liquid Chromatography (HPLC) and Gas Chromatography (GC) together with ligninolytic enzyme assays to further support the findings. Post treatment test which includes extracting toxic organic compounds, heavy metals analysis, microbiological analysis and germination index analysis will be conducted to ensure the bioremediation process is successful.

References

Adegoroye, G. (1997). Environmental considerations in property design, urban development and renewal. In Akinjide, O. (Ed.), *Dimensions of environmental problems in Nigeria*. Washington: Friedrich Ebert Foundation, pp 12 – 25.

Faboya, O. O. P. (1997). Industrial pollution and waste management. In O. Akinjide, O. (Ed.), *Dimensions of environmental problems in Nigeria*, Washington: Friedrich Ebert Foundation, pp 25.

Johnsen, A.R., Wickb, L.Y., and Harms, H. (2005). Principles of microbial PAH-degradation in soil. *Environmental Pollutation* 133:71–84.

Juhasz ,A.L. and Naidu R. (2000). Bioremediation of high molecular weight polycyclic aromatic hydrocarbons: a review of the microbial degradation of Benzo[a] pyrene. *Int Biodeterior Biodegradation* 45:57–88.

Kanaly, R.A., and Harayama, S. (2000). Biodegradation of high molecular weight polycyclic aromatic hydrocarbons by bacteria. *J Bacteriol* 182:2059–2067.

Kirch, W. (2008). *Encyclopedia of Public Health*. Springer Verlag.

Meckenstock, R.U., Safinowski, M., and Griebler, C. (2004). Anaerobic degradation of polycyclic aromatic hydrocarbons. *FEMS Microbiol Ecol* 49:27–36.

Odgen, R. and Adams, D.A. (1989). Recombinant DNA Technology: Applications. In: Carolina Tips, Vol. 52, Carolina Biological Supply Company, Burlington, North Carolina, pp 18 - 19.

Indigenous pectinolytic and ligninolytic fungi used in kenaf retting for potential application in handsheet preparation of kenaf bast fibre

Dayang Syahreeny Abang Mustafa, Awang Ahmad Sallehin Awang Husaini, Azham Zulkharnain and Hairul Azman Roslan

Department of Molecular Biology

Kenaf (*Hibiscus cannabinus* and *H. sabdariffa*) is a warm season annual hibiscus, having among the least expensive and most versatile of textile fibres. The fibres are biodegradable, renewable, and provide reliable employment in many rural areas. It grows to 20 feet under favourable condition but averaging 8 to 14 feet in 4 to 5 months. Among the components that are useful includes the stalks (bark and core), leaves, and seeds (Webber and Bledsoe, 2002). Kenaf stalks consist of an outer fibre (bast) and fibre (core). The bast and core are comparable to softwood tree fibres and hardwood fibres, respectively (Kutacova, 1998).

A non-tree source such as kenaf for paper manufacturing is a cost effective alternative to make paper without cutting woody trees. It was demonstrated that kenaf can be made into high-quality writing and specialty papers. The bast fibres offer strength to the pulp while the shorter core fibre provides appreciable surface characteristics (Liu, 2000). During pulping, bast fibres are relatively easier to delignify followed by the whole stem and the core kenaf fractions (Ashori, 2004).

Retting, which is a process of removing non-fibrous materials (Song, 2006), is the major problem in the development of high-grade paper products utilizing kenaf fibers (Yu & Yu, 2007). In this research, we are studying on methods of removing pectin and lignin components in order to obtain high quality kenaf fibers. Apart from fiber separation, retting is crucial as this process affects the final quality of paper products. Advancements in the biological and enzymatic retting open up possibilities of an efficient, cost-saving and environment-friendly approach in the production of kenaf fibers-based paper products.

