

Faculty of Science, Kasetsart University, Bangkok Thailand

I-KUSTARS 2016

2 - 4 June, 2016

The International Kasetsart University
Science and Technology
Annual Research Symposium

Title The International Kasetsart University Science and Technology Annual
research Symposium : I-KUSTARS 2016

Published and organized by

Faculty of Science, Kasetsart University, Bangkok, Thailand
Tel 02-562-5444 ext. 1002, 1003, 1004

Edition 1/2016

Year 2016

Copies 150

Website: <http://www.sci.ku.ac.th/ikustars2016/>

Press's name and address

PROTEXTS

DANEX Intercorperation

Tel 02-575-1791, Fax 02-575-1791 ext 16

Email: prottexts@hotmail.com

Copyright No part of this publication may be transmitted, stored, or reordered
in any form without written permission from IKUSTARS 2016.

ISBN 978-616-278-312-8



Dear Colleagues

On behalf of the organizing committee of the International Kasetsart University Science and Technology Annual Research Symposium 2016 (I-KUSTARS 2016), it is my great pleasure to extend a warm welcome to you to participate in this Symposium which is one of the significant occasions to celebrate 50th Anniversary of Faculty of Science, Kasetsart University (SciKU) for having been the Knowledge of the Land throughout these years.

I-KUSTARS 2016@Kasetsart is an exciting conference in science to provide opportunities for senior students to present their research work in a dedicated forum at the symposium. Leading by Plenary and invited speakers who pioneered their research field and made significant contributions in the area. This symposium is also a platform to strengthen current networks and to establish new collaborative links within Asian community and with the rest of the world. The scientific program comprises sessions that illustrate the relevance and value of modern science and technology and innovation.

We are looking forward to giving a warm welcome to you, and colleagues at I-KUSTARS 2016. We hope that you will find the Symposium both enjoyable and valuable. We thank you in advance for participating and contributing to the success of the event to mirror “*Knowledge of the Land*” for sustainable world.

With best wishes

Supa Hannongbua
Dean of Faculty of Science

“SciKU”

S : Sustainability

C : Creativity

I : Integrity

K : Knowledge

U : Unity

VISION: Excellence in Natural Science in ASEAN by 2022





PROGRAM COMMITTEE

Advisory Chair	Supa Hannongbua	Dean of the Faculty of Science
	Orapin Chienthavorn	Department of Chemistry
	Thiraporn Anuntasethakul	Department of Zoology
	Nongnuch Sukvaree	Department of Mathematics
	Umaporn Sirathranont	Department of Computer Science
	Vichien Kitpreechavanich	Department of Microbiology
Program Chair Committee	Nuanwan Soonthornphisaj	Department of Computer Science
	Ampai Thongteeraparp	Department of Statistics
	Apichart Pattanaporkratana	Department of Physics
	Chotika Yokthongwattana	Department of Biochemistry
	Juthaporn Sinsomboonthong	Department of Statistics
	Kannaree Chuangcham	Department of Earth Sciences
	Nattamon Koonsang	Department of Chemistry
	Paiboon Reungpatthanaphong	Department of Applied Radiology and Isotopes
	Panas Tumkiratiwong	Department of Zoology
	Pattira Ruengsinsub	Department of Mathematics
	Ratree Wongpanya	Department of Biochemistry
	Saree Phongphanphanee	Department of Material Sciences
	Sirikorn Channual	Department of Computer Science
	Srisom Suwanwong	Department of Botany
	Uraiwan Arunyawat	Department of Genetics
Wanna Malaphan	Department of Microbiology	





REVIEWER

Chair	Nuanwan Soonthornphisaj	Department of Computer Science
Committee	Anchane Kubera	Department of Genetics
	Chatchawan Jantasuriyarat	Department of Genetics
	Chonticha Tantitadapitak	Department of Biochemistry
	Chotika Yokthongwattana	Department of Biochemistry
	Churapa Teerapatsakul	Department of Microbiology
	Kiattawee Choowongkomon	Department of Biochemistry
	Nattanan T-Thienprasert	Department of Biochemistry
	Napapol Poopanitpan	Department of Biochemistry
	Noppon Lertwattanasakul	Department of Microbiology
	Pakaket Wattuya	Department of Computer Science
	Prissana Wiriyajitsomboon	Department of Microbiology
	Sasimanas Unajak	Department of Biochemistry
	Wannarat Pornsiriwong	Department of Biochemistry
	Wanna Malaphan	Department of Microbiology





PROGRAM SCHEDULE AT A GLANCE

June 2, 2016 Floor 3 Building: 45th Anniversary

Time	Session			
08.30 - 09.30 A.M.	Registration			
09.30 - 10.00 A.M.	Opening Ceremony (Room 341)			
10.00 -11.00 A.M.	Keynote 1 (Room 341)			
11.00 -12.00 A.M.	Keynote 2 (Room 341)			
12.00 - 01.00 P.M.	Lunch			
01.00 - 02.40 P.M.	Botany (5) A01-05 (Room 301)	Micro (5) B01-05 (Room 302)	Chem (5) C01-05 (Room 303)	Poster Session Biology Computer Sci. Earth Sci. Mathematics Physics Zoology Statistics Biochemistry (Ground Fl., Davi Yannasugondha Bldg.)
02.40 - 03.00 P.M.	Break			
03.00 - 05.00 P.M.	Genetics (6) A07-12 (Room 301)	Micro (4) B06-09 (Room 302)	Chem (6) C06-11 (Room 303)	
05.00 - 09.00 P.M.	Welcome Reception (Room 352)			

June 3, 2016 Floor 3 Building: 45th Anniversary

Time	Session			
09.00 – 10.00 A.M.	Zoology (4) A21-24 (Room 301)	Biochem (4) B21-24 (Room 302)	Physics (3) C21-C23 (Room 303)	Poster Session Botany Chemistry Genetics Microbiology Applied Radiation (Ground Fl., Davi Yannasugondha Bldg.)
10.00 – 10.20 A.M.				
10.20 – 10.40 A.M.	Break			
10.40 – 11.20 A.M.	Zoology (3) A25-27 (Room 301)	Biochem (2) B25-26 (Room 302)	Math/CS (3) C25-C27 (Room 303)	
11.20 – 11.40 A.M.				
11.40 – 12.30 A.M.	Lunch			
12.40 – 02.00 P.M.	Poster Session			
02.00 P.M.	Closing Ceremony (Room 341)			





PROGRAM SCHEDULE

June 2, 2016	
Time	Room 341 Floor 3 Building: 45th Anniversary
08.30 A.M.-09.30 A.M.	Registration
09.30 A.M.-10.00 A.M.	Opening Ceremony
10.00 A.M.-11.00 A.M.	Plenary Session Molecular Physiology & Functional genomic studies for Abiotic stress tolerance in plants <i>By Sanjib Kumar Panda</i>
11.00 A.M.-12.00 A.M.	Plenary Session Industrial Biotechnology: the Sustainable Solution for a Green World <i>By Bo Yu and Ruiyan Wang</i>
12.00 A.M.- 1.00 P.M.	Lunch





PROGRAM SCHEDULE (Oral Presentations)

June 2, 2016 Room 301 Floor 3, Building: 45th Anniversary

Time	Title	Page
	Botany	
1.00 P.M. -1.20 P.M.	Antioxidant Activities Screening from Deciduous Forest's Plants. <i>By Sorawit Bapia and Sutsawat Duangrisai</i>	1
1.20 P.M.-1.40 P.M.	Photosynthesis Efficiency of Black gram Under Nutrient Stress <i>By Melissa Soun-udom and Sutsawat Duangrisai</i>	2
1.40 P.M. -2.00 P.M.	Effect of phenolic compounds on seed germination and seedling growth of <i>Mimosa pigra</i> L. <i>By Mahsarahka Rungkrajang et.al.</i>	3
2.00 P.M.-2.20 P.M.	Bioherbicidal Effect of <i>Typha angustifolia</i> L. Extract on Seed Germination and Seedling Growth of <i>Mimosa pigra</i> L. <i>By Udomsap Chantanet</i>	4
2.20 P.M.-2.40 P.M.	Comparative Phytochemistry of <i>Guettarda speciosa</i> L. <i>By Wanitcha Muangrom and Srunya Vajrodaya</i>	5
2.40 P.M.-3.00 P.M.	Coffee Break	
	Genetics	
3.00 P.M.-3.20 P.M.	Avirulence Gene-Based Diagnosis of <i>Magnaporthe oryzae</i> and Its Application in the Resistance Gene Deployment for Controlling Rice Blast Disease <i>By Shiela Marie Selisana et.al.</i>	6
3.20 P.M.-3.40 P.M.	Genetic diversity of rice blast isolates in Vietnam based on RAPD, SRAP and ISSR markers <i>By Doan Thi Hoa et.al.</i>	7
3.40 P.M.-4.00 P.M.	The effect of ascorbic acid on the ability of rice blast disease resistance <i>By Mantira Suksirt and Chatchawan Jantasuriyarat</i>	8
4.00 P.M.-4.20 P.M.	Applications of Loop Mediated Isothermal Amplification (LAMP) assay for rapid detection of phytoplasmas associated diseases in plants <i>By Nguyen Thi Thanh Xuan and Nguyen Bao Quoc</i>	9
4.20 P.M.- 4.40 P.M.	Inductive effects of the giant African snail (<i>Achatina fulica</i>) mucus on the differentiation of human mesenchymal stem cells into osteocytes <i>By Thananat Jearasakwattana et.al.</i>	10
4.40 P.M.-5.00 P.M.	Cytotoxic effects of the giant African snail mucus on promyelocytic leukemia cell line HL-60 <i>By Kanokkorn Pitayakornpakdee et.al.</i>	11
5.00 P.M.-9.00P.M.	Reception (Room 352)	



**June 2, 2016 Room 302 Floor 3, Building: 45th Anniversary**

Time	Title	Page
	Microbiology	
1.00 P.M. -1.20 P.M.	Utilization of Sawdust as Substrate for Production and Characterization of Ethanol Biogel <i>By Itoandon Emoliela Ejiya et.al</i>	12
1.20 P.M.-1.40 P.M.	Expression of Resistance and Susceptibility on Selected Banana Cultivars to <i>Fusarium oxysporum</i> f.sp. <i>cubense</i> Schl. Strains in Southern Philippines <i>By Merlina H. Juruena et.al.</i>	13
1.40 P.M. -2.00 P.M.	Sooty Molds on Foliage of Philippine Ornamental Plants <i>By Sarah Jane B. Manaday and Teresita U. Dalisay</i>	14
2.00 P.M. -2.20 P.M.	Identification of Rust Fungi on Various Plants in Selected Areas in Luzon Philippines <i>By Teresita U. Dalisay and Vanessa A. Felices</i>	15
2.20 P.M. -2.40 P.M.	Simulation Modeling of Coffee Rust Epidemics Caused by <i>Hemileia vastatrix</i> Berk. & Br. <i>By Lynne R. Arevalo and Ireneo B. Pangga</i>	16
2.40 P.M.-3.00 P.M.	Coffee Break	
	Microbiology	
3.00 P.M.-3.20 P.M.	Simulation Modeling of Leaf Blast Epidemics caused by <i>Magnaporthe oryzae</i> B.C. Couch in the Philippines <i>By Julie Rose C. Caniamo et.al.</i>	17
3.20 P.M.-3.40 P.M.	Rapid and sensitive detection of <i>Salmonella</i> serotypes by loop mediated isothermal amplification (LAMP) assay <i>By Nguyen Bao Quoc and Woubit S. Abdela</i>	18
3.40 P.M.-4.00 P.M.	Diversity of Halotolerant Bacteria Isolated from Soil in Bang-Krachao Green Area and Their Potential as Plant Growth Promoting Bacteria <i>By Rungruedee Imvanich and Savitr Trakulnaleamsai</i>	19
4.00 P.M.-4.20 P.M.	Analysis of Population Structure of <i>Mycosphaerella fijiensis</i> Deighton in Luzon <i>By Mary Joy C. Mendoza and Edna Y. Ardales</i>	20
5.00 P.M.-9.00P.M.	Reception (Room 352)	





June 2, 2016 Room 303 Floor 3, Building: 45th Anniversary

Time	Title	Page
	Chemistry	
1.00 P.M. -1.20 P.M.	Synthesis of Gd-doped ZnO photocatalysts for degradation of dyes <i>By Nontarin Roopsung and Apisit Songsasen</i>	21
1.20 P.M.-1.40 P.M.	Synthesis of Gd-doped ZnO photocatalyst using co-precipitation method for degradation of dyes <i>By Supasin Limsapapkasiphon and Saijai Charnsethikul</i>	22
1.40 P.M.-2.00 P.M.	Exfoliation of Layered Hydroxy Double Salts in Non-aqueous Media <i>By Disatad Baedyanonda and Weekit Sirisaksoontorn</i>	23
2.00 P.M.-2.20 P.M.	Synthesis and Characterization of Titanium Complex supported by Salicylbenzothiazole Ligands for the Ring-Opening Polymerization of <i>rac</i> -Lactide <i>By Thanyathip Thongsutjaritphan and Pimpa Hormnirun</i>	24
2.20 P.M 2.40 P.M.	Synthesis of new cytotoxic tri- and tetraazabenz[3,2-a]fluorine-5,6-derivatives <i>By Wisansaya Jaikeandee and Theerachart Leepasert</i>	25
2.40 P.M.-3.00 P.M.	Coffee Break	
	Chemistry	
3.00 P.M.-3.20 P.M.	Toward the Total Synthesis of Anti-HIV Waltherione C <i>By Parichat Tawornchat and Paiboon Ngermmeesri</i>	26
3.20 P.M.-3.40 P.M.	Synthesis of Trifunctional Bioconjugate Molecule for Protein Kinases Detection <i>By Bongkotrat Thanaussavadata et.al.</i>	27
3.40 P.M.-4.00 P.M.	Towards the Synthesis of Steroid Receptor <i>By Chanoknun Boonyaratseewee and Bunyarithi Sookcharoenpinyo</i>	28
4.00 P.M.-4.20 P.M.	Introduction of Quantum Beam Science and Applications to Chemistry and Related Sciences <i>By Seiji Mori</i>	29
4.20 P.M.-4.40 P.M.	Searching for a Botanical Insecticide from <i>Coffea arabica</i> L. cv. Catimor Parchment <i>By Auraya Manaprasertsak and Wanchai Pluempanupat</i>	30
4.40 P.M.-5.00 P.M.	Searching for novel bioactive compounds produced by the fungus <i>Menisporopsis theobromae</i> BCC 4162 <i>By Thanyaporn Tengsuttivat and Pakorn Wattana-Amorn</i>	31
5.00 P.M.-9.00P.M.	Reception (Room 352)	




June 3, 2016 Room 301 Floor 3, Building: 45th Anniversary

Time	Title	Page
	Zoology	
9.00 A.M.-9.20 A.M.	Comparative genomics of <i>Cordyceps militaris</i> and other entomopathogenic fungi reveals gene interactions between fungal pathogens and insect hosts <i>By Chayapat Wizaza and Wanwipa Vongsangnak</i>	32
9.20 A.M.-9.40 A.M.	Histopathological Effects of Atrazine on the Freshwater Mussel, <i>Hyriopsis bialata</i> <i>By Krittapas Srisamai and Nopparat Srakaew</i>	33
9.40 A.M.-10.00 A.M.	Bioefficacy of leaf extracts from <i>Pouzolzia zeylanica</i> L. against diamondback moth <i>Plutella xylostella</i> in Viet Nam <i>By Nguyen Ngoc Bao Chau and Dang Thi Tinh</i>	34
10.00 A.M.-10.20 A.M.	Two <i>N</i> -acetyltransferase genes exist with different roles and expression mechanisms in the silkworm <i>Bombyx mori</i> <i>By Le Thi Dieu Trang et.al.</i>	35
10.20 A.M.-10.40 A.M.	Coffee Break	
10.40 A.M.-11.00 A.M.	Microscopic Structures of the Posterior Digestive Tract of the Butterfly Lizard, <i>Leiolepis ocellata</i> Peters, 1971 (Squamata: Agamidae) <i>By Tanachoke Kengkarnpanich and Nopparat Srakaew</i>	36
11.00 A.M.-11.20 A.M.	Effect of <i>Tiliacora triandra</i> on spatial learning and memory in permanent left common carotid artery occlusion mice <i>By Natsuda Mayagasa and Wachiryah Thong-asa</i>	37
11.20 A.M.-11.40 A.M.	Isolation and Identification of Fungi for Control <i>Spodoptera litura</i> F. from the Soils of Can Gio Mangrove Forest <i>By Le Thi Bich Lien et.al.</i>	38
11.40 A.M.-12.40 P.M.	Lunch	
12.40 P.M.-2.00 P.M.	Poster Session Ground Floor, Davi Yannasugondha Building	
2.30 P.M.	Closing Ceremony Room 341 Floor 3 Building: 45th Anniversary	





June 3, 2016 Room 302 Floor 3, Building: 45th Anniversary

Time	Title	Page
	Biochemistry	
9.00 A.M.-9.20 A.M.	Effect of Integrated Postharvest Treatment on Mango Stem End Rot Incidence <i>By Melissa P. Montecalvo et.al</i>	39
9.20 A.M.-9.40 A.M.	Systematic Acquired Resistance (SAR) Induction for the Control of Rice Blast Caused By <i>Pyricularia Grisea</i> Sacc. <i>By PIAMONTE, ROBELYN T. and BORINES, LUCIA M.</i>	40
9.40 A.M.-10.00 A.M.	Field Symptom Variability and Pathogenicity Testing of Sugarcane Leaf Scald caused by <i>Xanthomonas albilineans</i> <i>By Rizalina L. Tiongco et.al.</i>	41
10.00 A.M.-10.20 A.M.	Serological and Molecular Detection, and Transmission of the Virus Causing Leaf Curl Disease in Tobacco (<i>Nicotiana tabacum</i> L.) <i>By Ann Fatima Ariza Benjamin and Filomena C. Sta. Cruz</i>	42
10.20 A.M.-10.40 A.M.	Coffee Break	
10.40 A.M.-11.00 A.M.	Molecular Biotyping of <i>Vibrio vulnificus</i> Isolated from Diseases Brown-marbled grouper (<i>Epinephelus fuscoguttatus</i>) <i>By Thararat Phurahong and Sasimanas Unajak</i>	43
11.00 A.M.-11.20 A.M.	Occurrence, Identification, Characterization and Pathogenicity of <i>Fusarium</i> spp. Associated with Pokkah Boeng Disease of Sugarcane in the Philippines <i>By Manuela A. Samaco et.al.</i>	44
11.40 A.M.-12.40 P.M.	Lunch	
12.40 P.M.-2.00 P.M.	Poster Session Ground Floor, Davi Yannasugondha Building	
2.30 P.M.	Closing Ceremony Room 341 Floor 3 Building: 45th Anniversary	



X





June 3, 2016 Room 303 Floor 3, Building: 45th Anniversary

Time	Title	Page
	Physics	
9.00 A.M.-9.20 A.M.	Black holes in N=2 Supergravity in D=4 <i>By Jakkapat Seeyangnok and Parinya Karndumri</i>	45
9.20 A.M.-9.40 A.M.	Helium separation of monolayer C ₂ N membrane under uniform strain <i>By Klichchupong Dabsamut and Adisak Boonchun</i>	46
9.40 A.M.-10.00 A.M.	The study of structure and dynamics of water molecules in liquid phase using molecular dynamics method <i>By Intuon Chatratin and Chalernpol Kanchanawarin</i>	47
10.20 A.M.-10.40 A.M.	Coffee Break	
	Computer Science & Mathematics	
10.40 A.M.-11.00 A.M.	Thai Sign Language Website <i>By Pinpuk Phaison and Usa Sammapun</i>	48
11.00 A.M.-11.20 A.M.	Finite Volume Method for Shallow Water Equations Using Wet-Dry Cells Detecting Technique <i>By Thanet Markchom and Montri Maleewong</i>	49
11.20 A.M.-11.40 A.M.	Fourier Spectral Methods for Solving The Korteweg-De Vires Equation <i>By Teeradech Laisupannawong and Montri Maleewong</i>	50
11.40 A.M.-12.40 P.M.	Lunch	
12.40 P.M.-2.00 P.M.	Poster Session Ground Floor, Davi Yannasugondha Building	
2.30 P.M.	Closing Ceremony Room 341 Floor 3 Building: 45th Anniversary	





2nd KU-IMS Symposium

June 3, 2016 Room 375, Floor 3, Building: 45th Anniversary

Time	Activity
8.30 A.M.- 9.00 A.M.	Registration
9.00 A.M.- 9.10 A.M.	Opening meeting by Prof. Dr. Supa Hannongbua
9.10 A.M.- 9.30 A.M.	"Biomass decomposition by cellulase observed at the single-molecule level" Prof. Dr. Ryota IINO (IMS)
9.30 A.M.- 9.45 A.M.	"Computational design, synthesis and biological evaluation of compounds targeting diseases of the developing world" Dr. M. Paul Gleeson (KU)
9.45 A.M.- 10.05 A.M.	"Dynamics of water and proteins" Prof. Dr. Shinji SAITO (IMS)
10.05 A.M.- 10.25 A.M.	Coffee break
10.25 A.M.- 10.40 A.M.	TBA Assoc. Prof. Dr. Kiattawee Choowongkorn (KU)
10.40 A.M.- 11.00 A.M.	"Molecular dynamics simulations for assembly and disassembly of A β amyloid fibrils" Assoc. Prof. Dr. Hisashi OKUMURA (IMS)
11.00 A.M. - 11.15 A.M.	"Permeation of small molecules through membrane: Molecular dynamics simulations" Assoc. Prof. Dr. Jirasak Wong-ekkabut (KU)
11.15 A.M.- 11.30 A.M.	"Exploring structural and functional properties of human serum albumins for development of diabetic aptasensor: Simulation studies" Dr. Prapasiri Pongprayoon (KU)
11.30 A.M.- 1.00 P.M.	Lunch
1.00 P.M.- 1.20 P.M.	"Structural views of glycoprotein quality control in cells" Prof. Dr. Koichi KATO (IMS)
1.20 P.M.- 1.35 P.M.	"Binding prediction of 8-hydroxyquinoline derivative to Dengue Virus NS3 Protease using molecular modeling" Asst. Prof. Dr. Patchareenart Saparpakorn (KU)
1.35 P.M.- 1.50 P.M.	"Ion selectivity of Prussian Blue: 3D-RISM study" Dr. Saree Phongphanphanee (KU)
1.50 P.M.- 2.10 P.M.	"Organic Field-Effect-Transistor driven by phase transition" Prof. Dr. Hiroshi YAMAMOTO (IMS)
2.10 P.M.- 2.25 P.M.	"Improvement of charge separation and transport at interfaces between organic-inorganic hybrid perovskite and TiO ₂ " Dr. Pongthep Prajongtat (KU)
2.25 P.M. - 3.30 P.M.	Group discussion





PLENARY SESSION





Sanjib Kumar Panda, Professor

Department of Life Science and Bioinformatics

Assam University, Silchar, India

Prof. Sanjib K. Panda works in the area of Plant Molecular biology & Functional genomics to understand the mechanisms of stress signal transduction and to develop stress tolerant crop plants. He uses transcriptomics, miRNomics and metabolomics techniques along with transgenic technology to decipher stress responses in crop and model plant systems. His work has resulted in numerous publications and contributed to the training of a number of students.