Ninety fungal strains, isolated from diverse local environment and surrounding were screened based on their pectinolytic and ligninolytic activity. Macro and micro fungi were both isolated from rotten wood, decomposed vegetables and fruits waste such as carrot, water apple, jackfruit rind, banana peel, lime peel, palm leaves and various soil sources. Different standard techniques of isolation namely direct plating, pour plating, surface sterile plating and dilution plating of enrichment cultures were employed to maximize the variety of fungal strains obtained and isolated. From the screening, nineteen isolates gave positive results on both of pectin and lignin depolymerisation. Analysis for

pectin was conducted on a substrate specific assay plates using citrus pectin as the sole carbon source as shown by the formation of halo zones (Fig. 1) while the lignin depolymerisation was conducted by visual observation of the decolourisation of industrial dye, Remazol Brilliant Blue R (RBBR) in liquid assay (Fig. 2).

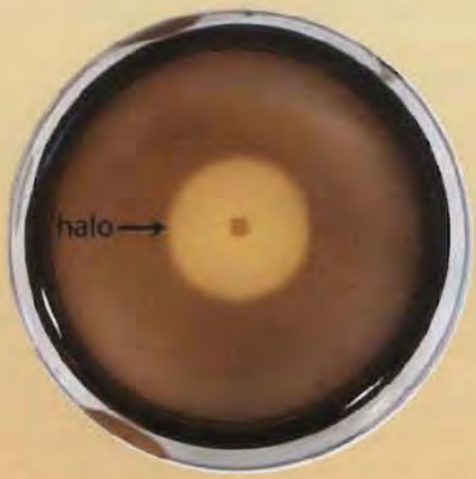


Fig. 1: Isolate PU1 isolated from decomposing paku *uban* with 13 mm halo formation after 3 days incubation. Strains are categorized as the best pectinase producer with at least 15 mm halo in diameter, followed by good producers with at least 10 mm halo, weak producers with 5 mm halo and poor producer when no clear zone was observed.

Fig. 2: Isolate MW16 isolated from rotten wood with 89% decolourisation of 0.02% RBBR after two weeks of incubation indicating ligninolytic enzyme activity produced by the isolate.

From these isolates (Fig. 3), these will be further tested at laboratory scale trial retting experiments for their kenaf retting efficiency. Parameters such as the use of substrates, initial pH of the culture medium, incubation temperatures, retting times and inoculums size of kenaf retting experiments will be optimized. The evaluation of retting is based on the weight loss content, chemical characterization and photomicrograph using scanning electron microscope of the treated and untreated kenaf retted fibre. Subsequently, paper handsheet will be prepared from the retted kenaf bast fibre pulp and the physical strength properties will be evaluated. An environment-benign, efficient retting processing under optimal experimental conditions for kenaf retting and paper handsheet using kenaf bast will be developed from this study.

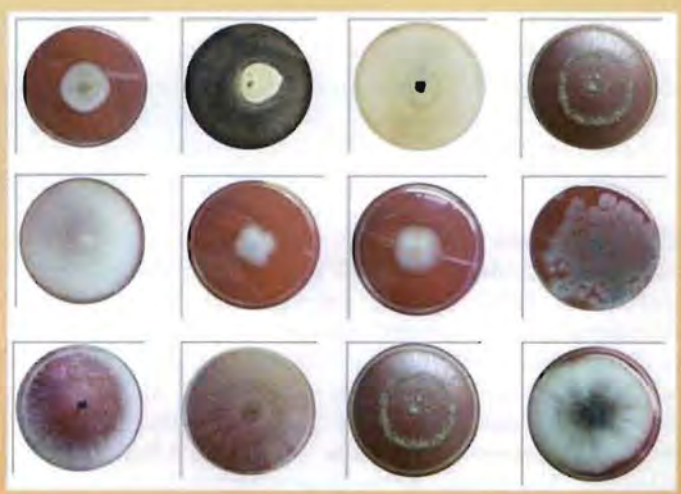


Fig. 3: Plates containing fungal isolates that are positive for both pectinase and ligninolytic activity. The best producer was selected via quantitative analysis; pectinase and ligninolytic enzyme assay and identified by molecular technique.