Prof. Sanjib K. Panda obtained his Ph.D. in 1998 and later D.Sc. in 2012 from Utkal University. Since completing his PhD, he has been awarded several fellowships worldwide and has held the position of Visiting Professor at Gifu University, Japan, University of Dusseldorf, Germany and INTRU, Russia in addition to his Professorship in the Department of Life Science and Bioinformatics at Assam University.





Molecular Physiology & Functional genomic studies for Abiotic stress tolerance in plants

Prof. Dr. Sanjib Kumar Panda, Ph.D., D.Sc.

Plant Molecular Biotechnology Laboratory,
Department of Life Science & Bioinformatics
Assam University (a Central University)
Silchar 788011. INDIA

Abiotic stress is a major limiting factors for sustainable crop production as it reduces yield by more than 50% in crop plants. Drought, salt, cold, metals and metalloids stress are important environmental factors that affect plant growth and productivity. Our group has made significant contributions in understanding the abiotic stress tolerance mechanisms in crops and models by using various Molecular physiological, transgenic and functional genomic approaches. Stress responsive genes and transcription factors like *NHX1*, *LEA4-1*, *DREB2A*, *STOP1*, *MATE*, *ALS*, *NAC* etc. were cloned from various important and resilient crops such as cowpea, mungbean, blackgram, tomato etc. and the functionality was tested in crops and model transgenic platforms. In the post-genomics era plant functional genomics has gained momentum in deciphering the genes, proteins, gene regulatory networks and metabolomic shifts etc. with the use of various high-throughput omics technologies. We have been working on transcriptomic, miRNomics and metabolomics platforms to understand major abiotic stress tolerance mechanisms in crops.





Dr. Bo Yu, Associate Professor
CAS Key Laboratory of Microbial Physiological
and Metabolic Engineering
Institute of Microbiology, Chinese Academy of Sciences
Deputy Director, CAS-TWAS Centre of Excellence for
biotechnology

Bo Yu was born on May 12th 1978 in China. He obtained his academic training at Shandong University, China. After completion of his PhD thesis in 2006, he moved to Institute of Microbiology, Chinese Academy of Sciences (IMCAS), where he worked as an assistant professor. In 2008, he started his Post-doc research for two years at German Helmholtz Centre for Infection Research and Hamburg University of Technology, both funded by German Alexander von Humboldt Fellowship. From Oct. 2010, Dr. Bo Yu returned to IMCAS and led the research group on Extremophiles and Industrial synthetic biotechnology. From 2014, Dr. Bo Yu served as the Deputy Director of CAS-TWAS Centre of Excellence for Biotechnology (CoEBio). His research interests are in biotechnology, especially in the aspect of systems metabolic engineering of strains for production of bio-based products. Till now, he authored more than 60 scientific (peer reviewed) papers and 9 issued patents in the fields of protein engineering, metabolic engineering and fermentation.





Industrial Biotechnology: the Sustainable Solution for a Green World

Bo Yu^{1,2} * and Ruiyan Wang^{1,2}

¹ CAS-TWAS Centre of Excellence for Biotechnology (CoEBio)

² CAS Key Laboratory of Microbial Physiological and Metabolic Engineering,

Institute of Microbiology, Chinese Academy of Sciences (CAS)

NO.1 Beichen West Road, Chaoyang District, Beijing 100101, China

E-mail: yub@im.ac.cn

Industrial biotechnology, also known as white biotechnology, is the application of enzymes and/or microorganisms to produce value-added chemicals from renewable sources. Compared to chemical technology, industrial biotechnology is one of the most promising new approaches to pollution prevention, resource conservation, and cost reduction. Additionally, the application of biotechnology to industrial processes is not only transforming how we manufacture products but is also providing us with new products that could not even be imagined a few years ago. Thus, industrial biotechnology offers new potential for meeting the world's increasing demand for food, feed, fuel, materials, and more while reducing our impact on the environment.

Given above, it is now widely accepted that industrial biotechnology is the driver for change from petroleum-based economy to a more sustainable green economy. During the past decades, development of tools in manipulating genetic framework empowered the cell as the reliable factories to either produce valuable chemicals or destroy hazardous/polluting chemicals. Here, we highlight advances of a wide variety of biological toolsets for industrial biotechnology, including protein engineering, metabolic engineering, synthetic biology and etc. In addition, we will show how these tools have been successfully applied in several case studies. The more sustainable green world should be expected in the near future when industrial biotechnology is extensively applied in chemical, pharmaceutical, food, and agricultural industries.





TABLE OF CONTENTS

	Page
Preface	i
Program Committee	ii
Reviewer	iii
Program Schedule at a Glance	iv
Program Schedule	v
2 nd KU-IMS Symposium	xii
Prenary Session	xiii
Biography: Professor Dr. Sanjib Kumar Panda	xiv
Molecular Physiology & Functional genomic studies for Abiotic stress tolerance in plants <i>By Sanjib Kumar Panda</i>	xv
Biography: Associate Professor Dr. Bo Yu	xvi
Industrial Biotechnology: the Sustainable Solution for a Green World <i>By Bo Yu and Ruiyan Wang</i>	xvii
Antioxidant Activities Screening from Deciduous Forest's Plants <i>By Sorawit Bapia and Sutsawat Duangsrjai</i>	1
Photosynthesis Efficiency of Black gram Under Nutrient Stress <i>By Melissa Soun-udom and Sutsawat Duangsrjai</i>	2
Effect of phenolic compounds on seed germination and seedling growth of <i>Mimosa pigra</i> L. <i>By Mahsaraha Rungkrajang et.al.</i>	3
Bioherbicide Effect of <i>Typha angustifolia</i> L. Extract on Seed Germination and Seedling Growth of <i>Mimosa pigra</i> L. <i>By Udomsap Chantanet</i>	4
Comparative Phytochemistry of <i>Guettarda speciosa</i> L. <i>By Wanitcha Muangrom and Srunya Vajrojaya</i>	5
Avirulence Gene-Based Diagnosis of <i>Magnaporthe oryzae</i> and Its Application in the Resistance Gene Deployment for Controlling Rice Blast Disease <i>By Shiela Marie Selisana et.al.</i>	6





TABLE OF CONTENTS

	Page
Genetic diversity of rice blast isolates in Vietnam based on RAPD, SRAP and ISSR markers <i>By Doan Thi Hoa et.al.</i>	7
The effect of ascorbic acid on the ability of rice blast disease resistance <i>By Mantira Suksirt and Chatchawan Jantasuriyarat</i>	8
Applications of Loop Mediated Isothermal Amplification (LAMP) assay for rapid detection of phytoplasmas associated diseases in plants <i>By Nguyen Thi Thanh Xuan and Nguyen Bao Quoc</i>	9
Inductive effects of the giant African snail (<i>Achatina fulica</i>) mucus on the differentiation of human mesenchymal stem cells into osteocytes <i>By Thananat Jearasakwattana et.al.</i>	10
Cytotoxic effects of the giant African snail mucus on promyelocytic leukemia cell line HL-60 <i>By Kanokkorn Pitayakornpakdee et.al.</i>	11
Utilization of Sawdust as Substrate for Production and Characterization of Ethanol Biogel <i>By Itoandon Emoliela Ejiya et.al</i>	12
Expression of Resistance and Susceptibility on Selected Banana Cultivars to <i>Fusarium oxysporum</i> f.sp. <i>cubense</i> Schl. Strains in Southern Philippines <i>By Merlina H. Juruena et.al.</i>	13
Sooty Molds on Foliage of Philippine Ornamental Plants <i>By Sarah Jane B. Manaday and Teresita U. Dalisay</i>	14
Identification of Rust Fungi on Various Plants in Selected Areas in Luzon Philippines <i>By Teresita U. Dalisay and Vanessa A. Felices</i>	15
Simulation Modeling of Coffee Rust Epidemics Caused by <i>Hemileia vastatrix</i> Berk. & Br. <i>By Lynne R. Arevalo and Ireneo B. Pangga</i>	16
Simulation Modeling of Leaf Blast Epidemics caused by <i>Magnaporthe oryzae</i> B.C. Couch in the Philippines <i>By Julie Rose C. Caniamo et.al.</i>	17
Rapid and sensitive detection of <i>Salmonella</i> serotypes by loop mediated isothermal amplification (LAMP) assay <i>By Nguyen Bao Quoc and Woubit S. Abdela</i>	18





TABLE OF CONTENTS

	Page
Diversity of Halotolerant Bacteria Isolated from Soil in Bang-Krachao Green Area and Their Potential as Plant Growth Promoting Bacteria <i>By Rungruedee Imvanich and Savitr Trakulnaleamsai</i>	19
Analysis of Population Structure of <i>Mycosphaerella fijiensis</i> Deighton in Luzon <i>By Mary Joy C. Mendoza and Edna Y. Ardales</i>	20
Synthesis of Gd-doped ZnO photocatalysts for degradation of dyes <i>By Nontarin Roopsung and Apisit Songsasen</i>	21
Synthesis of Gd-doped ZnO photocatalyst using co-precipitation method for degradation of dyes <i>By Supasin Limsapapasiphon and Saijai Charnsethikul</i>	22
Exfoliation of Layered Hydroxy Double Salts in Non-aqueous Media <i>By Disatad Baedyanonda and Weekit Sirisaksoontorn</i>	23
Synthesis and Characterization of Titanium Complex supported by Salicylbenzothiazole Ligands for the Ring-Opening Polymerization of <i>rac</i> -Lactide <i>By Thanyathip Thongsutjaritphan and Pimpa Hormnirun</i>	24
Synthesis of new cytotoxic tri- and tetraazabenz[3,2-a]fluorine-5,6-derivatives <i>By Wisansaya Jaikeandee and Theerachart Leepasert</i>	25
Toward the Total Synthesis of Anti-HIV Waltherione C <i>By Parichat Tawornchat and Paiboon Ngermmeesri</i>	26
Synthesis of Trifunctional Bioconjugate Molecule for Protein Kinases Detection <i>By Bongkotrat Thanaussavadate et.al.</i>	27
Towards the Synthesis of Steroid Receptor <i>By Chanoknun Boonyaratsewee and Bunyarithi Sookcharoenpinyo</i>	28
Introduction of Quantum Beam Science and Applications to Chemistry and Related Sciences <i>By Seiji Mori</i>	29





TABLE OF CONTENTS

	Page
Searching for a Botanical Insecticide from <i>Coffea arabica</i> L. cv. Catimor Parchment <i>By Auraya Manaprasertsak and Wanchai Pluempanupat</i>	30
Searching for novel bioactive compounds produced by the fungus <i>Menisporopsis theobromae</i> BCC 4162 <i>By Thanyaporn Tengsuttiwat and Pakorn Wattana-Amorn</i>	31
Comparative genomics of <i>Cordyceps militaris</i> and other entomopathogenic fungi reveals gene interactions between fungal pathogens and insect hosts <i>By Chayapat Wizaza and Wanwipa Vongsangnak</i>	32
Histopathological Effects of Atrazine on the Freshwater Mussel, <i>Hyriopsis bialata</i> <i>By Krittapas Srisamai and Nopparat Srakaew</i>	33
Bioefficacy of leaf extracts from <i>Pouzolzia zeylanica</i> L. against diamondback moth <i>Plutella xylostella</i> in Viet Nam <i>By Nguyen Ngoc Bao Chau and Dang Thi Tinh</i>	34
Two <i>N</i> -acetyltransferase genes exist with different roles and expression mechanisms in the silkworm <i>Bombyx mori</i> <i>By Le Thi Dieu Trang et.al.</i>	35
Microscopic Structures of the Posterior Digestive Tract of the Butterfly Lizard, <i>Leiolepis ocellata</i> Peters, 1971 (Squamata: Agamidae) <i>By Tanachoke Kengkarnpanich and Nopparat Srakaew</i>	36
Effect of <i>Tiliacora triandra</i> on spatial learning and memory in permanent left common carotid artery occlusion mice <i>By Natsuda Mayagasa and Wachiryah Thong-asa</i>	37
Isolation and Identification of Fungi for Control <i>Spodoptera litura</i> F. from the Soils of Can Gio Mangrove Forest <i>By Le Thi Bich Lien et.al.</i>	38
Effect of Integrated Postharvest Treatment on Mango Stem End Rot Incidence <i>By Melissa P. Montecalvo et.al</i>	39
Systematic Acquired Resistance (SAR) Induction for the Control of Rice Blast Caused By <i>Pyricularia grisea</i> Sacc. <i>By PIAMONTE, ROBELYN T. and BORINES, LUCIA M.</i>	40





TABLE OF CONTENTS

	Page
Field Symptom Variability and Pathogenicity Testing of Sugarcane Leaf Scald caused by <i>Xanthomonas albilineans</i> <i>By Rizalina L. Tiongco et.al.</i>	41
Serological and Molecular Detection, and Transmission of the Virus Causing Leaf Curl Disease in Tobacco (<i>Nicotiana tabacum</i> L.) <i>By Ann Fatima Ariza Benjamin and Filomena C. Sta. Cruz</i>	42
Molecular Biotyping of <i>Vibrio vulnificus</i> Isolated from Diseases Brown-marbled grouper (<i>Epinephelus fuscoguttatus</i>) <i>By Thararat Phurahong and Sasimanas Unajak</i>	43
Occurrence, Identification, Characterization and Pathogenicity of <i>Fusarium</i> spp. Associated with Pokkah Boeng Disease of Sugarcane in the Philippines <i>By Manuela A. Samaco et.al.</i>	44
Black holes in $N=2$ Supergravity in $D=4$ <i>By Jakkapat Seeyangnok and Parinya Karndumri</i>	45
Helium separation of monolayer C_2N membrane under uniform strain <i>By Klichchupong Dabsamut and Adisak Boonchun</i>	46
The study of structure and dynamics of water molecules in liquid phase using molecular dynamics method <i>By Intuon Chatratin and Chalernpol Kanchanawarin</i>	47
Thai Sign Language Website <i>By Pimpuk Phaison and Usa Sammapun</i>	48
Finite Volume Method for Shallow Water Equations Using Wet-Dry Cells Detecting Technique <i>By Thanet Markchom and Montri Maleewong</i>	49
Fourier Spectral Methods for Solving The Korteweg-De Vries Equation <i>By Teeradech Laisupannawong and Montri Maleewong</i>	50





TABLE OF CONTENT: POSTER SESSION

Physical Science Posters

Mathematics

No.	Title	Page
P 001	The values of $\left[\left(1 - \prod_{k=n}^{\infty} \left(1 - \frac{1}{F_k} \right) \right)^{-1} \right]$ <i>and</i> $\left[\left(1 - \prod_{k=n}^{\infty} \left(1 - \frac{1}{r_k} \right) \right)^{-1} \right]$ <i>By Chanokchon Onsri and Kantaphon Kuhapatanakul</i>	51
P 002	The Recurrence Formula of the Partition Function <i>By Jintana Thansawangdamrong and Teerapat Srichan</i>	52
P 003	The Riemann zeta-function and the ergodic transformations <i>By Somchai Chanti and Teerapat Srichan</i>	53
P 004	A problem obtained From integer derivative <i>By Suwittha Bunrit and Watcharapon Pimsert</i>	54

Chemistry

No.	Title	Page
P 005	Curcumin encapsulation by chitosan-cyclodextrin polymer nanoparticle <i>By Apipol Penkitti and Thitinun Karpkird</i>	55
P006	Application of porous silicon as a drug carrier material <i>By Kanlaya Singkaew and Junya Jettanasen</i>	56
P 007	Synthesis of novel biphenolic derivatives as sensors for anion detection <i>By Manassiri Pensirikul and Boontana Wannalarse</i>	57
P 008	Effect of Copper Promoted Silica Supported Cobalt Catalysts on Methanol Selectivity in Fischer-Tropsch Synthesis <i>By Napat Kanokpornwasin and Pinsuda Viravathana</i>	58
P 009	Synthesis of trimetal oxide catalysts for catalytic transfer hydrogenation of methyl levulinate <i>By Natthida Choungchai et.al.</i>	59





No.	Title	Page
P 010	The Development of Metal Oxide Catalysts Supported Alumina for Production of Biofuel via Deoxygenation Reaction of Fatty Acid under Inert Atmosphere <i>By Navapat Krobkrong and Pipat Khongpracha</i>	60
P 011	Electrochemical study of electrodeposited Pt-Sn electrodes for ethanol oxidation <i>By Nittha Nilapun and Wilai Siriwatcharapiboon</i>	61
P 012	Synthesis and photophysical properties of a copper binuclear complex of tetradentate Schiff base ligands and its DFT study <i>By Nichakan Miengmern and Songwut Suramitr</i>	62
P 013	Synthesis of Amino Nucleosides via Sharpless Amino Hydroxylation Reaction <i>By Norrachon Sakaret and Pitak Chuawong</i>	63
P 014	Applications of Metal-Organic Framework <i>By Onpailin Chantaphoom and Tanwawan Duangthongyou</i>	64
P 015	Synthesis of Peptide-conjugated Dendrimers to Target Cancer Cells <i>By Pongtai Chaiputtanapun and Wittha Imaram</i>	65
P 016	Toward the synthesis of anti-cancer and anti-malarial quinazolinone <i>By Ponlasak Tamsampaoloet and Boonsong Kongkathip</i>	66
P 017	An approach to develop a facile electrochemical sensor for caffeine by surface modified glassy carbon, and halloysite incorporated graphite electrodes <i>By Preeyanoot Thomuen and Chaiya Prasittichai</i>	67
P 018	Target identification of the compounds from <i>Centella asiatica</i> (L.) Urb. as inhibitors of Lipoxygenase by using molecular modeling <i>By Supak Pattaweepaiboon et.al.</i>	68
P 019	Preparation Ce-substituted in perovskite $\text{La}_{1-x}\text{Ce}_x\text{CoO}_3$ ($x=0-0.20$) for hydrogen production from water <i>By Suphannipha Thara et.al.</i>	69
P 020	Searching for novel bioactive compounds produced by the fungus <i>Menisporopsis theobromae</i> BCC 4162 <i>By Thanyaporn Tengsuttivat and Pakorn Wattana-Amorn</i>	70





No.	Title	Page
P 021	Synthesis and Characterization of Titanium Complex supported by Salicylbenzothiazole Ligands for the Ring-Opening Polymerization of <i>rac</i> -Lactide <i>By Thanyathip Thongsutjaritphan and Pimpa Hormnirun</i>	71
P 022	Synthesis of Lactide from Lactic Acid Using Zeolite Catalysts <i>By Wanatchapan Chinda-in and Tanin Nanok</i>	72
P 023	Preparation of Barium Ferrite Coated with Titanium Dioxide as Magnetic Photo Catalysts for Industrial Dyes Degradation <i>By Wanthakan Ketnak and Nattamon Koonsaeng</i>	73
P 024	Synthesis and characterization of Titaniumdioxide for using in sunscreen <i>By Wimonporn Anusonadisai and Surachai Thachepan</i>	74
P 025	Mesoporous Silica-Template Synthesis of Polyaniline-Derived N-Doped Mesoporous Carbons with Cobalt or Nickel as a Counter Electrode for Dye-Sensitized Solar Cells <i>By Wimut Awsakulsuddhi and Panitat Hasin</i>	75
P 026	Production of Biodiesel from Waste Cooking Oil Using Calcium Oxide as Catalyst and Tetrahydrofuran as Co-solvent <i>By Bheechanat Duangdee and Vittaya Punsuvon</i>	76
P 027	Production of Biodiesel from Waste Cooking Oil Using Calcium Methoxide as Catalyst and Tetrahydrofuran as Co-solvent <i>By Ratchanan Thitayanapong and Vittaya Punsuvon</i>	77
P 028	Utilization of Ash from Biomass in Silica Filled Natural Rubber <i>By Thitiya Mahaprom and Wirunya Keawwattana</i>	78
P 029	Effect of Epoxided Natural Rubber as Compatibilizer on Mechanical Properties of Natural Rubber filled with Biomass <i>By Warangkana Paritasung and Wirunya Keawwattana</i>	79
P 030	Extraction of phenolic compound from <i>Moringa oleifera</i> leaves for using as antioxidant in biodiesel <i>By Wuttipong Amornchaiyaphithak and Vittaya Punsuvon</i>	80