References

Ashori, A. (2004). *Development Of High Quality Printing Paper Using Kenaf (Hibiscus Cannabinus) Fibers.* PhD thesis, Universiti Putra Malaysia.

Kutacova, P. (1998). *Enzymatic Modification of Kenaf Pulp.* (Unpublished Master's Thesis). University of Toronto.

Liu, A. (2000). World Production and Potential Utilization of Jute, Kenaf, and Allied Fibers. *Proceedings of the International Kenaf Symposium*, Hiroshima, Japan.

Song, K.H. (2006). Chemical and Biological Retting of Kenaf Fibers. *Textile Research Journal* 76: 751-756.

Webber, C. L. and Bledsoe, V. K. (2002). Kenaf Yield Components and Plant Composition. In Janick, J & Whipkey, A. (Eds.), *Trends in new crops and new uses.* Alexandria, VA, ASHS Press.

Yu, H. and Yu, C. (2007). Study on Microbe Retting of Kenaf Fiber. *Enzyme and Microbial Technology* 40:1806 – 1809.

The Semporna Marine Ecological Expedition (SMEE) 2010 Semporna 28 Nov – 20 Dec 2010

Aazani Mujahid[1] and Angela Lim[2]

[1]Department of Aquatic Science
[2]WWF-Malaysia

The Semporna Marine Ecological Expedition (SMEE) was a timely and important effort by marine scientists to assess the rich biodiversity and health of coral reefs in Semporna waters. Its aim was to enhance conservation and outreach efforts through better understanding of the ecosystem. The expedition was successfully accomplished within 3 weeks, encompassing 19 diving days, 60 dive sites and 12 kilometres of transect.

SMEE was made possible with permission from the Economic Planning Unit (EPU), Prime Minister's Department, EPU Sabah, Sabah Parks and the Department of Fisheries Sabah. It was jointly organized by WWF, Netherlands Centre for Biodiversity (NCB) Naturalis, Universiti Malaysia Sabah (UMS) and Universiti Malaya (UM). Other collaborators were Universiti Malaysia Sarawak (UNIMAS), Universiti Kebangsaan Malaysia (UKM) and Old Dominion State University (ODU), USA. There were a total of 18 participants from different backgrounds. Leaders of the expedition include Naturalis's Dr Bert Hoeksema and UM's Affendi Yang Amri.

Semporna (Fig. 1) is a Globally Outstanding Priority Conservation Area (PCA), within the Sulu-Sulawesi Marine Eco-region (SSME) in the Coral Triangle – the world's apex for marine biodiversity. Besides that, Semporna is also unusual because of its mix of five geomorphological reef types. Prior to the expedition early indicators point towards Semporna to be rich with rare and unique species, besides a high level of biodiversity because of the mixed habitat types and ecosystems.

In Malaysia, similar research (in such scale) is almost unprecedented. Methods used were similar to those employed since 1998 in previous research and in other regions. Per dive, a complementary method used was the modified Reef Check methodology with reef profiling, to enable 'snapshots' of the reef health status to be made for future comparisons. Besides that, other surveys were also undertaken including of selected water quality parameters, towed phytoplankton samples, video and photo transects.

Early results were presented at a press conference in Kota Kinabalu on 20th December 2010. The biodiversity team identified 43 species of mushroom coral (highest diversity in the world), 844 species of fish, more than 100 species of algae and three endemic species of bubble coral; collected over 90 species of commensal shrimp (two new species), 25 species of ovulidae snails including some rare species and one new species of gall crab; and finally observed seven new (previously unknown) gall crabs hosts. Unfortunately, with the rich biodiversity in Semporna PCA, the coral reef status team had found only 5% (3 sites) with excellent coral coverage, 23% in good condition, 36% with fair cover and the rest of the 36% with corals in poor health. Further work and analysis is to be done back at respective institutions.