Physics

No.	Title	Page
P 031	Measurement of the Reflective Spectrum of Riceberry Grain for Rice Optical Sorter Design <i>By Chiraphat Puksuk and Noparit Jinuntuya</i>	81
P 032	Preparation and optical properties of Mg-doped ZnO nanorods <i>By Chutikan Iaolek and Sirikanjana Thongmee</i>	82
P 033	Raspberry Pi Grating Spectrometer <i>By Kanyaporn Ketthong and Noparit Jinantuya</i>	83
P 034	Assessment of Radioactivity in soil within Pharnakorn Rajabhat University with High-purity Germanium (HPGe) Detector <i>By Kritsana Khaothong and Teerasak Veerapaspong</i>	84
P 035	Invention of Insect Egg Counting Device Based on a Machine Vision <i>By Montira Kamchon et.al.</i>	85
P 036	Constraints on Dark Matter Annihilation from Synchrotron Radiation <i>By Nattapon Teeprachai and Maneenate Wechakama</i>	86
P 037	Thermal property of solid measured by photothermal deflection technique <i>By Pongsakorn Tipmonta and Puchong Kijamnajsuk</i>	87
P 038	Development of Wind Turbine System for Electricity Generation From Exhaust Waste Air in an Industry <i>By Sarun Arunragasa and Chatchawal Wongchoosuk</i>	88
P 039	Chilled-plate hygrometer with Arduino and Raspberry Pi <i>By Sataporn Mulkamnee and Noparit Jinuntuya</i>	89
P 040	First-principles calculations of carbon impurities in rutile TiO ₂ <i>By Supparat Charoenphon and Pakpoom Reunchan</i>	90
P 041	Properties and microstructure of lightweight aggregate produced from waste materials <i>By Supranee Siangma et.al.</i>	91
P 042	Dark Matter Constraints from PAMELA, H.E.S.S, Fermi and AMS-02 <i>By Suwitchaya Setthahirun and Maneenate Wechakama</i>	92





No.	Title	Page
P 043	Application of Image Processing to the Viscosity Measurement Laboratory <i>By Tanatsaparn Tithito and Noparit Jinuntuya</i>	93
P 044	Epidemic modeling of Dengue fever using one-dimensional lattice model <i>By Worachapha Banyongkid and Chalernpol Kanchanawarin</i>	94

Computer Science

No.	Title	Page
P 045	KUrun application on Android OS <i>By Thanee Sriamornruttanakul and Aekchai Wattana</i>	95
P 046	Eye Movement Application on Eye Tribe Tracker <i>By Bhanuwit Sirayobhas</i>	96
P 047	Stroke and Heart Disease for Application <i>By Chatinya Jundit and Panisa Apikulchatkit</i>	97
P 048	Word Search in The Wordland By Unity for Mobile Game <i>By Chirapont Tamronglak and Chanon Khamprasoet</i>	98
P 049	Construction of Unmanned Aerial Vehicle Model for 4 Propellers <i>By Prapakorn Nakvanich and Jenjira Praphasinsap</i>	99
P 050	Android Application for Thai Tourist in Japan <i>By Jitra Jarupha and Jainam Lappipat</i>	100
P 051	Review-KU Website <i>By Kanokwan Chooklinhom et.al.</i>	101
P 052	Thai Sign Language Website <i>By Pinpuk Phaison and Usa Sammapun</i>	102
P 053	Prototype of Thai song ontology for semantic search <i>By Krissada Mantanoo et.al</i>	103
P 054	Thai Korean Mobile Application for Tourists <i>By Kullapad Ratanatayarom and Jareewan Sarapon</i>	104
P 055	Thai Chino Application on Android OS for Chinese Tourist <i>By Methsawat Thanapairnt and Jirapat Intaaue</i>	105
P 056	The electrical on-off switch devices via Internet. <i>By Panudet Samittiwuttikul and Natapat Thanahiranpat</i>	106





No.	Title	Page
P 057	Kidney Care For Android Application <i>By Suwisan Prommuak and Chitipat Mueanpaopong</i>	107
P 058	"Easy Travel" all-in-one personal travelling consultant application <i>By Thitipan Pantaeng et.al.</i>	108
P 059	Bangkok Smart Life on Android OS <i>By Warangkana Senasathian</i>	109

Earth Science

No.	Title	Page
P 060	Influence of Synoptic Conditions on Rainfall Behavior in Bangkok <i>By Arunrung Ketsri and Pongsakorn Jiwapornkupt</i>	110
P 061	Distribution of Polycyclic Aromatic Hydrocarbons (PAHs) in Leachate from Ban Kam Bon Landfill, ueangKhonKaen District, KhonKaen Province, Thailand. <i>By Bussakorn Amnaj and Unnop Homchan</i>	111
P 062	Application of Resistivity and Induced Polarization Measurement to Investigate Tree Root Form for Bioengineering Purpose <i>By Chalermpon Wungsumpow and Desell Suanburi</i>	112
P 063	Shallow Marine Seismic Survey in the Offshore Ban Laem, Phetchaburi, Thailand <i>By Chanika Sarachai and Passakorn Pananont</i>	113
P 064	Developing Integrated Techniques ; GPR, Gradient magnetic and EM to Locate Water Pipeline Position under Asphaltic Road <i>By Chanon Lumpoo and Desell Suanburi</i>	114
P 065	Characteristic of Aggregates Rocks on the Alkali-Silica Reaction at U Thong District, Suphan Buri Province, Thailand <i>By Chinnasit Harueanmit and Krit Won-In</i>	115
P 066	Geology of Ban Na Phun gem deposit, Na Phun sub district, Wang Chin district, Phrae province <i>By Harnarong Sisamlee and Krit Won-in</i>	116
P 067	Rock Slope Stability at Huai Tha Pon Reservoir in Muang Phetchabun District Phetchabun Province <i>By Kaninsak Sinchai and Kannaree Chuangcham</i>	117





No.	Title	Page
P 068	Characteristics of Ruby Samples, Borai, Trat <i>By Kronsoung Rohitrattana and Somrudee Satitkune</i>	118
P 069	Rainfall Amount from Influence of Tropical Cyclone in Thailand <i>By Ladda Tasaso and Pongsakorn Jiwapornkupt</i>	119
P 070	The Measuring Earthquake on May 5 th 2014 in Chiang Rai Province <i>By Nutchanon Swangwan and Passakorn Pananont</i>	120
P 071	Characteristics of Blue Sapphire from Phrae Province <i>By Nutnicha Sripadungjaroen and Somrudee Satitkune</i>	121
P 072	Preliminary study of Gemstone deposit at Bo Rai District, Trat Province <i>By Pathomphong Suwannasin and Krit Won-in</i>	122
P 073	Stratigraphy of Nong Yai Gniess and surrounding rock units, Chonburi Province <i>By Sarawut Buranrom and Prayath Nantasin</i>	123
P 074	Geochemistry of mafic metamorphic rocks in Nong Yai Gneiss at Chonburi Province <i>By Sayrung Rungsaphrom and Prayath Nantasin</i>	124
P 075	Water filter of Iron and Hardness Removal in Groundwater from Ceramic Adsorbent <i>By Sirilux Junjaem and Kannaree Chuangcham</i>	125
P 076	Distribution of heavy metals in leachate from Ban Kam Bon Landfill, Khonkaen Province, Thailand <i>By Tapadee Sankapan and Unnop Homchan</i>	126
P 077	Ground Penetrating Radar Investigation at Archaeological site Mueang Bua Roi Et province, Thailand <i>By Techin Nantivipavee and Krit Won-In</i>	127
P 078	Study of The Suitable Exiting Environment of Chongsarika Landfill Site by 2D Resistivity Imaging <i>By Teerasuk Kladsri and Desell Suanburi</i>	128
P 079	Shallow Marine Seismic Reflection Survey in Coastal of Sam Roi Yot District, Prachuap Khiri Khan Province <i>By Thamonwan Thailee and Passakorn Pananont</i>	129
P 080	Shallow Marine Seismic Survey between Cha-Am District, Phetchaburi, and Sattahip District, Chonburi <i>By Thanakorn Maneewat and Passakorn Pananont</i>	130





Statistics

No.	Title	Page
P 081	The analysis of covariance based on the effect on Boer crossbred goats consuming four different food recipes <i>By Aphatsanan Tangkhunaphiphat et.al.</i>	131
P 082	The Comparison of Forecasting Methods for Thai Gold Bar Price Kanokkarn Kumhomkul Nutchanok Amornthawornsak Patravee Ghinwala <i>By Awatsada Suchartpong</i>	132
P 083	A COMPARISON OF FORECASTING MODELS FOR THE NUMBER OF TOURISTS TRAVELED IN THAILAND CASE STUDY : COUNTRIES IN ASEAN REGION <i>By Tanachot Hongsittiwong et.al.</i>	133
P 084	A Comparison of Forecasting Methods for Water Supply Consumption in Bangkok, Thailand <i>By Kantaya Yimtien et.al.</i>	134
P 085	The Comparisons of Efficiency of Mean Estimators in Simple Random Sampling when Correlation Coefficient is Negative <i>By Kotchakorn Rueangsri et.al.</i>	135
P 086	Efficiency Comparison of the Confidence Interval Estimations for a Proportion Parameter in the Binomial Distribution <i>By Nattawan Tiplert et.al.</i>	136
P 087	EFFICIENCY COMPARISONS OF STATISTICAL TESTS FOR TESTING INTERACTION EFFECTS ON FACTORIAL DESIGNS <i>By Chawisa Khrootmuang et.al.</i>	137
P 088	A Comparison of Parameters Estimation Method between Ordinary Least Squares and Maximum Likelihood for Response Surface Analysis <i>By Piyaporn Chote et.al.</i>	138
P 089	The Comparative of Correction for Heteroscedasticity in Simple Linear Regression <i>By Piyaboon Kunakornjittirak et.al.</i>	139
P 090	A Comparison study of Multiple Regression Analysis and Fuzzy Multiple Regression Analysis <i>By Chaninart Sumonkosit et.al.</i>	140
P 091	Sunter Sampling Method and Its Efficiency <i>By Veerapat Taweasapaya et.al.</i>	141





Biological Science Posters

Microbiology

No.	Title	Page
P 092	Lactic acid bacteria (LAB) found during Tempe production and Tempe products from different plastic bag packaging <i>By Ananya Yingjaroentana and Surang Suthirawut</i>	142
P 093	Isolation of actinomycetes in Bang-Kachao and their capability to produce plant growth promoters <i>By Chonlada Chinorn and Kannika Duangmal</i>	143
P 094	Expression profile of ATG16L1 protein in liver tissue of patients with hepatitis B virus-related hepatocellular carcinoma <i>By Harutai Sakai and Ingorn Kimkong</i>	144
P 095	Phenanthrene Biodegradation by Co-cultivation of Two PAHs Degrading Bacteria <i>By Jagkrapong Poomchat et.a.</i>	145
P 096	Measurement and Isolation of Airborne and Surface Microorganisms in Indoor Environments <i>By Jirachaya Boonpramuanvit et.al.</i>	146
P 097	Studies on the Effect of Mushroom Extracts Against Liver Cancer Cells <i>By Jiraporn Kantajinda et.al.</i>	147
P 098	Biosorption of heavy metals by Lactic Acid Bacteria isolated from soil in Bang Kra Jao <i>By Juthathip Nuamthong and Wanna Malaphan</i>	148
P 099	Isolation and Physiological Characterization of Xylose-Utilizing Yeasts Isolated From Soil Around Pang Sida Waterfall and of Yeasts Isolated From Soil in The Peat Swamp Forest (Pru To Daeng) <i>By Kwanhathai Rungtivaruangrong et.al.</i>	149
P 100	Survey of <i>Escherichia coli</i> O157:H7 in ready-to-eat salads. <i>By Methawee Sriprasit and Kooranee Tuitemwong</i>	150
P 101	Isolation of actinomycetes from Bang-kachao and their ability to produce plant growth promoters in saline condition <i>By Mongkol Wimonsonkitti and Kannika Duangmal</i>	151





No.	Title	Page
P 102	Isolation and screening of plant growth promoting bacteria from soil in Num Dok Mai mango plantation in Bangkachao <i>By Napaporn Kajadpai et.al.</i>	152
P 103	Screening and Identification of Phytase-Producing Fungi <i>By Natchaya Chatchavalrat and Saeree Jareonkitmongkol</i>	153
P 104	Single Laboratory Validation of Silica Nanoparticles Test Kit (SPNs) for <i>Campylobacter jejuni</i> in Chicken and Products <i>By Nattarat Wongsuwan and Kooranee Tuitemwong</i>	154
P 105	Strain improvement of by induced mutation of <i>Bacillus pumilus</i> DMKUB39 and its optimization for enhancing of β -xylanase production <i>By Nattha Yongwattana et.al.</i>	155
P 106	Isolation and Screening of Thermo Stable Extracellular Alkaline Protease Producing Bacteria from Green Areas in Bangkajao <i>By Natthanicha Sukphodee and Pinsurang Deevong</i>	156
P 107	Isolation and Physiological Study of Yeasts Isolated from Soil in Sirindhorn Peat Swamp Forest Nature Research and Study Center (Pa Pru To Daeng), Narathiwat Province <i>By Nichakorn Sadoyu et.al.</i>	157
P 108	The Effect of Medical Mushroom Extract on the Growth of Liver Cancer Cells <i>By Nisachon Chamchaeng et.al.</i>	158
P 109	Study of soybean soaking water and amount of fungal inoculum to quality of tempe. <i>By Nuwara Jumronggit and Surang Suthirawut</i>	159
P 110	Expression profile of ATG16L1 protein in hepatitis B virus infection <i>By Ongon Chotiwutidachar and Ingorn Kimkong</i>	160
P 111	Characterization and optimization of microalgae <i>Schizochytrium</i> sp. for DHA production <i>By Paisan Tongam and Deunrat Chonudomkul</i>	161
P 112	Isolation and screening of plant growth promoting yeast from soil in Num Dok Mai mango plantation in Bangkachao <i>By Panpilard Meekamol et.al.</i>	162
P 113	Study of Cereal Grains Used in Solid State Cultivation of Mushroom Mycelia for Hydrophobin Extraction <i>By Patcharin Mathurapojanakul et.al.</i>	163





No.	Title	Page
P 114	Production of Tempeh starter in laboratory scale and shelflife <i>By Pawanrat Prayodamornkul and Surang Suthirawut</i>	164
P 115	Selection of endophyte <i>Bacillus</i> spp. against <i>Phytophthora</i> sp. and characterization their antagonistic mechanisms and plant growth promotion properties <i>By Phanumas Nguanprasert et.al.</i>	165
P 116	Detection of E.coli O157:H7 by Loop-mediated isothermal amplification (LAMP) technique. <i>By Phisurang Konjanda and Chaivat Kittigul</i>	166
P 117	The effects of an extract of persimmon to control diseases in strawberries <i>By Pornpattra Songrak and Yaovapa Aramsirirujwet</i>	167
P 118	Anti-fungal plant disease properties of lactic acid bacteria isolated from soil <i>By Pretti Srisoi and Wanna Malaphan</i>	168
P 119	Isolation and Identification of Chitinase-Producing Bacteria from Khung Bang Kachao <i>By Sakawrat Uamtet and Patcharaporn Siwayaprahm</i>	169
P 120	Mechanisms of epiphytic yeasts against fungal pathogens in rice seedling rot disease in vitro <i>By Satawan Kongsomjit and Savitree Limtong</i>	170
P 121	Optimization of tannase production from fungi in liquid medium supplemented with agricultural residue <i>By Sattraporn Kasamewitch and ChurapaTeerapatsakul</i>	171
P 122	Diversity of soil fungi from Bangkajao district and screening for their xylanase and laccase production <i>By Sireen Pummala and Yaovapa Aramsirirujwet</i>	172
P 123	Study on the Effect of Succinate, Fumarate and Hydrophobin on Growth and Ethanol Fermentation in the Thermotolerant Yeast <i>Kluyveromyces marxianus</i> DMKU 3-1042 <i>By Sujamas Komsoongnurn et.al.</i>	173
P 124	Survival enhancement of probiotic <i>Lactobacillus paracasei</i> subsp. <i>tolerans</i> JCM 1171 by encapsulation and freeze –drying <i>By Suttipong promsawad and Duenrut Chonudomkul</i>	174
P 125	Selection of <i>Bacillus</i> sp. stains for high efficient on indole acetic acid and Study on factors affecting the production <i>By Thanapat Ontnikul et.al.</i>	175





No.	Title	Page
P 126	Factors Affecting Biodegradation of Polycyclic Aromatic Hydrocarbons by a white rot fungus <i>Trametes polyzona</i> RYNF13 <i>By Thanyarat Pinyo et.al.</i>	176
P 127	Identification and characterization of thermotolerant acetic acid bacteria isolated from Huai Kha Khaeng Wildlife Sanctuary, Thailand <i>By Theerisara Phathanathavorn and Gunjana Theeragool</i>	177
P 128	Study on phytase production of molds isolated from soils. <i>By Tidarut Pratumtuang and Saeree Jareonkitmongkol</i>	178
P 129	Identification and characterization of acetic acid bacteria newly isolated from fruits in Thailand <i>By Wannasiri Klinchan and Gunjana Theeragool</i>	179
P 130	Improvement of acetic acid production by adapted <i>Acetobacter pasteurianus</i> SKU1108 (7E-13) from rice wine <i>By Watcharakiat Kuekoon and Gunjana Theeragool</i>	180
P 131	Study on phytase production of molds isolated from soil <i>By Wiriya Sriwichai and Saeree Jareonkitmongkol</i>	181
P 132	The use of herb extracts for control <i>Trichoderma hazianum</i> and <i>Pseudomonas fluorescens</i> in Bhutan oyster mushroom <i>By Yadpiroon Boonsue and Kooranee Tuitemwong</i>	182

Biochemistry

No.	Title	Page
P 133	Development of enhanced fluorescent reporter vector <i>By Chaiyos Sirimaneekul and Nattanan T-Thienprasert</i>	183
P 134	Study of novel gene in aldo-keto reductase superfamily in Thai jasmine rice (KDML 105) <i>By Chawanwit Imsuwan and Chonticha Tantitadapitak</i>	184
P 135	Effects of the Y286F and Y286W mutations in beta-glucosidase from <i>Aspergillus niger</i> <i>By Duangdow Saechou and Prachumporn Kongsaree</i>	185
P 136	Effect of protein extracts from silkworm pupae in incubation with breast cancer cell line <i>By Duanghatai Sangnoi and Suttida Chukiatsiri</i>	186





No.	Title	Page
P 137	Characterisation of protein profiles of aortic and ventricular valve endothelial cells to identify potential markers. <i>By Jirawan Waichata and Napachanok Mongkoldhumrongkul</i>	187
P 138	Characterization of a SAL1 Homologue from Thai Aromatic Rice KDML 105 <i>By Krittapart Chua-yam and Wannarat Pornsiriwong</i>	188
P 139	<i>In silico</i> prediction of molecular docking between tripeptide against tyrosine kinase function of Epidermal Growth Factor Receptor for cancer therapy. <i>By Nonnarit Sriporatana and Kiattawee Choowongkomon</i>	189
P 140	<i>HSP22A</i> and <i>HSP22B</i> promoter analysis for recombinant protein production in <i>Chlamydomonas reinhardtii</i> <i>By Nutpapha Charoensuk and Chotika Yokthongwattana</i>	190
P 141	Study of three dimensional structure of rice aldo-keto reductase, AKR4C15 in Thai jasmine <i>By Nuttida Boonkor and Chonticha Tantitadapitak</i>	191
P 142	Purification and Characterization of Adenine deaminase (ADE) <i>By Pantada Nilkhong and Somchai Pornbanlualap</i>	192
P 143	Establishment and characterization of drug-resistant breast cancer cell lines for in vitro multidrug resistance mechanisms <i>By Panyarat laurchan and Pichamon Kiatwuthinon</i>	193
P 144	Expression of recombinant RIP protein from <i>Jatropha curcas</i> in <i>E. coli</i> <i>By Pattarapong Polwiseth and Chotika Yokthongwattana</i>	194
P 145	Overexpression of the black tiger shrimp transglutaminase II <i>By Peradet Katanyuwongjalern and Ratree Wongpanya</i>	195
P 146	Effects of naphthoquinone and indole derivatives on human Topoisomerase II ATPase <i>By Pichayanan Suwannabun and Nonlawat Boonyalai</i>	196
P 147	Cloning and expression of factors controlling fatty acid metabolism in <i>Yarrowia lipolytica</i> <i>By Pornsuda Piluk and Napapol Poopanitpan</i>	197





No.	Title	Page
P 148	Biological effects of <i>Amomum xanthioides</i> Wall. extracts <i>By Tanawan Sattanun and Chomdao Sinthuvanich</i>	198
P 149	Molecular Biotyping of <i>Vibrio vulnificus</i> Isolated from Diseases Brown-marbled grouper (<i>Epinephelus fuscoguttatus</i>) <i>By Thararat Phurahong and Sasimanas Unajak</i>	199
P 150	Immobilization of beta-glucosidase from <i>Aspergillus niger</i> to magnetic nanoparticles <i>By Tidatip Bunasuwan and Prachumporn Kongsaree</i>	200
P 151	Purification and cloning of β -glucanase from <i>Bacillus</i> sp. C4 SS-2013 <i>By Wunchaloem Sakuntasri</i>	201

Botany

No.	Title	Page
P 152	Morphology and Pollen Morphology of the Genus <i>Macroptilium</i> (Benth.) Urb. (Family Fabaceae, Subfamily Papilionoideae) in Thailand <i>By Jamikorn Wongjio and Chatchai Ngernsaengsaruy</i>	202
P 153	Comparative Phytochemistry of <i>Hapalosiphon</i> sp. and It's Effect on Growth of <i>Chlorella</i> sp. <i>By Kongkidakorn Thaweepanyaporn et.al.</i>	203
P 154	Effect of Water Deficit on Relative Water Content and Anthocyanin Accumulation in Leaf of <i>Calathea</i> x 'Medallion' <i>By Sirikarn Petsiri and Kanapol Jutamanee</i>	204
P 155	Evaluation of DNA markers in bryophytes genus <i>Cololejeunea</i> for DNA barcoding <i>By Sorrasak Yodphaka and Ekaphan Kraichak</i>	205
P 156	Comparative Phytochemistry of Indigenous Vegetables and Their Acetylcholinesterase (AChE) Inhibitory Activity <i>By Thanwarat Woraratkul and Srunya Vajrodaya</i>	206
P 157	Diversity of Weeds on Two Ancient Ruins in Thailand <i>By Thewarit Iamarrom and Srunya Vajrodaya</i>	207





Genetics

No.	Title	Page
P 158	Mapping of QTLs Conferring Downy Mildew Resistance in F2 Population of Cucumber (<i>Cucumis sativus</i> L.) <i>By Angsana Nitcharoen and Chatchawan Jantasuriyarat</i>	208
P 159	DNA fingerprinting technique reveal number of queens in a colony of the <i>By Issarawan Keadkraichaiwat</i>	209
P 160	Cytotoxic effects of the giant African snail mucus on the leukemia cell line U937 <i>By Kornsuang Jangtarwan et.al.</i>	210
P 161	Distribution and genetic diversity of <i>Pteroptyx</i> spp. (Coleoptera: Lampyridae) in Thailand <i>By Lalita Tonuch and Ajaraporn Sriboonlert</i>	211
P 162	Expression of AGAMOUS in Arabidopsis and expression of <i>Jatropha curcas</i> AGAMOUS Gene in Arabidopsis that have been transformed <i>By Natnaree Sirirat and Sompid Samipak</i>	212
P 163	Modelling a Fusion Core Structure of the Porcine Epidemic Diarrhea Virus (PEDV) <i>By Nattaya Chutikamoltham et.al.</i>	213
P 164	Effect of glyphosate to detoxifying gene, Phytochelatin synthase (PCs), in Thai rice <i>By Pattana Srifah Hunhne et.al.</i>	214
P 165	DNA fingerprinting technique reveal number of queens in a colony of the weaver ant, <i>Oecophyllasmaragdina</i> <i>By Pitchapa Yampairoh</i>	215
P 166	Genetic variation of <i>copia</i> -retrotransposons in biofuel crops, <i>Jatropha</i> spp. <i>By Piyanont Tangbutr and Vipa Hongtrakul</i>	216
P 167	Phenotypic study on <i>Jatropha curcas</i> AGAMOUS overexpressed Arabidopsis <i>By Preeyanuch Srinilta and Sompid Samipak</i>	217
P 168	Molecular identification and genetic variation of the malaria mosquito (<i>Anopheles maculatus</i>) from Thailand and Indonesia <i>By Rachawalan Suriyasaengsri and Uraiwan Arunyawat</i>	218





No.	Title	Page
P 169	Characterization of <i>ngr1</i> mutant of the green alga <i>Chlamydomonas reinhardtii</i> with altered sensitivity to oxidative stress <i>By Saran Wai</i>	219
P 170	Cloning and expression of <i>Anopheles</i> proteins as target for blocking malaria transmission <i>By Sirinun Kimcharoensuk and Anchane Kubera</i>	220
P 171	Study of Repetitive DNA Sequences in Vertebrate Chromosomes <i>By Tanawut Chiangklang et.al.</i>	221
P 172	Genetic Variation of Immune System Genes in Malaria Vector (<i>Anopheles minimus</i>) in Thailand <i>By Thamonwan Lertvareerat and Uraivan Arunyawat</i>	222
P 173	Expression analysis and cloning of genes involved in Luciferin biosynthetic pathway <i>By Warinda Thongsukh and Ajaraporn Sriboonlert</i>	223

Applied Radiation and Isotopes

No.	Title	Page
P 174	The use of Bitumen to improve performances of paraffin/boron oxide for neutron shielding <i>By Donrudee Toyen and Kiadtisak Saenboonruang</i>	224
P 175	Effects of Acute Gamma Irradiation on Morphological and Tillering Characters in Tissue Culture of Three Vetiver Ecotypes <i>By Kamontip Ruanpang and Katarut Chusreeaeom</i>	225
P 176	Development of a Single Channel Analyzer for gamma-ray spectroscopy <i>By Kanes Amornchaimontree and Mani Jitpukdee</i>	226
P 177	Synthesis bismuth nanoparticles using gamma radiation <i>By Kanokwan Saipheth and Ridthee Meesat</i>	227
P 178	Enhancement of Stability of ^{68}Ga -DOTA-Bombesin by using Gentic acid <i>By Nushwara Junsuri and Wanwisa Sudprasert</i>	228
P 179	Development of a spectroscopy amplifier for radiation detector <i>By Nutthanon Amkrang et.al.</i>	229





No.	Title	Page
P 180	Effects of Iron Oxide Nanoparticles Synthesized by Gamma Radiation on Selected Seed Germination and Chromosome Aberrations <i>By Palita Lertjarad and Ridthee Meesat</i>	230
P 181	Factors Influencing the Accumulation of Radionuclides in Marine Sediment <i>By Panchalee Chuttimaphorn and Wanwisa Sudprasert</i>	231
P 182	Radioactivity Level in Marine Sediment after Fukushima Nuclear Power Plant Accident <i>By Parot Supangyut and Wanwisa Sudprasert</i>	232
P 183	Development of a 2 kV high voltage power supply for scintillation detector <i>By Pasawee Promsila et.al.</i>	233
P 184	Calibration of HPGe Gamma-ray Detector System for Radionuclides Measurement in Marine Sediment <i>By Paveena Maomodee and Wanwisa Sudprasert</i>	234
P 185	Gross alpha and beta measurement in selected drinking water samples by a gas proportional counter <i>By Pracharee Korsuppharukchai et.al.</i>	235
P 186	Gamma-ray Mutagenesis Studies on Stem Cuttings of Wild Petunia (<i>Ruellia squarrosa</i> (Fenzi) Cufod) <i>By Rujira Yairam and Katarut Chusree_aeom</i>	236
P 187	Testing Performance of CsI(Tl) Scintillator for Gamma-ray Detection <i>By Sasiluk Thongsom et.al.</i>	237
P 188	The study of ascorbic acid as a stabilizer of radiolabeled DOTA-biomolecule conjugates <i>By Sasiwimon Naksuriyawong and Wanwisa Sudprasert</i>	238
P 189	The radioprotective effect of edible mushroom extracts inhibits gamma radiation-induced dicentric chromosome aberration in human lymphocytes <i>By Sirirattana Thongkaew and Paiboon Ruengpatthanaphong</i>	239
P 190	Radioprotective effect of <i>Lentinula edodes</i> and <i>Hericiium erinaceus</i> in gamma radiation induced dicentric chromosome aberration <i>By Sisirapatch Buasawas and Paiboon Reungpatthanaphong</i>	240
P 191	The study of using solid neutron converters coated on a drift cathode for Gas Electron Multiplier-based Neutron Detector <i>By Suwadee Sripriprem and Kiadtisak Saenboonruang</i>	241





No.	Title	Page
P 192	Synthesis of Gold-Iron Oxide Composite Nanoparticles using Gamma Radiation <i>By Thanyabhorn Khemthong and Ridthee Meesat</i>	242
P 193	The use of Soypex100 to improve performances of paraffin/boron oxide for neutron shielding <i>By Waraporn Putthumrong and Kiadtisak Saenboonruang</i>	243
P 194	Effect of silver nanoparticles synthesized by gamma radiation on resistant to bacteria, mung bean seed germination and chromosome aberrations <i>By Warisa Ussawanantakarn and Ridthee Meesat</i>	244
P 195	Detection of organothionphosphate using gold nanoparticles synthesized by gamma radiation <i>By Yada Mongkhonthanaporn and Ridthee Meesat</i>	245

Zoology

No.	Title	Page
P 196	Diversity of Diatoms in the Area of Bang Kachao, Samut Prakan Province <i>By Apirak Oomgrai and Nittaya Somsap</i>	246
P 197	Antioxidant activity of golden apple snail extracts <i>By Chinachote Kongraksrasakul et.al.</i>	247
P 198	Diversity of Blue Green Algae in the Area of Bang Kachao, Samut Prakan Province <i>By Jaruwan Phantuchan and Nittaya Somsap</i>	248
P 199	Effect of <i>Tiliacora triandra</i> leaves extract on hippocampal neurogenesis. <i>By Jurairat Rungreung and Wachiryah Thong-asa</i>	249
P 200	Histopathological Effects of Atrazine on the Freshwater Mussel, <i>Hyriopsis bialata</i> <i>By Krittapas Srisamai and Nopparat Srakaew</i>	250
P 201	Effect of <i>Tiliacora triandra</i> on spatial learning and memory in permanent left common carotid artery occlusion mice <i>By Natsuda Mayagasa and Wachiryah Thong-asa</i>	251
P 202	Effect of <i>Tiliacora triandra</i> leaves extract on oxidative status in permanent left common carotid artery occlusion mice. <i>By Nicha Swattanakoon and Wachiryah Thong-asa</i>	252





No.	Title	Page
P 203	The Survey of Edible Bivalve in Prachuap Khiri Khan Province <i>By Patitta Deesanguan and Cheewarat Printrakoon</i>	253
P 204	Diversity of Green Algae in the Area of Bang Kachao, Samut Prakan Province <i>By Pattarawadee Thongjam and Nittaya Somsap</i>	254
P 205	Diversity of Dinoflagellates in the Area of Bang Kachao, Samut Prakan Province <i>By Piyatida Kumnuedsana and Nittaya Somsap</i>	255
P 206	Distribution of Bivalve Species in Kood Island, Trat Province <i>By Ratchakorn Wetworanan and Cheewarat Printrakoon</i>	256
P 207	Histological Structures of Digestive System in Leschenault's Rousette (<i>Rousettus lechenaulti</i>) <i>By Ratchanon Sopapan and Wirasak Fungfuang</i>	257
P 208	Functional annotation of metabolic genes in firefly <i>Luciola aquatilis</i> <i>By Sarintip Nguantad et.al.</i>	258
P 209	Antioxidant activity of Cyclophorid snail mucus <i>By Sasi Thakan et.al.</i>	259
P 210	Histological Structures of the Digestive tract in Greater short-nosed Fruit Bat (<i>Cynopterus sphinx</i>) <i>By Sippakorn Phantawongsapakorn and Wirasak Fungfuang</i>	260
P 211	Antibacterial biofilm activity of mucous proteins from giant African snail (<i>Achatina fulica</i>) on <i>Escherichia coli</i> and <i>Staphylococcus aureus</i> <i>By Suwapitch Chalongsulasak et.al.</i>	261
P 212	Microscopic Structures of the Posterior Digestive Tract of the Butterfly Lizard, <i>Leiolepis ocellata</i> Peters, 1971 (Squamata: Agamidae) <i>By Tanachoke Kengkarnpanich and Nopparat Srakaew</i>	262
P 213	Effect of <i>Tiliacora triandra</i> and neuronal damage in permanent left common carotid artery occlusion mice <i>By Thitapha Boonwattanasophon and Wachiryah Thong-asa</i>	263
P 214	Species Diversity and Abundance of Freshwater Cladocera (Crustacea: Branchiopoda) at Sri Nakhon Khuean Khan Park, Samut Prakarn Province <i>By Warawut Wongkawee and Supiyanit Maiphae</i>	264





Antioxidant Activities Screening from Deciduous Forest's Plants

Sorawit Bapia

Kasetsart University, Bangkok, Thailand
Sbapia@gmail.com

Sutsawat Duangrisai*

Kasetsart University, Bangkok, Thailand
fscissw@ku.ac.th

In Thailand, **70%** of all forests are considered deciduous forests. Trees in this forest have been utilized by human long time ago. Some can be eaten, some are used for construction/shelter, some are used as medicinal plants. Due to high diversity of species in deciduous forest, it is a great source for screening potential bioactive compounds that can be further used for drug, supplement or cosmetics industry. Fundamental property that usually is used to evaluate for screening is antioxidant activity. Therefore, in this study we focused on comparing antioxidant activities of 8 species through 6 assays (DPPH method, superoxide radical scavenging activity, Nitric oxide radical scavenging, total phenolic content, total flavonoid content, FRAP assay). DPPH method, Superoxide radical scavenging activity and Nitric oxide radical scavenging, express in terms of IC₅₀, were found to be 0.12-5.15 mg/ml, 0.48-7.20 mg/ml. and 13.16-205.48 µg/ml respectively. Total phenolic content method, express as mg of gallic acid equivalent (GAE) per gram of dry weight, was found to be 227.57-466.14 mg GAE/g. Total flavonoid determination, express as mg of quercetin equivalent (QE) per gram of dry weight, was found to be 0.99-22.37 mg QE/g. And FRAP method, express as mg torlox equivalent (TE) per gram extract, was found to be 27.45 – 501.2 mg TE/g. In conclusion, 9 of 14 parts of plant found from deciduous forest have high value of antioxidant activities. From this screening, active compounds from this nine species will be further isolated, purified and elucidated for further steps.





Photosynthesis Efficiency of Black gram Under Nutrient Stress

Melissa Soun-udom

Kasetsart University, Bangkok, Thailand
melissasoun_udom@hotmail.com

Sutsawat Duangrisai*

Kasetsart University, Bangkok, Thailand
fscissw@ku.ac.th

Nutrients are an essential for growth and development. Usually the studies of nutrient stress in previous reports focused on the change of outer appearance which could be observed with naked eyes e.g. changes of leaves color, leaves shape etc. Photosynthesis is a primary process that can affect plant yield. However, few studies have observed the effect of nutrient stress on photosynthesis. Therefore, we aimed to study how nitrogen (N), phosphorus (P), potassium (K), magnesium (Mg) and iron (Fe) affect to photosynthetic apparatus; chlorophyll fluorescence measured by using pulse-amplitude-modulate (PAM) and pigment content measured by using SPAD meter. 30 plants of black gram bean at 2nd week were transferred to brown bottles. There were 6 treatments (control, lacking of N, P, K, Mg and Fe). Five replicates were done per each treatment. The result showed that chlorophyll fluorescence parameters, minimum fluorescence and PSII quantum yield, didn't significantly differ between overall treatment ($P < 0.05$). In the contrary, SPAD reading of lacking-Fe treatment at 4 weeks had significantly decreased from 38.22 ± 0.600 to 6.28 ± 1.490 . Tissues of plants in control and lacking of Mg, Fe were further investigated to study change in anatomy by using SEM technique. Crystals was found in shoot of Fe deficient treatment, which might be a way of adaptation mechanism to response to stress. In conclusion: lacking of Fe strongly affected to photosynthetic apparatus, and Fe might plays as important nutrient that can limit plant growth and development. For the future work, we might use this knowledge for a machine to detect nutrient deficiency of plants, before they show symptoms in order to reduce losing yield.





Effect of phenolic compounds on seed germination and seedling growth of *Mimosa pigra* L.

Mahsarahka Rungkrajang
Kasetsart University, Bangkok, Thailand
b5510404795@ku.ac.th

Ornusa Khamsuk
Kasetsart University, Bangkok, Thailand
fsciosk@ku.ac.th

Srisom Suwanwong*
Kasetsart University, Bangkok, Thailand
fsciss@ku.ac.th

Phenolic compounds, a class of the most important and common allelochemicals, are secondary product generated by plant. Allelochemicals can be released into the environment by volatilization from leaves, exudation from roots and leaching from leaves and plant litter by precipitation. They play a major role in the inhibition of seed germination and seedling growth of some plants. In this study, five phenolic compounds including *p*-coumaric acid, catechin, caffeic acid, vanillic acid and gallic acid were tested on seed germination and seedling growth of giant mimosa (*Mimosa pigra* L.), an invasive and noxious weed. The result showed that an individual phenolic compounds had no significant effect on seed germination and seedling growth of giant mimosa. However, the synergistic inhibitory effect was obvious by using the mixture of five phenolic compounds.





Bioherbicidal Effect of *Typha angustifolia* L. Extract on Seed Germination and Seedling Growth of *Mimosa pigra* L.

Udomsap Chantanet*
Kasetsart University, Bangkok, Thailand
tonsmilelive@gmail.com

Narrow-leaf cattail (*Typha angustifolia* L.) is an invasive plant which produces and releases allelochemicals to the environment. In the present study, bioherbicidal effect of aqueous extract of leaves of *Typha angustifolia* L. was investigated by using giant mimosa (*Mimosa pigra* L.) and shallot (*Allium ascalonicum* L.) as bioassay materials. Total phenolic contents in crude extract at the concentration of 25, 50 and 75 g/L were 196, 269 and 307 ppm, respectively. The extracts significantly inhibited seed germination and seedling growth of giant mimosa. Seed germinations were 91, 86 and 84 %, shoot lengths were 63, 44 and 30 % and root lengths were 21, 16 and 13 % of control when treated with 25, 50 and 75 g/L of the extract, respectively. Malondialdehyde in both shoot and root were not different from the control. This indicated that the inhibition of seedling growth did not cause by lipid peroxidation. Moreover, the extract also inhibited shallot root cell division by causing an arrest of cells in interphase. Since lipid peroxidation did not affect seedling growth of giant mimosa and total phenolic content in the extract increased by increasing the concentration of the extract, the inhibition of root cell division might be due to the effect of phenolic compounds in the extract.





Comparative Phytochemistry of *Guettarda speciosa* L.

Wanitcha Muangrom
Kasetsart University, Bangkok, Thailand
wanitcha.m@ku.ac.th

Srunya Vajrodaya*
Kasetsart University, Bangkok, Thailand
fscisyv@ku.ac.th

Comparative phytochemistry of lipophilic extracts from *Guettarda speciosa* L. had been done during August 2015 to April 2016. By mean of High Performance Liquid Chromatography (HPLC), the chemical profiles of different plant parts (roots, stem barks and leaves) were obtained and showed similarity in all plant parts. Phytochemical screening by using Thin Layer Chromatography (TLC) and detection by spraying Dragendorff's reagent and Wagner's reagent showed the absence of alkaloid in all plant parts. Organic matters detection by spraying sulfuric acid reagent showed the difference between roots and leaves. Coumarin, phenol, terpene, steroid and sugar could be observed in all plant parts. Spraying potassium hydroxide reagent is detection of coumarin and spraying anisaldehyde-sulfuric acid reagent is detection of phenol, terpene, steroid and sugar.





Avirulence Gene-Based Diagnosis of *Magnaporthe oryzae* and Its Application in the Resistance Gene Deployment for Controlling Rice Blast Disease

Shiela Marie Selisana*

University of the Philippines Los Baños, Laguna, Philippines.

sgselisana@up.edu.ph

Mary Jeanie Yanoria

International Rice Research Institute, Laguna, Philippines.

m.yanoria@irri.org

Berlaine Quime

University of the Philippines Los Baños, Laguna, Philippines.

b.quime@irri.org

Chaivarakun Chaipanya

Kasetsart University, Bangkok, Thailand.

c.chaipanya@irri.org

Bo Zhou

International Rice Research Institute, Laguna, Philippines.

b.zhou@irri.org

The avirulence (Avr) genes in the fungal pathogen, *Magnaporthe oryzae*, causing the devastating rice blast disease have been assumed the major targets subject to mutations to evade the recognition by so-called resistance (R) genes. These R genes are widely utilized as the most effective and economical resource for controlling rice blast disease. In this study, an Avr gene-based diagnosis tool for determining the virulence spectrum of rice blast pathogen population was developed and validated. A set of 77 single-spore field isolates was pathotyped using LTH-derived international rice blast differential lines (IRBLs). Based on the reactions to the IRBLs, isolates were clustered into 20 virulent races except 4 isolates that have lost its pathogenicity, suggesting that the diversity of pathogen population in the test site was relatively narrow. In addition, the haplotypes of 7 cloned Avr genes were determined by PCR amplification and sequencing, if applicable. *AvrPi9* was present whereas *AvrI-CO39* and *AvrPia* were absent in all isolates. A varying percentage of *AvrPiz-t* (2.7%), *AvrPita191C/194H* (loss-of-function haplotype, 13.7%), *AvrPii* (86.3%), and *AvrPik* haplotypes [-D (20.5%), -E (1.4%), and -F (5.5%)] were identified. The deduced avirulence/virulence of each isolate showed quite high consistency with its pathotype to all IRBLs except IRBLzt-T, IRBLkp-K60, and IRBLta-K1. Moreover, the existence of additional *Pi19* gene in these 3 lines was deduced by comparing their reaction patterns with IRBL19-A, which in turn was able to explain the cause of discrepancy on the avirulence/virulence reactions by Avr-gene diagnosis and pathotyping. The merit of Avr gene-based diagnosis tool is it is precise, R-gene specific, and IRBL-free assessment that can be used for monitoring the virulence spectrum of rice blast pathogen and prediction of effectiveness of respective R genes in rice.