Besides that, an expedition blog was hosted at www.ncbnaturalis.nl, and serves as a diary of the expedition. The catalogue of 23 videos made available by Treasure Images on behalf of the expedition, and are available for viewing at http://www.youtube.com/user/2010SMEE. Topics range from interviews with scientist onboard to documentation of available resources and its people.

It is important that these reefs and natural heritage are conserved and managed as they are in danger from anthropogenic activities. There lies an urgent need for effective management of marine resources in Semporna (and Malaysia in general) for the bright future and potential of supporting sustainable fisheries and tourism for generations to come.

Reef Status team members (from left) :
Angela (WWF), Ken (WWF), Muhd Ali (UMS), Aazani (UNIMAS), Kent Carpenter (Old Dominion University), Nina (WWF), Affendi (UM), Munira (UM), Kee Alfian (UKM), Mohd Nara (Sabah Parks).

Fig. 1: Map of the Semporna PCA (orange border) with the 60 numbered dive sampling sites marked; Inset: Sabah Malaysia. Adapted from B.T. Reijnen/NCB Naturalis.

'Touch-incubate-PCR' approach for high-throughput genotyping

Lai Pei Sing[1], Ho Wei Seng[1], Pang Shek Ling[2] and Ismail Jusoh[3]

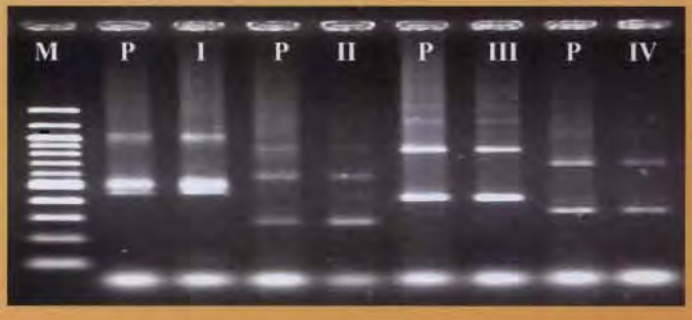
[1]Department of Molecular Biology, [2]Sarawak Forestry Corporation and [3]Department of Plant Science and Environmental Ecology

The 'Touch-incubate-PCR' approach (aka *f*asTiP-X) is a rapid extraction method which allows direct amplification without going through conventional CTAB extraction. In the same time, it allows DNA extraction without contacting any harmful chemicals and liquid nitrogen. This method offers a great advantage whereby it requires only approximately 20 minutes for DNA preparation before PCR amplification thus increases the possibility for high-throughput genotyping. Apart from that, the requirement of small amount of plant material is greatly suitable for samples with limited quantity.