Genetic diversity of rice blast isolates in Vietnam based on RAPD, SRAP and ISSR markers

Doan Thi Hoa

Research Institute of Biotechnology and Environment, Nong Lam University, Ho Chi Minh city, Vietnam
niemtincsk33@gmail.com

Vo Thi Ngoc Linh

Research Institute of Biotechnology and Environment, Nong Lam University, Ho Chi Minh city, Vietnam
hoarequat2005@gmail.com

Chatchawan Jantasuriyarat

Department of Genetics, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscicwj@ku.ac.th.

Nguyen Bao Quoc

Research Institute of Biotechnology and Environment, Nong Lam University, Ho Chi Minh city, Vietnam
baoquoc@hcmuaf.edu.vn

Magnaporthe oryzae is a causal agent of blast disease, one of the most devastating disease in rice resulting significant crop losses worldwide. Understanding of pathogenicity and the source of pathogen variation has been known to play an important role of the improvement of strategies in management of the rice blast disease. In this study, at least 30 isolates of the rice blast fungus, *M. oryzae*, collected from rice fields in South, Central and North Vietnam were identified by PCR method with specific iDM primers and evaluated for their cell growth, melanization, conidial morphology, infection structure formation, fungal virulence and genetic characterization using RAPD, SRAP and ISSR markers. The results indicated that SRAP method showed the highest polymorphism of which 182 polymorphic markers per total 254 markers were scored when using 30 primers. In addition, the similarity degree value of blast isolates was ranged from 6.31-9.33 and PIC value was 0.21. Although RAPD method showed high polymorphism ratio and PIC value, PCR amplified products were lower than other methods. ISSR has the lowest PIC value compared with SRAP and RAPD analyses, but the number of polymorphic bands is better than RAPD method. Interestingly, we also found that at least 9 of 30 *M.oryzae* isolates can breakdown blast resistance in both non-susceptible rice varieties JHN and IR50404. The correlation of such methods with fungal virulence and the development of SCAR method for identification of fungal pathogenicity will be discussed in this study.

Keywords: *Magnaporthe oryzae*, rice blast, genetic diversity, fungal isolates, pathogenicity





The effect of ascorbic acid on the ability of rice blast disease resistance

Mantira Suksirt

Kasetsart University, Bangkok, Thailand
mantira.s@ku.th

Chatchawan Jantasuriyarat*

Kasetsart University, Bangkok, Thailand
fscicwj@ku.ac.th

Rice is the most important food crops in the world especially in Asia. Thailand has a strong tradition of rice production. Nowadays, the rice yields in Thailand have lower productivity due to many factors such as the fungal diseases. Rice blast is one of the most important diseases. This disease is caused by the fungus names *Magnaporthe oryzae*, which can infects and produces lesions in all above ground parts of a rice plant. In Thailand, Jao Hom Nin (JHN) rice variety has been showing broad-spectrum resistance against various blast pathogen isolates across the country. Therefore this rice variety was selected to examine in this experiment. Ascorbate is a strong and active antioxidant. This antioxidant property may help plant to defense against the pathogen stress. In previous report, ascorbate level was altered after the infection of plant pathogen suggested that ascorbate might involve with the plant defensive response. The objective of this study was to investigate the relationship between the expression of ascorbic biosynthesis genes and rice blast disease resistance. The 3 week-old Jao Hom Nin seedling was inoculated with two isolates of rice blast fungus that can and cannot infect Jao Hom Nin at 5×10^4 spores/ m^3 fungal concentration. All treated plants were placed with 100% relative humidity and at 24C. Leave samples were collected at 0, 6, 12, 24 and 48 hours after inoculation The total RNA was extracted, converted to cDNA and investigated in expression levels of *VTC1* gene, which involved in ascorbic biosynthesis by using RT-PCR technique. cDNA were cloned and sequenced to confirm gene. The results of this study will be shown in the presentation.





Applications of Loop Mediated Isothermal Amplification (LAMP) assay for rapid detection of phytoplasmas associated diseases in plants

Nguyen Thi Thanh Xuan*

Department of Biotechnology, Nong Lam University, Ho Chi Minh city, Vietnam
thanhxuan091991@gmail.com

Nguyen Bao Quoc

Research Institute of Biotechnology and Environment, Nong Lam University, Ho Chi Minh City, Vietnam
baoquoc@hcmuaf.edu.vn

Phytoplasmas have been recently considered as a causal agent of witches' broom disease (WBD) having a huge damage to crop yields, especially on cassava, sesame and longan trees from the South East areas to Mekong River Delta. Until now, many worldwide scientists have developed numerous techniques for phytoplasma diagnostics, in particular the use of PCR based methods, RFLP analysis and sequencing. However, such methods are normally labour and time intensive and can only be undertaken in well-equipped labs. Therefore, an alternative method known as Loop Mediated Isothermal Amplification (LAMP) has been applied as a rapid, simple and low cost diagnostic tool for phytoplasmas within one hour of sampling in the field that is appropriate to the poor and developing countries. In this study, the diagnostic procedures for WBD caused by phytoplasmas in longan, cassava and sesame trees were set up and validated with universal and specific LAMP primers of 16S rRNA as described previously. LAMP assays were conducted in real-time PCR, agarose gel and optogene systems. We found the presence of phytoplasmas group 16SrXI in sugarcane and group 16SrI in young leaves and phloem of longan trees. Particularly, we can not detect the presence of phytoplasmas group 16SrII, 16SrV, and 16SrXII as demonstrated previously. This approach was also used for the detection of phytoplasmas group 16SrI in mites (*Eriophyes dimocarpis* Kuang) that seem to be involved in one of the potential insect vectors causing WBD in longan trees. The results from this study will be helpful for practical applications of LAMP based diagnostics that have been considered as an alternative approach for the detection and control of different phytoplasma associated diseases and their insect vectors in plants.

Keywords: LAMP, rapid detection, diagnostic, phytoplasma, witches' broom disease





Inductive effects of the giant African snail (*Achatina fulica*) mucus on the differentiation of human mesenchymal stem cells into osteocytes

Thananat Jearasakwattana*

Department of Genetics, Faculty of Science, Kasetsart University, Bangkok, Thailand,
dolls.tj@gmail.com

Pramote Chumnanpuen

Department of Zoology, Faculty of Science, Kasetsart University, Bangkok, Thailand,
pramote.c@ku.ac.th

Teerasak E-kobon

Department of Genetics, Faculty of Science, Kasetsart University, Bangkok, Thailand,
fscitse@ku.ac.th

Fahsai Kantawong

Department of Medical Technology, Faculty of Associated Medical Sciences, Chiang
Mai University, Chiang Mai, Thailand,
fahsai.k@cmu.ac.th

The giant African snail (*Achatina fulica*) is an important animal pest in agriculture. Several studies revealed benefits of its secreted mucus in pharmaceutical and cosmetic industries. The *A. fulica* mucus also has an important role in wound healing and shell repairing process after injury. Likewise, human bone development begins with the differentiation of human mesenchymal stem cells (hMSC) into multiple lineages of osteocyte, osteoblast, adipocyte and chondrocyte. The hMSCs treatment has become an advancement in the bone repairing technology. This study aimed to induce the osteogenic differentiation of hMSCs using the *A. fulica* mucus. The hMSC differentiation was detected by Alizarin Red S and Brilliant Blue stainings and observed under the light microscope. The hMSCs cultured in a complete medium DMEM supplemented with 150 $\mu\text{g}/\text{ml}$ of the *A. fulica* mucus showed higher level of calcium deposition compared to those without the mucus supplementation. Increased expression of osteopontin (*OPN*) and osteocalcin (*OCN*) genes in the hMSCs treated with the snail mucus confidently confirmed the osteogenic differentiation. Thus, our study successfully revealed the novel property of the *A. fulica* mucus that induces the osteogenic differentiation of the hMSCs for the first time. This could be developed as an alternative treatment for bone repairing and other medical applications in the future.





Cytotoxic effects of the giant African snail mucus on promyelocytic leukemia cell line HL-60

Kanokkorn Pitayakornpakdee

Department of Genetics, Faculty of Science, Kasetsart University, Bangkok, Thailand
Kanokkorn.p@ku.th

Pramote Chumnanpuen*

Department of Zoology, Faculty of Science, Kasetsart University, Bangkok, Thailand
pramote.c@ku.ac.th

Teerasak E-kobon

Department of Genetics, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscitse@ku.ac.th

Ratana Banjerdpongchai

Department of Biochemistry, Faculty of Medicine, Chiang Mai Univeristy,
Chiang Mai, Thailand.
ratana.b@cmu.ac.th

Recently, there were several reports on antimicrobial and anticancer properties of mucous proteins extracted from the giant African snail (*Achatina fulica*) which is one of the most impact agricultural pest in Thailand. In this study, the snail mucus was collected from *A. fulica* and used to investigate cytotoxic effects on promyelocytic leukemia cell line HL-60 compared to normal peripheral blood mononuclear cell (PBMC). The treatment of HL-60 cells with various snail mucus concentrations (0, 1-5, 10, 15, 20, 40 and 80 $\mu\text{g/ml}$) was determined by 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) assay. The apoptosis was observed by propidium iodide staining under fluorescent microscopy and fragmentation of DNA was determined by agarose gel electrophoresis. Results showed the activities of the snail mucus on anti-proliferative activity, cell morphological change and apoptosis induction in the HL-60 cell line at the 50% inhibitory concentration of 4 $\mu\text{g/ml}$ with subtle effects on the PBMC. We strongly believe that the snail mucus could be a potential candidate for the development of anti-cancer drugs for the treatment of leukemia in the future.





Utilization of Sawdust as Substrate for Production and Characterization of Ethanol Biogel

Itoandon Emoliela Ejiya*

Federal Institute of Industrial Research, Lagos state, Nigeria

smlj3926@gmail.com

Ibrahim Abdulkadir

Nigeria National Petroleum Cooperation, Warri, Delta state, Nigeria

ibrokadir@yahoo.com

Yazdani Shams Syed

Synthetic Biogology and Biofuels Group

International Centre for Genetic Engineering and Biotechnology, New Delhi, India

shams@icgeb.res.in

Improvement on bioethanol research using agro waste such as sawdust, as well as promoting sustainable alternative energy has brought about global restructuring thus sustaining growth, economy and industrialization. But much is required in the area of alleviating high cost of energy sources such as wood, kerosene and gas in cooking, most especially in the rural area where risk is high. This investigation was aimed at utilizing sawdust as substrate for production of bioethanol and further develop biogel as an alternative cooking energy source. The sawdust fiber sample was grinded into powder using a ball mill grinder, treated and processed for the production of bioethanol by: (i). Hot water pretreatment was employed by preparing 100% w/v of sample boiled at 150°C for 24hr thus removing high concentration of hemicellulose up to 15% and increased 55% digestibility of lignin as well as removal of microorganisms. (ii). Enzymatic digestion was carried out by using cellulase of 0.33umol/min/ml activity having optimal pH 4.5 and temperature of 55°C conditions. 1.0ml of the active enzyme was used to hydrolyze the sample at the optimal enzymatic conditions for 24hr enabling digestion. (iii). Fermentation was finally carried by solid state fermentation technique to obtain ethanol. 2% (v/v) of overnight grown *Saccharomyces cerevisiae* cells were then inoculated into the 100% (w/v) hydrolyzed medium which had been supplemented with 1% ammonium chloride acting as a nitrogen source and further incubated at room temperature for 74hr in a stationary phase. The production of biogel was carried out using: 70% of ethanol, 10% water and 20% nitrosol. Analyzed product showed: viscosity at 40°C and 80°C (421.20cst and 210.87cst) respectively, flashpoint (26°C), density at 25°C (0.908kg/m³), total acid number (0.12mgkOH/g), pour point (-13% still flowing), pH 6.16. There was no base settlement, no water content present. It also had a bluish colour, full of motion, odourless with complete combustion. The innovative technology has justified the sustenance of clean environment and healthy living towards promoting job creation, wealth creation as well as entrepreneurship.

Keywords: Sawdust, *Saccharomyces cerevisiae*, Bioethanol, Water, Nitrosol, Biogel.





Expression of Resistance and Susceptibility on Selected Banana Cultivars to *Fusarium oxysporum* f.sp. *cubense* Schl. Strains in Southern Philippines

Merlina H. Juruena*,
 Graduate Student, Ph.D. in Plant Pathology, Graduate School,
 University of the Philippines Los Baños, mhjuruena@yahoo.com

Teresita U. Dalisay
 Director and Associate Professor, Crop Protection Cluster,
 University of the Philippines Los Baños, tudalisay_d1760@yahoo.com

Agustin B. Molina, Jr.
 Research Fellow and Regional Coordinator, Bioversity International –Asia and Pacific

The expression of resistance and susceptibility on banana cultivars against *Fusarium oxysporum* f.sp. *cubense* (*Foc*) can be attributed to the genetics of the host and virulence of the pathogen. This study aims to determine the response of selected banana cultivars namely ‘Gran Naine’ (AAA), ‘Lakatan’ (AAA), ‘Latundan’ (AAB), ‘Cardaba’ (BB) and somaclonal variant ‘GCTCV-119’ (AAA) towards six strains of *Foc* namely tropical race 4 (VCG1213/16, VCG1213 and VCG1216), VCG122 and race 1 (VCG 123 and VCG 126) both in the screenhouse and field condition in Southern Philippines. Inoculation tests were done using 14-day-old pre-colonized corn meal sand medium with *Foc*. Five weeks old banana tissue culture seedlings and 8-week-old seedlings were used in the screenhouse test and field inoculation, respectively. The expression of resistance and susceptibility was manifested based on the *Fusarium* wilt incidence and disease severity of leaf yellowing and vascular discoloration. It was shown that there is an apparent correlation between vascular discoloration and yellowing of leaves in most susceptible cultivars. However, in cultivars that manifested resistance to specific *Foc* strain expression of severe leaf yellowing did not correspond to increase in the severity of vascular discoloration. This was considered a manifestation of host plant defense. Screenhouse tests showed that ‘Gran Naine’ (AAA) and ‘Lakatan’ (AAA), manifested the highest disease incidence and severity both on leaf yellowing and vascular discoloration. These cultivars were considered most susceptible to *Foc* TR4 (VCG1213/16, VCG1213, VCG1216) while ‘Latundan’ (AAB) and ‘Cardaba’ (BB) were also affected but to a lesser extent. ‘Cardaba’ and ‘Latundan’ were most susceptible while ‘Lakatan’ was less susceptible and ‘Gran Naine’ was resistant to race 1 (VCG123 and VCG126). ‘Cavendish’ and ‘Lakatan’ were also infected with VCG122 but with lower disease severity. Cavendish somaclonal variant, ‘GCTCV 119’ (AAA) proved resistant to all *Foc* strains. Field trial validated the result in the screenhouse such that ‘Lakatan’, ‘GranNaine’ and ‘Latundan’ was susceptible to *Foc* TR4 strain VCG 1213/16. On the contrary, ‘Latundan’ and ‘Cardaba’ was susceptible to race 1 VCG 126 which displayed cultivar specificity, while ‘Lakatan’ and ‘Gran Naine’ were resistant. ‘GCTCV-119’ showed high resistance to both *Foc* strains. These observations indicate differential responses of banana genotypes towards various *Foc* strains. Derive information is relevant in cultivar deployment in areas in epidemic with known *Foc* strain.

* Paper Presenter





Sooty Molds on Foliage of Philippine Ornamental Plants

Sarah Jane B. Manaday*

University of the Philippines Los Banos, Laguna, Philippines
sarahmanaday@gmail.com

Teresita U. Dalisay

University of the Philippines Los Banos, Laguna, Philippines
tudalisay_d1760@yahoo.com

Morphological characterization of sooty molds in ornamental plants was conducted to further explore the presence and diversity of this group of fungi in Philippine ornamentals. Leaf samples of various ornamentals infested with sooty molds were collected from different areas but mostly in Los Banos, Laguna. Fungal slide mounts were prepared by carefully scraping the moldy growth on the surface of leaves and placed on a clean glass slides with lactic acid then covered with cover slip and sealed. Identification of sooty molds was done by morphological characterization of fungal structures like ascocarp shape, presence of setae, pigmentation, presence of neck, and shape of cells composing the wall. Sizes of specific fungal structures were measured under microscope: 15 ascocarps, 15 asci, 25 ascospores and 5 sterile strands. Nine genera of sooty molds were found to infest Philippine ornamental plants namely *Chaetothyrium*, *Meliola*, *Phaeochaetia*, *Trichomerium*, *Tripaspermum*, *Conidiocarpus*, *Leptoxiphium*, *Polychaeton* and *Tripasporium*. The first four genera were categorized as ascospore-forming sooty mold fungi while the rest were considered non-ascospore forming sooty molds. All of these 9 genera except for *Meliola*, were found to be present in combinations with one another in all collections. In all the collections, 19 different ornamental species were found to be hosts of these sooty mold fungi.





Identification of Rust Fungi on Various Plants in Selected Areas in Luzon Philippines

Teresita U. Dalisay*

University of the Philippines Los Baños, Laguna, Philippines
tudalisay_d1760@yahoo.com

Vanessa A. Felices

University of the Philippines Los Baños, Laguna, Philippines
tudalisay_d1760@yahoo.com

Field collections of diseased plants were conducted in selected areas in Northern (Benguet) province, Central (Tarlac and Pampanga) province and Southern Luzon (Batangas and Cavite provinces) and towns in Laguna Province (Caliraya, Majayjay and Cavinti). Ten rust species were associated from the diseased specimens. To our knowledge, this is the first report of *Crossospora* on creeper vine and both *Tranzschelia* and *Phragmidium* on berry plant.

Microscopic examination was done to characterize the fungal structures. Urediniospores with depression on sides forming an elevated center are typically associated with *Uredo* sp. and hyaline envelope forming another wall-like structure for those of *Tranzschelia*. These features were not observed from other known rust fungi prevalent in the country. Neglected structures for full morphological characterization of rust fungi are the paraphyses exhibited from the above mentioned fungi. Characteristics of paraphyses include the presence of either truncate or round apices, of uniform width or tapering towards the tip. One to several pores were visible on urediniospores of all species. About 2-4 pores were faintly observed on urediniospores of species of *Phragmidium* and *Tranzschelia* while distinct pores were seen on those of *Puccinia oxalidis*, species of *Uromyces* and *Uredo*. Spore ornamentation was best described as either verrucose or echinulate.





Simulation Modeling of Coffee Rust Epidemics Caused by *Hemileia vastatrix* Berk. & Br.

Lynne R. Arevalo *

University of the Philippines Los Baños, Laguna, Philippines

lynnearevalo@gmail.com

Ireneo B. Pangga

University of the Philippines Los Baños, Laguna, Philippines

COFRUS, a coffee rust simulation model, was developed using STELLA 9.1, a modeling software appropriate for systems analysis of biological populations. For model verification and validation, the COFRUS model was used to simulate farm coffee rust epidemics in Silang, Cavite and Jamboree, University of the Philippines at Los Baños (UPLB), College, Laguna conditions in the Philippines. The epidemic was modeled on a coffee farm of 36 (6 x 6 grid) healthy trees of uniform growth, age, and nutritional status planted in a 3 x 3 m planting distance and susceptible to coffee rust caused by *Hemileia vastatrix*. The modeling approach was based on HLIR (healthy (H) - latent (L) - infectious (I) – removed (R)) epidemic model where the diseased trees were partitioned into non-overlapping states or variables. Field model validation results from Silang, Cavite and Jamboree, UPLB sites showed that the COFRUS model satisfactorily simulated coffee rust epidemics. The effect of climate change was simulated through the addition of 1, 2 and 3°C to the average daily temperature from 2010-2015 in Silang, Cavite and Jamboree, UPLB by sensitivity analysis.

Simulation results showed that simulated percent disease severity increased as the average daily temperature was increased by 1-3°C based on the area under disease progress curve (AUDPC) in both sites. Maximum percent disease severity can be observed in dry seasons that coincided with the peak in temperature. The peak and trough coincided with the variation in average daily temperature. The simulated AUDPC values increased by 24-26% and 36-59% in Silang, Cavite and Jamboree, UPLB, respectively as 1-3°C were added to the average daily temperature. Earlier onset of the coffee rust epidemic was observed to be 17-42 days and 24-40 days in Silang, Cavite and Jamboree, UPLB, respectively as 1-3°C were added to the average daily temperature. This model can be applied in coffee rust management by adding non-meteorological variables such as fungicide application and fertilization. It can also be used to assess climate change risks of coffee rust epidemics in the Philippines upon further validation in several years and locations.





Simulation Modeling of Leaf Blast Epidemics caused by *Magnaporthe oryzae* B.C. Couch in the Philippines

Julie Rose C. Caniamo*

University of the Philippines Los Baños, College, Laguna, Philippines
jrcaniamo@gmail.com

Ireneo B. Pangga

University of the Philippines Los Baños, College, Laguna, Philippines
ibpangga@yahoo.com

Teresita U. Dalisay

University of the Philippines Los Baños, College, Laguna, Philippines
tudalisay_d1760@yahoo.com

Pompe C. Sta. Cruz

University of the Philippines Los Baños, College, Laguna, Philippines
pompestacruz@yahoo.com

Rice blast, caused by *Magnaporthe oryzae* B.C. Couch, is an emerging and major disease of rice in the Philippines. The objectives of this study are to develop a mechanistic leaf blast simulation model using STELLA 9.1, a modeling software appropriate for systems analysis of biological populations; and to verify, calibrate and validate the leaf blast model in selected sites in the Philippines. PHILBLAST, a mechanistic model of leaf blast, was developed using STELLA software, verified in Los Baños, Laguna conditions, and validated in Calauan, Laguna; Lucban, Quezon; and Rosario, Batangas conditions, which are rice blast-prone areas representing different climate types. PHILBLAST followed the H-L-I-R (healthy (H) - latent (L) - infectious (I) – removed (R)) epidemic modeling approach where diseased plants were partitioned into non-overlapping compartments or states. PHILBLAST was parameterized using data from the literature in tropical conditions, combined with a simple rice crop growth sub-model, and coupled with a previously validated leaf wetness duration model, DEWFOR.

Model verification and validation compared simulated and observed lesion number and percent leaf blast disease severity. Evaluation of simulated disease parameters was performed through the comparison with observed values graphically and by statistical analyses. Model verification results showed that the model satisfactorily simulated leaf blast epidemics in Los Baños, Laguna conditions. Model validation results in the rice blast ‘hot spot’ areas showed that the generated leaf blast disease progress curves satisfactorily simulated the observed leaf blast epidemics in the field. Overall, the model has simulated the increase in leaf blast severity for a susceptible variety, IR50, and a moderately susceptible variety, IR72, from early up to mid- season and the progressive decrease until maturity. PHILBLAST can be used to study the effects of climate change on leaf blast epidemics in the Philippines.





Rapid and sensitive detection of *Salmonella* serotypes by loop mediated isothermal amplification (LAMP) assay

Nguyen Bao Quoc*

Research Institute of Biotechnology and Environment, Nong Lam University, Ho Chi Minh city, Vietnam
baoquoc@hcmuaf.edu.vn

Woubit S. Abdela

Department of Pathobiology, College of Veterinary Medicine, Nursing and Allied Health, Tuskegee University, Tuskegee, Al 36088 USA
wabdela@mytu.tuskegee.edu

Gram-negative *Salmonella* bacteria has been best known as a causal agent of enteric or typhoid fever, an important infectious disease in human. The consumption of undercooked or half cooked beef, poultry and eggs is a major cause of bacterial food poisoning resulting global public health problem. Conventional methods for microbial detection are normally labour and time intensive and can no longer match the pace of today, food processing, and global distribution networks. So the development of emerging rapid detection of non-typhoidal *Salmonella* accounting for >95% of all foodborne pathogens will play an important role in providing the timely and actionable information needed to lessen negative impacts on human and economic burdens caused by food-borne disease. Previously, we developed a high throughput sensitive and specific PCR screening platform for the detection of multiple *Salmonella* serovars reported to be significant as causative agents for foodborne outbreaks. We report here on the development of an alternative method so-called loop mediated isothermal amplification (LAMP) that can allow less than 30 minutes and potential of on site diagnostics, was used for the detection of various *Salmonella* serovars. For this purpose, universal and specific LAMP primers for the detection of all and each of *Salmonella* serovars were designed by LAMP designer software of Optigene (<http://www.optigene.co.uk/lamp-designer/>), then followed by validating those primers using Vector NTI software (Thermo Scientific, US) and *in silico* PCR amplification. The LAMP assays were conducted with Master mix (Optigene, UK) at the single temperature of 63⁰C for 30 minutes. Samples tested in this study, were genomic DNA templates of at least 7 pure cultures of *Salmonella* serovars. All experiments were carried out by using ABI realtime machine, Eppendorf PCR and Smart-DARTTM detection unit which is operated from an Android device. The results indicated that LAMP based detection method can work well with seven *Salmonella* serovars when using universal primers of *Inv A* gene. At least ten sets of LAMP primers for differentiating *Salmonella* serovars such as Agona, Arizonae, Enteritidis, Hadar, Heidelberg, Barendrup, Bareilly, Montvideo, Schwaengrund, and Ty21, were also successfully validated in pure cultures, resulting the development of new and promising diagnostic system for on-site detection of bacterial pathogens in food.

Keywords: *Salmonella* serovars, food-borne disease, LAMP, rapid detection, bacteria





Diversity of Halotolerant Bacteria Isolated from Soil in Bang-Krachao Green Area and Their Potential as Plant Growth Promoting Bacteria

Rungruedee Imvanich
Kasetsart University, Bangkok, Thailand
Noterrd@gmail.com

Savitr Trakulnaleamsai*
Kasetsart University, Bangkok, Thailand
rdisat@ku.ac.th

Bang-Krachao is the green area located in Samutprakan province and so-called the best urban oasis of Asia. Due to its unique ecology with sea area-underlay, it is interesting to study the diversity of microbes in this bio-resource. Thus, the aim of this research was to explore the diversity of halotolerant bacteria from soil in Bang-Krachao by culturable technique using spread plate technique and screen for plant growth promoting bacteria. Soil samples were collected from five areas and mixed together. The chemical properties of the mixed soil sample were analyzed. The pH was 7.53 and the salt content was 0.8 ppt. The total number of bacteria grown on haloalkaliphile agar medium pH 7.6 was 2.11×10^6 CFU/g soil. One hundred and twenty five isolates were randomly picked up based on their different morphology. They were grouped into 16 groups by pigment and colony morphology. The majority group consisted of colonies with white pigment, raised, smooth and glossy surfaces, opaque and smooth edges. Microscopic study revealed that they were Gram positive, rod shape and not spore forming. In addition, 125 isolates were applied to biochemical test to identify. As plant growth promoting bacteria, they were screened for phosphorus solubilization on Pikovskaya's medium and IAA production test on haloalkaliphile medium pH 7.6 supplemented with 5 mM L-tryptophan. The results indicated that 37 out of 125 isolates possessed the phosphate solubilizing capability as shown by halo zone on agar plate. The isolate named BK-69 was the most efficient in phosphorus solubilizing (PSE= 1.4). Moreover, 95 isolates gave the positive results on IAA screening. The isolates with high potential characteristics were further identified by molecular technique using 16S rRNA sequencing. The data support that soil in Bang-Krachao area is an appropriate bio-resource to explore the diversity of bacteria especially halotolerant bacteria which some of them may be useful as plant growth promoting bacteria.





Analysis of Population Structure of *Mycosphaerella fijiensis* Deighton in Luzon

Mary Joy C. Mendoza*

University of the Philippines Los Baños, Laguna
mcmendoza7@up.edu.ph

Edna Y. Ardales

University of the Philippines Los Baños, Laguna
eardales2009@gmail.com

Ten (10) microsatellite markers were used for the DNA fingerprinting of 168 *M. fijiensis* isolates obtained from different banana-growing regions in Luzon. The objective of this study is to assess the genetic diversity and genetic differentiation of the population and determine the phylogenetic relationships of the isolates. The PowerMarker v.3.25 software was used to (1) determine the following: Polymorphism Information Content (PIC) of the ten markers, number of alleles present, gene diversity and haplotypic diversity values, F_{ST} values, (2) to construct dendrograms showing the phylogenetic relationships of the isolates and (3) to estimate the amount of variation by Analysis of Molecular Variance (AMOVA).

Gene diversity estimate of 0.42 was obtained for the entire population. From the 168 isolates, 129 multilocus haplotypes were generated; 113 and 16 of which were unique and common haplotypes, respectively, resulting to high haplotypic diversity of 0.9875 for the entire population. Analysis of genetic differentiation showed that the subpopulations of *M. fijiensis* from Quezon and Batangas (F_{ST} : 0.0148) were genetically similar, whereas the subpopulations from Laguna and Pangasinan (F_{ST} : 0.3090) were genetically distinct. The subpopulation from Mindoro was genetically distinct from the subpopulations from seven (7) other provinces (Pangasinan, Cagayan, Isabela, Cavite, Laguna, Quezon, and Batangas). Determination of the phylogenetic relationships among the isolates showed no correlation between the groupings or cluster formed with either geographical or varietal origin of the isolates. However, isolates from a particular province or cultivar were found to be predominant in a particular cluster. Analysis of Molecular Variance (AMOVA) showed that the amount of variation within subpopulations (85% within a province and 96% within a variety) was higher than among subpopulations (15% and 4% among provinces and varieties, respectively).

The present study on the population structure of *M. fijiensis* from Luzon provides significant information on the amount and distribution of genetic variation of the pathogen in the island which is necessary in formulating effective disease management strategies. The results gathered in this study could serve as guide in the development of resistant banana varieties and in the deployment of these varieties that may have contribute to the management of black Sigatoka in the country. Specifically, it could serve as guide to plant breeders, and plant pathologists in developing resistant cultivars that are high yielding, high consumer-acceptability and adaptive to different crop production.





Synthesis of Gd-doped ZnO photocatalysts for degradation of dyes

Nontarin Roopsung

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
b5510400081@ku.ac.th

Apsit Songsasen*

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
fsciass@ku.ac.th

Gd-doped ZnO photocatalysts were prepared by reflux method at different concentration of doped Gd which were 0.5, 1 and 2 % of mole of Zn. These photocatalysts were characterized by various techniques namely TGA, XRD, SEM, EDS and PL. The thermograms indicated these photocatalysts are composite material which contained ZnO and Gd. The crystalline size which determined by XRD patterns was about 20 to 27 nm. The SEM images indicated the morphology of these photocatalysts were varied from fastigiated rod developing to bush depended on concentration of doped Gadolinium. The EDS spectra indicated the existence of Zinc, Oxygen and Gadolinium. The PL spectrum implied that the doping did not have effect on the recombination process of the photocatalysts. The doped photocatalysts at every concentration of doping had high efficiency on the degradation of Acid Orange 7 and Basic Blue 41 dyes.





Synthesis of Gd-doped ZnO photocatalyst using co-precipitation method for degradation of dyes

Supasin Limsapapkasiphon

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand,
b5510400994@ku.ac.th

Saijai Charnsethikul*

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand,
fscisac@ku.ac.th

1 mole% of Gadolinium(Gd)-doped ZnO was synthesized by co-precipitation method. The calcination temperature were 400 °C, 600 °C and 800 °C. Characterization was carried out by XRD, SEM, EDX and PL. In the XRD pattern of samples, there was signature of impurity peaks, which could indicate Gd-related secondary phases on calcined at 600 and 800 °C. Particles size which calculated by Scherrer's equation was in the range of 23.21 to 43.52 nm, depended on the calcination temperature. The SEM of Gd-doped ZnO illustrated that morphology is well ordered, has aggregation, and homogeneous distribution of particle size. Results of Photoluminescence indicated that Gd-doped could reduced the recombination process of ZnO which calcined at 400 °C has higher rate of recombination than the samples which calcined at 800 °C and 400 °C. Photodegradation of dyes (AO7 and Basic blue 41) under sunlight showed that Gd-doped ZnO calcined at 800 °C had the highest first order rate constant of 1.77 hr⁻¹ (AO7) and 2.01 hr⁻¹ (Basic blue 41). The % degradation was 72.34% for AO7 and 95.34% for Basic blue 41.





Exfoliation of Layered Hydroxy Double Salts in Non-aqueous Media

Disatad Baedyanonda

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand.
b5510401451@ku.ac.th

Weekit Sirisaksoontorn*

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand.
fsciwks@ku.ac.th

Layered Hydroxy Double Salts (HDSs) and other similar 2D-structured materials are being gained more research interests recently due to their structural uniqueness, allowing new research works and industrial applications. However, successful exfoliation of these materials is proved to be a challenge, as specific conditions are needed to be applied while not tampering with their sheet-like 2D structures. In this work, Ni/Zn acetate- and Co/Zn dodecylsulfate-HDSs were prepared through modified Morioka's route. Powder X-ray Diffraction (PXRD), Fourier Transform-Infrared Spectroscopy (FT-IR), Atomic Absorption Spectrophotometry (AAS), Thermogravimetric Analysis (TGA) and Elemental Analysis of carbon, hydrogen, nitrogen (EA, CHN-mode) were utilized in characterization of as-prepared materials. The formula can be confirmed as $\text{Ni}_3\text{Zn}_2(\text{OH})_8(\text{ac})_2 \cdot 2\text{H}_2\text{O}$ and $\text{Co}_3\text{Zn}_2(\text{OH})_8(\text{DS})_2 \cdot 2\text{H}_2\text{O}$, with spacing between sheets of 1.31 nm and 3.21 nm, respectively. Exfoliation of prepared HDSs in butanol, formamide, dimethylformamide, dimethylsulfoxide and ethyl acetate, comparing to that in aqueous medium, was then studied by using laser beam scattering test for basic qualitative and stability tests. Saturation concentration of each material in each medium was measured with AAS. Different saturation concentrations and stability of exfoliated nanosheets result from the interactions between solvent molecules and intercalated ions, as well as the solvation of HDS nanosheets.

Keywords: layered hydroxy double salts (HDSs), 2D structure, exfoliation, delamination, non-aqueous medium





Synthesis and Characterization of Titanium Complex supported by Salicylbenzothiazole Ligands for the Ring-Opening Polymerization of *rac*-Lactide

Thanyathip Thongsutjaritphan

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
pangrum_happy@hotmail.com

Pimpa Hormnirun*

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscipph@ku.ac.th

A series of titanium complexes supported by salizylbenzothiazole ligands (**1–4**) were prepared from the reaction of one equivalent of titanium isopropoxide ($\text{Ti}(\text{O}^i\text{Pr})_4$) and two equivalents of the appropriate ligands in toluene at room temperature. All complexes were characterized by NMR spectroscopy. The catalytic activities towards the ring-opening polymerizations of *rac*-lactide and ϵ -caprolactone were investigated. Complexes **1–4** afforded polylactides and polycaprolactones with molecular weights closes to the theoretical values and narrow PDIs. The ligand substituents of the titanium complexes have no effect on the stereoselectivity of *rac*-lactide polymerization. Atactic polylactide were produced using all complexes.





Synthesis of new cytotoxic tri- and tetraazabenz[3,2-a]fluorine-5,6-derivatives

Wisansaya Jaikandee

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
wm.wisansaya@gmail.com

Theerachart Leepasert*

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscitcl@ku.ac.th

The reaction between 2,3-dichloronaphthalene-1,4-dione/6,7-dichloroisoquinoline-5,8-dione /6,7-dichloroquinazoline-5,8-dione and 2-aminopyridine derivatives /1-animoisoquinoline /2-aminoquinoline in ethanol in the presence of K_2CO_3 produced novel tetra- and pentacyclic compounds 3a, 3b, 3b', 3c, 5a, 7c and 9a via nucleophilic aromatic substitution. All of synthesized compounds are being studied the cytotoxicity.

Reference:

1. Shai, A., Johnson, F., Grollman, P. A. *J. Med. Chem.* 1986, 29, 1329-1340
2. Young-shin, K., So-Young, P., Myung-Eun, S., Hyun-Jung, L., Schollmeyer, D. *Bioorg. Med. Chem.* 2003, 11, 1829-1833.
3. Hyun-Jung, L., Jin, S. K., Myung-Eun, S., Hyen, J.P., Sang, K. L., Hee-Kyung, R., Hwa, J. K., Eun-Kyung, S., Choonmi, K., Chong-Ock, L., Hea-Young, P. C. *Eur. J. Med. Chem.* 2007, 42, 168-174
4. Theerachart, L., Manochehr, S., Karem S., Eva, S., Wolfgang, H., Helmut S., Babette A., Gilbert M., Eckhard, G. *Bioorg. Med. Chem.* 2013, 23, 5264-5266.





Toward the Total Synthesis of Anti-HIV Waltherione C

Parichat Tawornchat

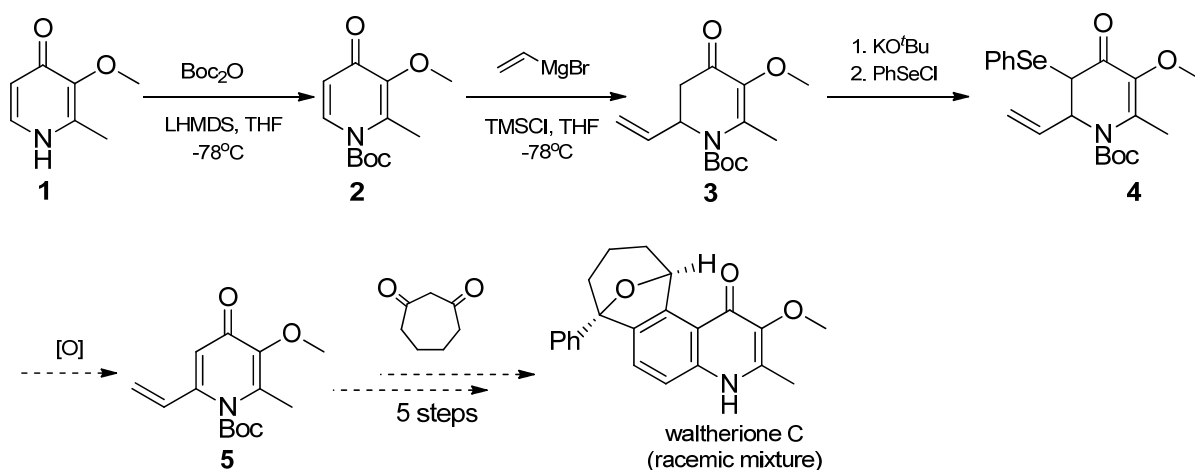
Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
b5510400986@ku.ac.th

Paiboon Ngermmeesri *

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscipbn@ku.ac.th

In 1987, a drug called zidovudine also known as AZT became the first approved treatment for HIV disease. Since then, approximately 30 drugs have been approved to treat people living with HIV/AIDS, and more are under development. Recently, the discovery of waltherione C has been reported. These compounds have been found to be biologically active against human immunodeficiency virus, HIV. When compare waltherione C ($EC_{50} = 0.84 \mu\text{M}$, $LC_{50} = 11 \mu\text{M}$) with AZT ($EC_{50} = 1.30 \mu\text{M}$, $LC_{50} = 89.5 \mu\text{M}$), AZT is worse than waltherione C to protect T cells from HIV-1 and AZT is more cytotoxic than waltherione C. Therefore, waltherione C could be a better drug.

Waltherione C was isolated from *Melochiaodorata*, which is a plant found in Papua New Guinea. Our objective is to synthesize waltherione C from 3-methoxy-2-methyl-1*H*-pyridin-4-one (**1**). The first step was the protection of the NH group to give *N*-Bocpyridione (**2**). This compound has been synthesized successfully with 61% yield. The next step involves the Michael addition of α,β -unsaturated ketone to form vinyl dihydropyridione (**3**) (78% yield) followed by regeneration of the double bond to form *N*-Boc-5-methoxy-6-methyl-3-phenylselanyl-2-vinylpyridin-4-one (**4**) (20% yield). This compound will then be used to react with 1,3-cycloheptanedione to form a framework of waltherione C.