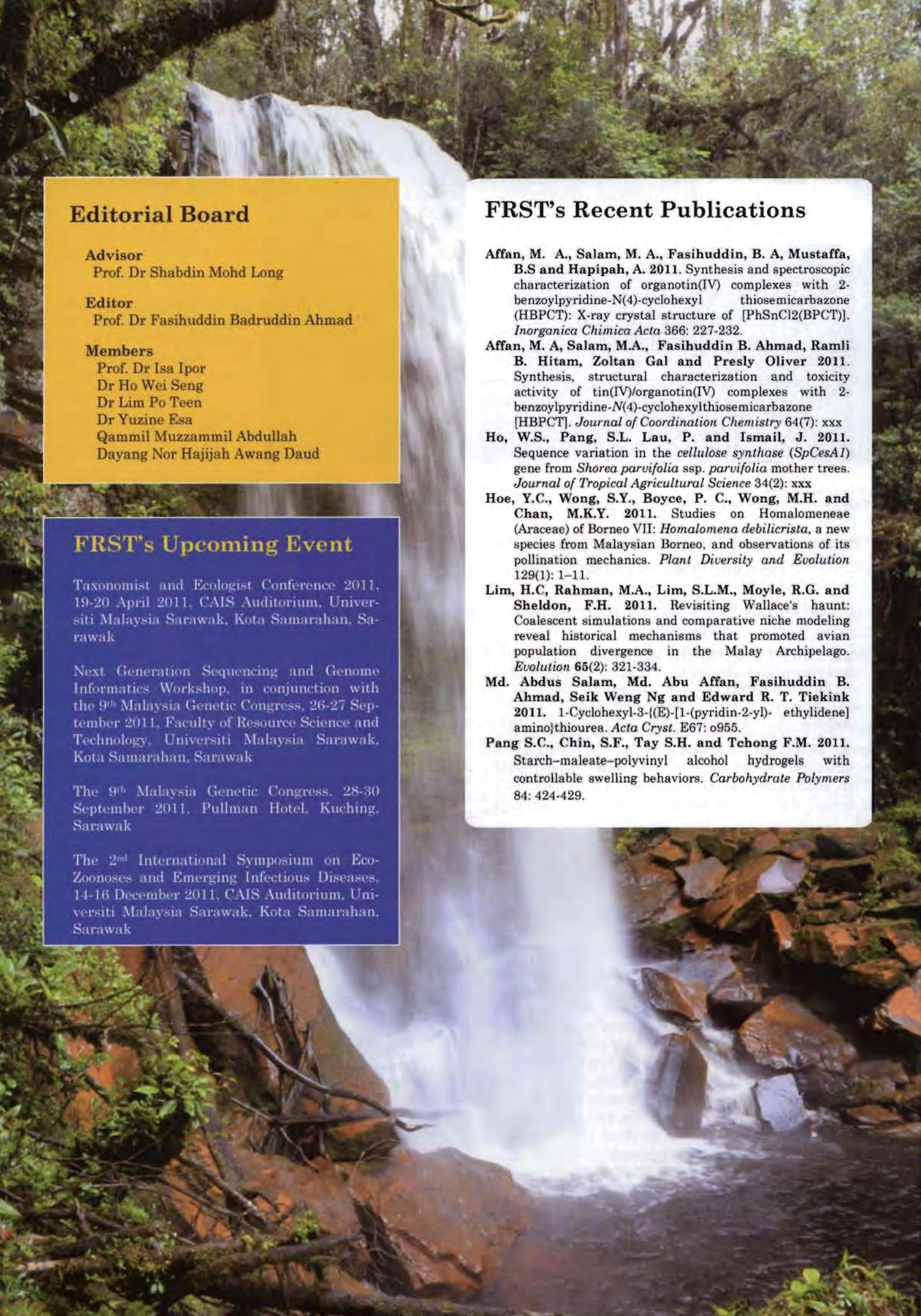
The initiative for developing this approach was due to the common hindrance faced by the researchers where sample collection and preparation was the most time consuming part of the project. Hence, this approach was developed to reduce the time, cost and consumable volume required for sample DNA extraction. This rapid DNA extraction approach only involves 3 simple steps before PCR amplification, which is: 1) transferring plant samples into the extraction buffer by touching the sample leaves by using pipette tips or Harris Uni-Core™ puncher 0.5 mm; 2) incubate to lyse plant cells, and 3) the incubated solution can be directly used for PCR amplification. However, care must be taken if Harris Uni-Core™ puncher is used for obtaining samples. A 2% solution of sodium hypochlorite (NaClO) shall be used for cleaning the puncher to prevent cross-contamination.

The *f*asTiP-X approach was tested using 5S rRNA primers via PCR on 4 different species, namely *Neolamarckia cadamba* (Roxb.) Bosser (Kelampayan), *Duabanga moluccana* (Sawih), *Durio zibelthinus* (Durian) and *Dimocarpus longan* Lour. (Longan). The amplification of DNA template obtained from the *f*asTiP-X was comparable to the positive control which extracted using conventional CTAB method (Fig. 1). The PCR analysis using DNA template isolated by the *f*asTiP-X approach for each species was repeated 3 times to prove the reliability and reproducibility of this method. This result showed that the *f*asTiP-X approach has higher potential for high-throughput genotyping compared to the conventional DNA extraction by considering its rapidity, simplicity and cost-effective features.

Fig. 1: PCR amplification using 5S rRNA primers with



template obtained using the *f*asTiP-X method. M: 100bp marker; P: positive control; I: *Neolamarckia cadamba*; II: *Duabanga moluccana*; III: *Durio zibelthinus*; and IV: *Dimocarpus longan* Lour.



FRST's Upcoming Event

Taxonomist and Ecologist Conference 2011, 19-20 April 2011, CAIS Auditorium, Universiti Malaysia Sarawak, Kota Samarahan, Sarawak

Next Generation Sequencing and Genome Informatics Workshop, in conjunction with the 9th Malaysia Genetic Congress, 26-27 September 2011, Faculty of Resource Science and Technology, Universiti Malaysia Sarawak, Kota Samarahan, Sarawak

The 9th Malaysia Genetic Congress, 28-30 September 2011, Pullman Hotel, Kuching, Sarawak

The 2nd International Symposium on Eco-Zoonoses and Emerging Infectious Diseases, 14-16 December 2011, CAIS Auditorium, Universiti Malaysia Sarawak, Kota Samarahan, Sarawak

FRST's Recent Publications

Affan, M. A., Salam, M. A., Fasihuddin, B. A, Mustaffa, B.S and Hapipah, A. 2011. Synthesis and spectroscopic characterization of organotin(IV) complexes with 2-benzoylpyridine-N(4)-cyclohexyl thiosemicarbazone (HBPCT): X-ray crystal structure of [PhSnCl2(BPCT)]. *Inorganica Chimica Acta* 366: 227-232.

Affan, M. A, Salam, M.A., Fasihuddin B. Ahmad, Ramli B. Hitam, Zoltan Gal and Presly Oliver 2011. Synthesis, structural characterization and toxicity activity of tin(IV)/organotin(IV) complexes with 2-benzoylpyridine-*N*(4)-cyclohexylthiosemicarbazone [HBPCT]. *Journal of Coordination Chemistry* 64(7): xxx

Ho, W.S., Pang, S.L. Lau, P. and Ismail, J. 2011. Sequence variation in the *cellulose synthase* (*SpCesA1*) gene from *Shorea parvifolia* ssp. *parvifolia* mother trees. *Journal of Tropical Agricultural Science* 34(2): xxx

Hoe, Y.C., Wong, S.Y., Boyce, P. C., Wong, M.H. and Chan, M.K.Y. 2011. Studies on Homalomeneae (Araceae) of Borneo VII: *Homalomena debilicrista*, a new species from Malaysian Borneo, and observations of its pollination mechanics. *Plant Diversity and Evolution* 129(1): 1–11.

Lim, H.C, Rahman, M.A., Lim, S.L.M., Moyle, R.G. and Sheldon, F.H. 2011. Revisiting Wallace's haunt: Coalescent simulations and comparative niche modeling reveal historical mechanisms that promoted avian population divergence in the Malay Archipelago. *Evolution* **65**(2): 321-334.

Md. Abdus Salam, Md. Abu Affan, Fasihuddin B. Ahmad, Seik Weng Ng and Edward R. T. Tiekink 2011. 1-Cyclohexyl-3-{(E)-[1-(pyridin-2-yl)- ethylidene] amino}thiourea. *Acta Cryst.* E67: o955.

Pang S.C., Chin, S.F., Tay S.H. and Tchong F.M. 2011. Starch–maleate–polyvinyl alcohol hydrogels with controllable swelling behaviors. *Carbohydrate Polymers* 84: 424-429.