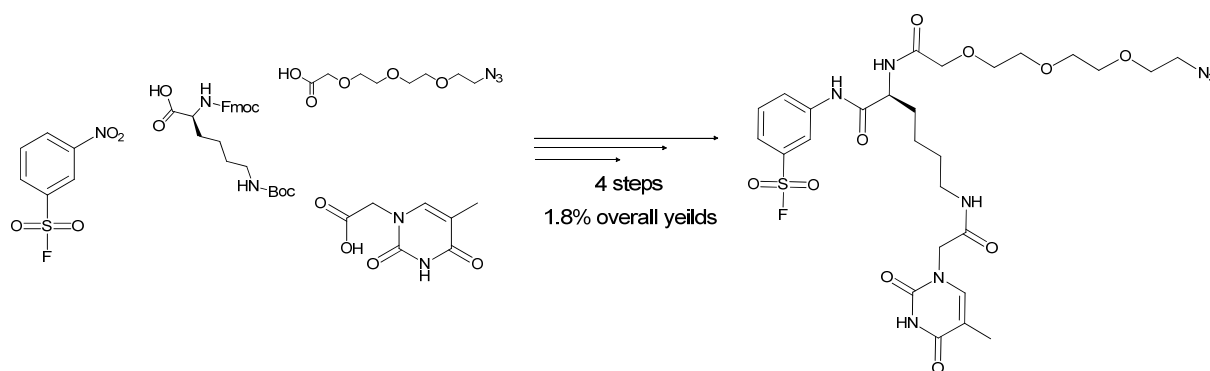
Synthesis of Trifunctional Bioconjugate Molecule for Protein Kinases Detection

Bongkotrat Thanaussavade^a, Lee-Chiang Lo^{b,*}, Pitak Chuawong^{a,*}

^a*Department of Chemistry and Center of Excellence for Innovation in Chemistry, Faculty of Science, and Special Research Unit for Advanced Magnetic Resonance (AMR), Kasetsart University, Bangkok 10900, Thailand*

^b*Department of Chemistry, National Taiwan University, Taipei 106, Taiwan*
E-mail: lclo@ntu.edu.tw (L.-C., Lo), Pitak.C@ku.ac.th (P. Chuawong)

The bioconjugate molecules are widely used as protein chemical probes in biological processes. An active site of an enzyme is specific for its substrate, and therefore, could be modified with a specific probe. The 5'-*p*-fluorosulfonylbenzoyl adenosine (5'-FSBA) is a bioconjugate molecule with the structure resembling the ATP. In this study, the structural features of 5'-FSBA were improved to increase the efficacy of active site-directed probe PP1, a protein kinase inhibitor, which selectively blocked the action of Src family. In this work, the adenosine core of 5'-FSBA was replaced by a lysine residue to increase the rotation of the sugar and also to carry more functional groups. The lysine carries 3 functional groups including an electrophilic fluorosulfonylaryl group at the meta position, an azido reporter group at the α -amino position, and a thymine base at the α -amino group. The target compound was synthesized in 5 steps in moderate to good yields from nitrobenzene. The synthetic steps include chlorosulfonation, fluorination, and an amide bond formation using POCl₃ as a coupling reagent. Subsequently, the amino protecting group was replaced by azido group and thymine, respectively, using EDC/HOBt as a coupling reagent. The target compound was characterized by NMR spectroscopic techniques.





Towards the Synthesis of Steroid Receptor

Chanoknun Boonyaratsewee

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
cboonyaratsewee@gmail.com

Bunyarithi Sookcharoenpinyo*

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscibts@ku.ac.th

This research is about the synthesis of a precursor for the new steroid receptors. The synthetic approach involved two main sections; i.e. the linker and the aromatic part. The synthesis of the linker begins with methyl esterification of trimesic acid (benzene-1,3,5-tricarboxylic acid : $C_9H_6O_6$), then mono-methyl-ester reduction to alcohol which was followed by OH-protection with 3,4-dihydropyran, and the other two methyl ester groups were converted to pentafluorophenyl groups.. This part plays as a template for the future derivatives. Regarding the aromatic part, the synthesis starts with 9,10-bisbromomethylation of anthracene, then treatment with hexamethylenetetramine, acidic hydrolysis, and basicification to yield 9,10-bis(aminomethyl)anthracene. Macrocyclisation between the linker and the aromatic part is a key step for the synthesis of our receptor framework. It is no surprised that the last step would produce several cavity-sized macrocycles. These compounds then will be purified by HPLC. Finally, THP groups will be deprotected and deriverised for the future work.





Introduction of Quantum Beam Science and Applications to Chemistry and Related Sciences

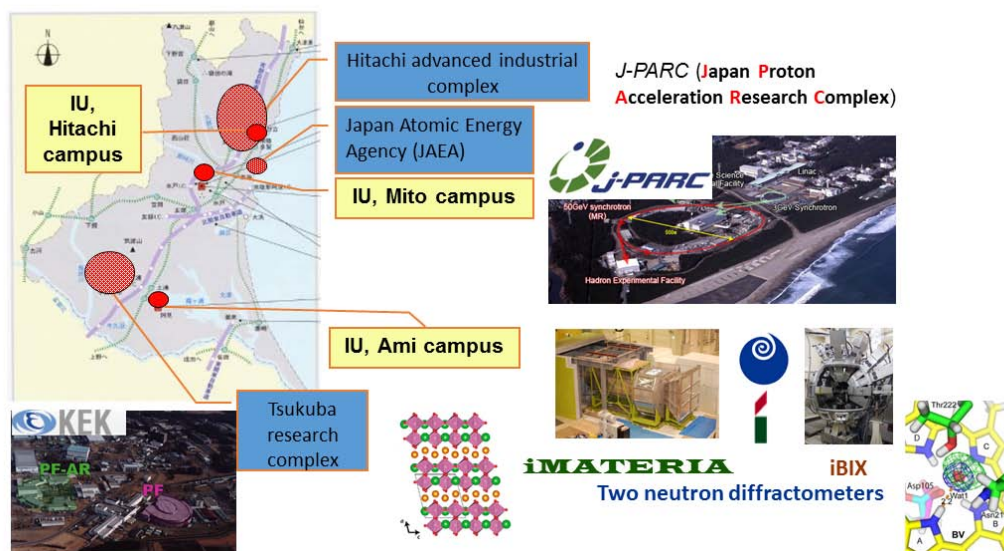
Seiji Mori*

Institute of Quantum Beam Science, Graduate School of Science and Engineering,
Ibaraki University, Mito, Japan
seiji.mori.compchem@vc.ibaraki.ac.jp

Ibaraki University has established Institute of Quantum Beam Science, which related to quantum beam (electromagnetic wave involving X-ray, γ -ray, and laser, and particle beam involving neutron, electron, and proton) since April 1st, 2016. Our institute has unique feature of quantum sciences among any universities in Japan and strong collaborations with Japan Proton Accelerator Complex (J-PARC), National Institutes for Quantum and Radiological Science and Technology, Japan Atomic Energy Agency (JAEA), Ibaraki Quantum Beam Science Research Center, National Institute of Advanced Industrial Science and Technology, National Institute of Radiological Science, and KEK.

In this lecture, I am going to introduce that, and our recent researches combined with X-ray absorption spectra and DFT calculations for organometallic compounds toward understanding reaction mechanisms or catalyst design at the *quantum* level.

I thank the financial supports by Kaken-hi from MEXT and JST ACT-C.





Searching for a Botanical Insecticide from *Coffea arabica* L. cv. Catimor Parchment

Auraya Manaprasertsak

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
b5510400111@ku.ac.th

Wanchai Pluempanupat*

Department of Chemistry and Center of Excellence for Innovation in Chemistry,
Faculty of Science, and Special Research Unit for Advanced Magnetic Resonance,
Kasetsart University, Bangkok, Thailand
fsciwcp@ku.ac.th

The objective of this research was to study the insecticide efficiency of *Coffea arabica* L. cv. Catimor parchment. The dried parchments were extracted with sequential polarity solvent; hexane, dichloromethane, ethyl acetate and methanol, respectively by soaking at room temperature. Four crude extracts were examined the toxicity against *Tribolium castaneum* under laboratory conditions. The dichloromethane crude extract exhibited the most toxicity as $ED_{50} = 3921$ ppm. Therefore, this crude extract was further isolated by preparative thin layer chromatography with 100% ethyl acetate to obtain caffeine that exhibited the toxicity as $ED_{50} = 3445$ ppm. These results could identify that caffeine is one of active gradients from the dichloromethane crude extract.





Searching for novel bioactive compounds produced by the fungus *Menisporopsis theobromae* BCC 4162

Thanyaporn Tengsuttivat*

Department of Chemistry, Faculty of Science, Kasetsart University,
Bangkok, Thailand
b5510400072@ku.ac.th

Pakorn Wattana-Amorn

Department of Chemistry, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fscipwa@ku.ac.th

Menisporopsis theobromae BCC 4162 is a seed fungus producing bioactive compounds, menisporopsin A and menisporopsin B. These compounds exhibit a wide range of biological activities such as antimycobacterial, cytotoxicity and antimalarial activities¹. As micro-organisms are a source of invaluable secondary metabolites, this makes us believe that there are more bioactive compounds producing from *M. theobromae* BCC 4162. In this work, menisporopsin A, menisporopsin B, and also their hydrolyzed product were isolated from the ethyl acetate extract using Sephadex LH-20 column chromatography and high performance liquid chromatography (HPLC). These purified secondary metabolites were structurally analyzed using nuclear magnetic resonance spectroscopy (NMR) and mass spectrometry (MS). Furthermore, three types of media were used to screen for production of novel metabolites produced by *M. theobromae* BCC 4162. They are czapex yeast autolysate (CYA), corn meal and yeast extract sucrose (YES). The metabolites produced by these media were analyzed using both thin layer chromatography (TLC) and HPLC. The promising result is from YES medium providing us new metabolic profiles on both TLC and HPLC. Therefore, YES medium was used to culture the fungus *M. theobromae* BCC 4162. The novel compounds were clearly detected on TLC under long-wave UV light (366 nm). These compounds will be further purified and elucidated for their structures using NMR and MS. Moreover, these compounds will be tested for their biological activities.

Reference

- 1 Chinworrungsee, Maneekarn, Prasat Kittakoop, Masahiko Isaka, Pacharee Maithip, Sumalee Supothina, and Yodhathai Thebtaranonth, 'Isolation and Structure Elucidation of a Novel Antimalarial Macrocyclic Polylactone, Menisporopsin A, from the Fungus *Menisporopsis Theobromae*', *Journal of Natural Products*, 67 (2004), 689–92





Comparative genomics of *Cordyceps militaris* and other entomopathogenic fungi reveals gene interactions between fungal pathogens and insect hosts

Chayapat Wizaza
Kasetsart University, Bangkok, Thailand
zero036@hotmail.com

Wanwipa Vongsangnak*
Kasetsart University, Bangkok, Thailand
fsciwpv@ku.ac.th

Cordyceps militaris is an entomopathogenic fungus, which is being used as a biological agent for insect pest control in agriculture. Comparative genomics provides details on gene function leading to a better understanding of *evolution* of fungal *entomopathogenicity*. In this study, we aim to identify orthologous coding genes in aspects of their functions and interactions between fungal pathogens and insect hosts by comparative genomics of *C. militaris* and other related entomopathogenic fungi. Initially, we retrieved the *C. militaris* genome sequence and compared this sequence to other five related entomopathogenic fungi genomes, including three species of *Metarhizium*, *Ophiocordyceps sinensis* and *Beauveria bassiana*. The results showed that the identified orthologous coding genes of *C. militaris* resembles to *B. bassiana* for 7,486 genes. This suggests that *C. militaris* and *B. bassiana* are the closest evolutionary relationship among entomopathogenic fungi studied. Analyzing pathogen and host interaction (PHI) genes in entomopathogenic fungi showed that 799 core PHI genes might be responsible for interactions between fungal pathogens and their hosts. Focusing on fungal pathogens and insect hosts interactions, 10 out of 799 core PHI genes in *C. militaris* were identified. Of these, there were 4 PHI genes i.e., Bbslt2, BbAC, Ktr4 and Kre2/Mnt1 related to white muscardine disease and the other 2 PHI genes i.e., BbCHIT1 and Chi2 related to cell wall degradation. This study suggests putative gene targets for further improving biocontrol strains with customized properties for sustainable agriculture.





Histopathological Effects of Atrazine on the Freshwater Mussel, *Hyriopsis bialata*

Krittapas Srisamai
Kasetsart University, Bangkok, Thailand
kritaphasdeksiyung@gmail.com

Nopparat Srakaew*
Kasetsart University, Bangkok, Thailand
fscinrsr@ku.ac.th

Atrazine is one of the herbicides widely used in Thailand for controlling broad-leaf weeds that grow in the crops. High utilization of atrazine results in its contamination both in terrestrial and aquatic environments. Accumulated evidence has indicated that atrazine at 0.01-160 $\mu\text{g/l}$ is detected in the natural freshwater resources in Thailand. Bivalve molluscs are ubiquitously distributed in several aquatic environments. Their filter-feeding activity likely makes them sensitive to toxicants, and thus they are often used as sentinels to monitor the toxic levels of the water. This study aimed to evaluate the acute toxicity of atrazine to the freshwater pearl mussel, *Hyriopsis bialata*, using high concentrations of atrazine. The mussels were reared in aquaria with a controlled temperature (26 °C) and photoperiod (12 h L: 12 h D). The animals were fed *ad libitum* with the green algae, *Kirchneriella incurvata*. Four mussels each (two males and two females) were treated with atrazine at different concentrations (0, 25, 50, 100 and 200 mg/l) for 4 days. The experiments were conducted with three replicates. The viability of the mussels was determined and assessed using one way ANOVA and Turkey's multiple comparison test. Tissues (the gills, mantles, gonads and digestive organs) were dissected out, fixed in 10% neutral buffered formalin, embedded in paraplast and cut into 5- μm -thick sections. Histological sections were stained with hematoxylin and eosin and viewed under a light microscope for histopathological study. It appears that atrazine did not cause significant mortality. In addition, atrazine-treated mussels did not show histopathological changes compared with untreated mussels. Therefore, atrazine did not exert acute toxicity to *H. bialata*. However, further study is needed to determine the chronic effects of atrazine on the freshwater mussels to guarantee the potential use of the mussels as a bioindicator for the atrazine toxicity test.





Bioefficacy of leaf extracts from *Pouzolzia zeylanica* L. against diamondback moth *Plutella xylostella* in Viet Nam

Nguyen Ngoc Bao Chau*

Faculty of Biotechnology, Ho Chi Minh City Open University, Viet Nam

chau.nmb@ou.edu.vn

Dang Thi Tinh

Faculty of Biotechnology, Ho Chi Minh City Open University, Viet Nam

dangthitinh1301@gmail.com

Biopesticide from leaf extracts is known to play an important role in order to reduce the impact of chemical pesticides which have been developed recently. In Viet Nam, *Pouzolzia zeylanica* L. is native species and have been demonstrated its applicability as a medical plant. Additionally, when making traditional “Sauce of macerated fish” food, *Pouzolzia zeylanica* L. was also used to control fly larvae during processing due to insecticidal activity. In this study, *Pouzolzia zeylanica* L. was collected and grew in the university nethouse, then followed the harvest and extraction with ethanol in Soxhlet apparatus. The solvent was evaporated and the residue was dissolved in 20% methanol (w/v), then it was diluted in water at different concentration for experiment. This solution was screened for insecticidal activity on *Plutella xylostella*. The diamondback moth *P. xylostella* was also collected in Cu Chi province, Ho Chi Minh City and reared at the laboratory until the second generation and second instar larvae were chosen for testing. We tested the bioefficacy of leaf extracts from *Pouzolzia zeylanica* L. against diamondback moth at 5%, 10%, 15%, 20%, 25%, and 30% leaf extract concentration; water and methanol 30% were used as control. Each treatment was replicated 3 times with 5 larvae per replicate. The rate of mortality, rate of pupation and adult of diamondback moth were recorded after 6, 12, 24 h, 48h treatment. Besides, antifeedant activity of the leaf extract also was evaluated by a leaf-disc choice test and no-choice leaf test. The results indicated that alkaloid compounds were determined in the leaf extract of *Pouzolzia zeylanica* L. by using Dragendorff methods. The mortality (100%) induced by those compounds was recorded on *Plutella xylostella* second instars at 30% leaf extract concentration by spraying method after 24h treatment and have significant difference compared to the control ($P=0.0000$). *Pouzolzia zeylanica* L. leaf extract at 30% leaf extract concentration also effect on the ratio of pupation, and adult emergence of *Plutella xylostella* and have significant difference compared to the control ($P=0.0000$). Moreover, feeding activity was significantly reduced almost 90% when using 30% leaf extracts concentration of *Pouzolzia zeylanica* L. The result promises a potential of using *Pouzolzia zeylanica* L. as biopesticide to improve sustainability of agricultural production in Viet Nam.

Keywords: leaf extract, *Pouzolzia zeylanica* L, diamondback moth, antifeedant.





Two *N*-acetyltransferase genes exist with different roles and expression mechanisms in the silkworm *Bombyx mori*

Le Thi Dieu Trang*

Research Institute for Biotechnology and Environment, Nong Lam University in
HoChiMinh City, Vietnam
ltdtrang@hcmuaf.edu.vn

Hana Sehadova

The Czech Academy of Sciences, Czech Republic
sehadova@yahoo.com

Makio Takeda

Graduate School of Agricultural Science, Kobe University, Japan
mtakeda@kobe-u.ac.jp

Daily oscillation in expression of arylalkylamine *N*-acetyltransferase gene (*NAT*), enzymatic activity of *NAT*, and content of melatonin in both vertebrates and insects central nervous system, suggests that insects share a similar circadian timekeeping mechanism with vertebrates where *NAT* gene is a clock controlled gene. Following cloning of *BmNAT1*, we cloned the second *NAT* gene from the silkworm, *Bombyx mori* (*BmNAT2*) and compared molecular structures and expression patterns of the two genes. Amino acid sequence identity between the two *BmNAT* isoforms was 35%. The *BmNAT2* transcript was expressed exclusively in the brain and its level was constant under LD 12:12. *BmNAT1* and *BmNAT2* were transcribed in neurons where *Bombyx* Cycle (CYC) immunoreactivity (-ir) and *Drosophila* *NAT*-ir were previously detected. Neurons expressing both *BmNAT1* and *BmNAT2* transcripts overlapped but unique expression to each isoform were also noted. Real-Time PCR substantiated that the *BmNAT1* transcript fluctuated but the transcript of *BmNAT2* did not fluctuate at larval stage under LD 12:12. The putative promoter region of *BmNAT1* and *BmNAT2* were structurally analyzed. Seven canonical E-box elements and one perfect E-box existed in the putative promoter region and the first intron of *BmNAT1*, suggesting possible binding of Clock/Cycle (CLK/CYC) heterodimer to an E-box. No E-box was found in the upstream regulatory region of *BmNAT2*. Instead, only one CRE was detected in the promoter. *BmNAT2* produced both sense and antisense RNA, while *BmNAT1* produced no antisense signal. The unique expression pattern, together with the presence or absence of E-box element suggested diversity in mechanism that regulates *NAT* genes expression in this species.





Microscopic Structures of the Posterior Digestive Tract of the Butterfly Lizard, *Leiolepis ocellata* Peters, 1971 (Squamata: Agamidae)

Tanachoke Kengkarnpanich*
Kasetsart University, Bangkok, Thailand
best.tk5561@gmail.com

Nopparat Srakaew
Kasetsart University, Bangkok, Thailand
fscinrsr@ku.ac.th

The butterfly lizard, *Leiolepis ocellata*, widely inhabits northern Thailand and it is important in the ecosystem as a predator for controlling insects. Although ubiquitously found, the biology of *L. ocellata* is poorly understood, including the digestive system. The goal of the present study was to investigate the microscopic structures and carbohydrate components of the posterior digestive tract of *L. ocellata*. Ten wild lizards (five males and five females) were collected from Tak and Lampang provinces. Animals were anesthetized with an overdose of sodium pentobarbital. The abdominal incision was made to expose the internal organs. The small and large intestines were collected, fixed in Bouin's solution for 24 h, embedded in a paraplast and cut into 5- μ m-thick sections. Histological sections were stained with hematoxylin-eosin for general nuclear and cytoplasmic staining, periodic acid-Schiff (PAS) for neutral mucopolysaccharides, alcian blue (AB) pH 1.0 for sulfated mucopolysaccharides, AB pH 2.5 for carboxylated mucopolysaccharides, PAS-AB pH 2.5 for determination of co-production of neutral and carboxylated mucopolysaccharides and Masson's trichrome for differentiation of the collagenous connective tissues and the muscular tissues. The results show that three common tissue layers from the inside to the outside (mucosa, muscularis and serosa) constitute the wall of both intestinal regions. However, the large intestinal wall has an additional submucosa layer located between the mucosa and the muscularis. The mucosa consists of an epithelium and an underlying lamina propria. The small intestinal epithelium is of a simple ciliated columnar epithelium, while the large intestine is lined by a simple non-ciliated columnar epithelium. Interspersed with epithelial cells are mucous goblet cells. Carbohydrate histochemistry reveals that these mucous cells produce a mixture of neutral, carboxylated and sulfated mucopolysaccharides. The lamina propria contains loose connective tissues with numerous blood vessels. The submucosa of the large intestine is separated from the mucosa by few layers of the smooth muscles (muscularis mucosae). It consists of connective tissues that become blue upon Masson's trichrome staining. The muscularis comprises the inner circular and outer longitudinal smooth muscles, both of which become red upon Masson's trichrome staining. The outermost serosa is composed of loose connective tissues covered with a simple squamous epithelium. Our ongoing study is also to investigate the microscopic structures of the anterior digestive system and organs associated with the digestive system in this species. Improved fundamental knowledge on the structures of the lizard digestive system contributes to a better understanding of the digestive system of the lizards in comparison to other reptiles.





Effect of *Tiliacora triandra* on spatial learning and memory in permanent left common carotid artery occlusion mice

Natsuda Mayagasa

Department of Zoology, Faculty of Science, Kasetsart University, Bangkok, Thailand
natsuda.ma@ku.th

Wachiryah Thong-asa*

Department of Zoology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fsciwyth@ku.ac.th

Chronic cerebral hypoperfusion led to a neuronal dysfunction and a neuronal dead may cause by an atherosclerosis or arteriosclerosis. The neuronal dead occurred in vulnerable areas, such as the hippocampus, which played an important role in the formation of new memories, the consolidation of information from short-term memory to long-term memory and spatial navigation. The present study investigated the effect of the *Tiliacora triandra* extract on spatial cognitions in chronic cerebral hypoperfusion mice cause by permanent left common carotid artery occlusion (LCO). Sixteen male ICR mice were randomly divided into 3 groups of Control, LCO+300 and LCO+600, respectively. Drug administration was treated for 18 days and started 8 days after the operation. At day 7 of drug administration the cognitive abilities were evaluated using the acquisition and reversal trials in the Moris water maze. The result revealed significantly enhancing effect on spatial learning of LCO+300. Both LCO+300 and LCO+600 showed significantly enhanced of learning flexibility, on the other hand, there was no significant difference in memory capacity between all groups, which imply that *T. triandra* extract enhances spatial learning and flexibility learning, but not spatial memory capacity. In conclusion, *T. triandra* extract enhances the spatial learning and learning flexibility, but not spatial memory capacity in chronic cerebral hypoperfusion mice caused by permanent left common carotid occlusion.





ISOLATION AND IDENTIFICATION OF FUNGI FOR CONTROL *SPODOPTERA LITURA* F. FROM THE SOILS OF CAN GIO MANGROVE FOREST

Le Thi Bich Lien*

Nong Lam University, Ho Chi Minh City, Viet Nam, bichlelien@gmail.com

Nguyen Thanh Bach

Faculty of Biotechnology, Ho Chi Minh City Open University, Viet Nam,
thanhbach.ou@gmail.com

Tran Le Huu Duyen

Faculty of Biotechnology, Ho Chi Minh City Open University, Viet Nam,
tluuduyen@gmail.com

Nguyen Bao Quoc

Research Institute of Biotechnology and Environment, Nong Lam University, Ho Chi
Minh City, Viet Nam, baoquoc@hcmuaf.edu.vn

Le Thi Dieu Trang

Research Institute of Biotechnology and Environment, Nong Lam University, Ho Chi
Minh City, Viet Nam, ltdtrang@hcmuaf.edu.vn

Nguyen Ngoc Bao Chau

Faculty of Biotechnology, Ho Chi Minh City Open University, Viet Nam,
chau.nnb@ou.edu.vn

Development of sustainable agricultural system by reducing chemical pesticide is critically important in Viet Nam. Benefit soil microbes (bacteria and fungi) are not only essential for decomposing organic matter and recycling but also pest suppression. Can Gio mangrove forest in the South of Viet Nam is considered as a diverse flora and fauna along with extremely unique ecosystem, especially fungi and bacteria against pests. In this study, we collected soil under the roots of *Rhizophora apiculata* Blume and *Lumnitzera littorea* trees from Can Gio forest. The isolated fungal strains named D1 to D13 were identified. Those strains were tested for its ability to control *Spodoptera litura* at different concentrations (10^5 , 10^7 , 10^9 spores/ml) after 72 hours treatment, water was served as control treatment. *Beauveria bassiana* obtained from Nong Lam University, was also used as entomopathogenic fungi indicator for the experiment. The mortality of *Spodoptera litura* was corrected using Abbott's formula. The results showed the lethal potency of *Spodoptera litura* was observed in D2 and D3 fungal isolates with the rates of $2,27 \pm 0,13$ and $2,19 \pm 0,13$ at 10^7 spores/ml after 72 hours, respectively. This mortality rate has significant differences compared to control ($P = 0.00$). However, we did not obtained spores and hyphae of the fungus in the body cavity of infected larvae from D2 and D3 fungal strains, except *Beauveria bassiana*. In addition, genomic DNA of D2 and D3 were extracted, followed by PCR amplification with ITS-rDNA primers and sequencing. The analysis of phylogenetic tree and conidial morphology indicated that D2 and D3 samples are *Talaromyces verruculosus* D2 and *Aspergillus fumigates* D3, respectively. Those fungi have capability of bio-control due to their attacks on red flour beetle *Tribolium castaneum* and *Plutella xylostella* as described previously (Bosly et al., 2015).

Keywords: Can Gio mangrove forests, *Spodoptera litura*, fungus, ITS-rDNA





Effect of Integrated Postharvest Treatment on Mango Stem End Rot Incidence

Melissa P. Montecalvo*

University of the Philippines Los Baños, Laguna, Philippines
melissabpalacio@gmail.com

Oscar S. Opina

University of the Philippines Los Baños, Laguna, Philippines
oscarsopina@yahoo.com.ph

Teresita U. Dalisay

University of the Philippines Los Baños, Laguna, Philippines
tudalisay_d1760@yahoo.com

Elda B. Esguerra

University of the Philippines Los Baños, Laguna, Philippines
elda_esguerra@yahoo.com

Mango stem end rot (SER) is a major postharvest disease problem that limits the storage and marketable life of 'Carabao' mango fruits. Infected fruits become unmarketable or with cheaper price since fruit rotting progresses throughout the flesh. This research evaluated the control efficacy of postharvest management practices in reducing SER disease. Results showed that postharvest treatment combinations such as heat treatment, fungicide dip, modified atmosphere packaging (MAP), and low temperature storage remarkably minimized rots and extended saleable life as compared when these treatments were applied solely. Among the postharvest treatments, hot water treatment (HWT, 55°C for 10min) appeared to be the most effective treatment when applied alone. On the other hand, SER infection was favored under MAP condition. Fungicide dips (azoxystrobin, 175ppm and tebuconazole, 156ppm) provided similar degree of disease control. Among the treatment combinations, integration of HWT and fungicide dips under MAP and Non-MAP conditions minimized the disease to a great extent, with HWT in combination with azoxystrobin and HWT combined with tebuconazole and MAP to be the most effective treatment combinations of mango fruits stored at 13°C for 28 days after treatment.

Saleable life of fruits was extended due to the significant disease reduction. In contrast, shelflife of fruits was shorter for mangoes under MAP condition due to severe and early onset of SER infection even before the fruits attained full ripeness.

The various combinations of postharvest treatments did not influence the peel color development of mango fruits. Peel color development was delayed when packed in MAP. In contrast, HWT enhanced ripening process. Physico-chemical attributes such as firmness, total soluble solids, titratable acidity, and pH were not influenced by the postharvest treatments. Findings of this research suggest that combination of postharvest treatments can ensure effective suppression of SER infection and prolong marketable period of mango fruits.





SYSTEMIC ACQUIRED RESISTANCE (SAR) INDUCTION FOR THE CONTROL OF RICE BLAST CAUSED BY *PYRICULARIA GRISEA* SACC.

PIAMONTE, ROBELYN T.*

Graduate Student, University of the Philippines Los Banos, College, Laguna, Philippines, rtpiamonte@up.edu.ph and Faculty, Visayas State University, Visca, Baybay City, Leyte, Philippines

BORINES, LUCIA M.

Professor, Visayas State University, Visca, Baybay City, Leyte, Philippines, Imborines@vsu.edu.ph

Resistance induction in rice plants may offer a promising sustainable approach in managing the rice blast disease. In this study, resistance elicitors like Benzothiadiazole (BTH), Beta-amino butyric acid (BABA), Chitosan (CAN), Salicylic acid (SA), Silicon dioxide (SiO₂), and Acetic acid (AA) were tested for their ability to induce SAR in rice at varying concentrations (50, 100 and 150 ppm), spray intervals (10 and 20 days), and number of applications (1, 2, 4 applications) for blast control. The elicitor was sprayed to 15-day old IR24 rice seedlings and inoculated with *P. grisea* seven days after the initial elicitor application and observed until harvest. Disease severity ratings, number of surviving plants, grain yield and antifungal activity were compared between treatments and to the fungicide check (Mancozeb). All the elicitors tested lower rice blast severity. Though there was no significant difference observed between concentrations in each of the elicitor, SA and SiO₂ tend to work better at 50 ppm than when applied at 100 and 150 ppm while BTH, CAN, AA and BABA has lower blast severity when applied at 150 ppm. The 10- and 20- day spray interval of the elicitors just conferred comparable protection to rice against the blast disease. The two spray applications of the elicitor at 20 days interval was enough to protect the rice from blast disease up to harvest. All the elicitor treated plants has grain yield higher than Mancozeb. BTH gave the highest number of surviving plants and thus the highest yield. The absence of direct antifungal activity against *P. grisea in vitro* of the elicitors indicates that the mechanism of control was through the elicitation of systemic acquired resistance. The results showed the potential of BTH, SA and CAN as elicitors of resistance which are cheaper than when using Mancozeb in managing the rice blast disease.

Keywords: systemic acquired resistance (SAR), rice blast, *Pyricularia grisea* Sacc., benzothiadiazole (BTH), beta-amino butyric acid (BABA), chitosan (CAN), salicylic acid (SA), silicon dioxide (SiO₂), and acetic acid (AA).





Field Symptom Variability and Pathogenicity Testing of Sugarcane Leaf Scald caused by *Xanthomonas albilineans*

Rizalina L. Tiongco*

University of the Philippines Los Baños, Laguna, Philippines
lynlawas.tiongco@gmail.com

Manuela A. Samaco

University of the Philippines Los Baños, Laguna, Philippines
masamaco@gmail.com

Fe M. dela Cueva

University of the Philippines Los Baños, Laguna, Philippines
fmdcueva@yahoo.com

Teresita U. Dalisay

University of the Philippines Los Baños, Laguna, Philippines
tudalisay_d1760@yahoo.com

Leaf Scald caused by *Xanthomonas albilineans* (Ashby) Downson, has been predominantly observed among sugarcane cultivars in various fields at Negros Occidental. Due to stressful and extreme conditions such as drought, waterlogging and low temperatures favorable for the multiplication of the bacterial pathogen, resulting to the increased incidence of the disease, it can now be considered with re-emerging importance. This study was done to determine the aggressiveness and virulence of *X. albilineans* in inducing disease symptoms, which can affect the sugarcane industry in the long run. Proper management practices such as sterilization and disinfection of cutting materials, use of disease-free and resistant varieties and cold soak hot water treatment (CSHWT) of the seedcane can be implemented to control and minimize disease spread. Infected plant samples exhibiting the typical visible symptoms of the chronic stage including white, pencil-line streaks running parallel to the leaf veins with or without reddish necrotic lesions, partial or complete leaf chlorosis, inward curling with burnt leaf appearance (scalding), and side-shoot development on mature stalks with the scalded and/or white pencil-like leaf streaks were collected from various sugarcane fields. Bacterial isolation of *X. albilineans* from the collected diseased samples was done in Wilbrink's medium. Several four-week old susceptible VMC 84-524 seedlings were inoculated with bacterial suspensions of *X. albilineans*. Virulence and aggressiveness of 38 bacterial isolates was evaluated. Infected seedlings manifested symptoms varying from mild forms such as leaf chlorosis (7 isolates), white pencil-like streaks (9 isolates) to severe forms such as wilting of leaves and stalk discoloration (4 isolates). Earliest symptom expression was observed 15 days after inoculation. Isolates coded as *LS 1B* and *Cadiz side shoot* were observed to be the most aggressive and virulent, having infected VMC 84-524 seedlings by 15 days upon inoculation and manifesting stalk discoloration and wilting. Confirmatory testing was done through re-isolation of the causal bacterium and dot-blot immunoassay. Bacterial re-isolation from the infected inoculated seedlings appeared to have yellow, non-mucoid colonies typical of *X. albilineans*. Dot-blot immunoassay results of the bacterial re-isolates yielded positive reaction towards *X. albilineans*.





Serological and Molecular Detection, and Transmission of the Virus Causing Leaf Curl Disease in Tobacco (*Nicotiana tabacum* L.)

Ann Fatima Ariza Benjamin*

University of the Philippines Los Baños, Laguna, Philippines

benjaminannfatima@gmail.com

Filomena C. Sta. Cruz

University of the Philippines Los Baños, Laguna, Philippines

fcstacruz@ymail.com

In the Philippines, the leaf curl disease of tobacco has been identified based on the similarity of the symptoms with tobacco leaf curl and on the transmission of the virus by the whitefly (*Bemisi tabaci*) vector. This study aimed to identify the virus causing tobacco leaf curl observed in Claveria, Misamis Oriental and Los Baños, Laguna through serological and molecular detection, biological assay and virus transmission test. Leaf samples collected in tobacco plants from three locations in Claveria, Misamis Oriental were positive in PCR assay for begomovirus infection. The virus was detected by polymerase chain reaction (PCR) using three sets of begomovirus degenerate primers designed for the DNA-A component of the viral genome, namely TY1F/TY1R, PALv1978/PAR1c715 and PALv1978/PAR1c496 with amplicons of about 585 bp, 1500 bp and 400 bp in size, respectively. Two of 29 samples from Claveria reacted positively to Tobacco mosaic virus (TMV) infection in enzyme-linked immunosorbent assay (ELISA). However, these samples have negative reaction in bioassay for TMV and Cucumber mosaic virus (CMV) infection using the indicator plants, *Nicotiana tabacum* and *N. glutinosa*. Moreover, the virus was successfully transmitted by the whitefly vector using the isolates from Los Baños, Laguna. Thus, the virus causing tobacco leaf curl disease in Claveria, Misamis Oriental and Los Baños, Laguna is a *Begomovirus*.





Molecular Biotyping of *Vibrio vulnificus* Isolated from Diseases Brown-marbled grouper (*Epinephelus fuscoguttatus*)

Thararat Phurahong*

Kasetsart University, Bangkok, Thailand jane.thararat@gmail.com

Sasimanas Unajak

Kasetsart University, Bangkok, Thailand fscissmn@ku.ac.th

Vibriosis disease is one of a serious infectious disease in animals and human being caused by *Vibrio* spp. infection. This bacterium is a part of the natural flora of coastal marine environments worldwide. In Thailand, Vibriosis disease is major causes of death in fish in several areas of coastal fisheries area including brown-marbled grouper. The major bacterial species that caused disease is *Vibrio vulnificus* which is a Gram-negative, halophilic estuarine, rod shape bacterium that causes acute cell death and fatal septicemia. *V. vulnificus* are classified into 3 biotypes including biotype 1, which are majority of human infections, biotype 2, which are primarily eel pathogens, and biotype 3, which cause human wound infection. The objectives of this research are characterization of *V. vulnificus* isolated from diseases grouper, biotyping subtyping of *V. vulnificus* based on virulence genes and identify surface protein, and secreted protein of *V. vulnificus* by surfome and secretome analysis. First, 30 samples from 36 samples were identified as *V. vulnificus* based on 16s rRNA and classified as biotype 1 using BLASTN and phylogenetic tree analysis. Bacterial subtyping was identified by multiplex PCR of virulence genes demonstrated that those *V. vulnificus* can be divided into 8 groups. Candidate bacterial strain, VV106, VV218, VV303, VV423, VV513, VV619, VV720 and VV805, were used to study surface proteins and secreted proteins by proteomics analysis. The resulted from these studies will be importance in understanding the function of surface proteins and secreted proteins which are required for bacterial pathogenesis. Those proteins of *V. vulnificus* can be used to develop a vaccine for Vibriosis disease in fish.

Keywords: Vibriosis, *Vibrio vulnificus*, biotyping, virulence genes, multiplex PCR, proteomics analysis





Occurrence, Identification, Characterization and Pathogenicity of *Fusarium* spp. Associated with Pokkah Boeng Disease of Sugarcane in the Philippines

Manuela A. Samaco*

University of the Philippines Los Baños, Laguna, Philippines
masamaco@gmail.com

Rizalina L. Tiongco

University of the Philippines Los Baños, Laguna, Philippines
lynlawas.tiongco@gmail.com

Fe M. dela Cueva

University of the Philippines Los Baños, Laguna, Philippines
fmdcueva@yahoo.com

The increasing incidence of Pokkah Boeng, a disease that was reportedly caused by *Fusarium moniliforme*, has been observed among sugarcane cultivars throughout the sugarcane producing areas in the Philippines. In the past, the disease was regarded as a minor problem to the sugarcane industry, but due to changing environmental conditions such as hot and dry season followed by wet and highly humid season, and the presence of susceptible varieties, it can now be considered as a re-emerging disease. Infected plant samples from various sugarcane fields were collected from representative locations in Luzon, Visayas and Mindanao. These manifested symptoms which are characteristic to the disease such as rotting, malformation and distortion of apical shoot and stalk, chlorotic pattern towards the base of the leaves and wrinkling and twisting of leaves. A total of 81 *Fusarium* spp. were isolated from these diseased samples and were allowed to grow in potato dextrose agar (PDA) and water agar (WA) media. Morphological characteristics and differences among the fungal cultures were noted. Molecular confirmation of *Fusarium* spp. was done using ITS-Fu and FUS primers. All of the 81 isolates were positive to ITS-Fu primers, while 32 isolates were positive to FUS primers. Upon confirmation, detection of the most common *Fusarium* spp. that causes the disease was done using species-specific primers (VER 1/2 for *Fusarium verticilloides*; PRO 1/2 for *Fusarium proliferatum*; SUB 1/2 for *Fusarium subglutinans*; 53-6 F/R for *Fusarium moniliforme*). Based on molecular analysis, it was interestingly noted that the most common species is *F. proliferatum* (13 isolates), followed by *F. verticilloides* (5 isolates), contrary to the report that the causal organism of the disease is *F. moniliforme*, which can be accounted to the wider host range of *F. proliferatum*. Molecular fingerprinting using M13 was performed to determine the genetic diversity among the confirmed *Fusarium* spp. Generally, isolates collected within the same area were clustered together. Pathogenicity test of confirmed isolates showed typical symptoms on inoculated sugarcane seedlings of the susceptible VMC 86-550, 11 days after inoculation. The predominance of each species in sugarcane growing regions was also assessed.





Black holes in N=2 Supergravity in D=4

Jakkapat Seeyangnok

Kasetsart University, Bangkok, Thailand, joejakkapatphys@gmail.com

Parinya Karndumri*

Chulalongkorn University, Bangkok, Thailand, parinya.ka@hotmail.com

The purpose of this senior project is to study the combination of general relativity and supersymmetry. General relativity explains how gravity works by the idea of spacetime curvature. It is also used to visualize the evolution of the Universe. Quantum field theory alone cannot describe the whole story of elementary particles. Therefore it needs an additional theory, so called “supersymmetry”. The supersymmetry unifies three interactions, including strong, weak, and electromagnetic interactions. It is considered as a good candidate to explain the dark matter particles. Supersymmetry allows us to have superpartner for every elementary particle, e.g. gravitino for graviton. It is also an indispensable ingredient for superstring theory which is the best candidate of quantum theory of gravity. In this project, we are interested in studying “supergravity” which is an effective theory of superstring theory.

Instead of study supergravity from superstring theory, which is extremely complicated, we have studied directly by combining general relativity and supersymmetry as follow. Firstly, we add the kinetic energy term of the spin 3/2 gravitino called Rarita-Schwinger action, into Einstein-Hilbert action which describes the dynamics of spacetime of graviton with spin 2. Secondly, we apply supersymmetry to the calculations. To preserve the classical solution and Einstein’s field equations when we combine general relativity with supersymmetry, the important conditions is needed. The conditions can be found by studying superalgebra, i.e. the combination of the supertransformation, which relates bosons to fermions, and the spacetime transformation. Moreover, the structure of the superalgebra depends on the number of supersymmetry and spacetime dimensions. Although there are higher dimensions and other numbers of supersymmetry, we are interested only in four dimensional (D=4) super Poincare algebra with the smallest numbers of supersymmetry N=1 and N=2. On classical backgrounds, the variation of bosonic sector will automatically vanish, and the variation of fermionic sector will vanish if there is a consistent Killing spinor. Killing spinors are related to the geometry of spacetime as Killing vectors do. For N=2 supergravity in D=4, we have studied the Reissner-Nordstrom black hole solution.

We have proven that the extremal Reissner-Nordstrom black hole solution is the solution of the N=2 supergravity and in D=4, where N=2 represents the number of gravitini. Moreover, we have discussed the fundamental ideas of one of the vital applications of supergravity called the AdS/ CFT correspondence, i.e. Anti-DeSitter Space and Conformal Field Theory correspondence. It relates quantum field theory and gravity. This is a tool to investigate a strongly coupling interaction in the collider accelerator and superfluid state by using gravity theories. We have also shown that the extremal Reissner-Nordstrom black hole solution can be obtained from supergravity. Supergravity not only provides the classical solutions, it can also give new perspectives on the relation between quantum physics and general theory of relativity and a deeper understanding of the Universe.





Helium separation of monolayer C_2N membrane under uniform strain

Klichchupong Dabsamut
Kasetsart University, Bangkok, Thailand
klichchupong.d@ku.th

Adisak Boonchun*
Kasetsart University, Bangkok, Thailand
fsciasb@ku.ac.th

An efficient membrane for helium separation from natural gas is quite crucial for cryogenic industries. However, most experimentally available membranes fail in separating He from small molecules in natural gas, such as Ne, H_2 , O_2 , CO and N_2 . Using first-principles calculations, we calculated the energy barrier of gas molecules (Ne, H_2 , O_2 , CO, N_2) passing through the porous C_2N membrane. We found that He molecules have unexpectedly lowest energy barrier. The selectivity of He over Ne, H_2 , O_2 , CO, N_2 molecule is also calculated to reveal efficiency. Unfortunately, our result show that the C_2N membrane can serve as low selectivity for He/gases separation membrane. Furthermore, we study the selectivity as function of uniform strain. Under moderate symmetrical tensile strain, we found that the selectivity of gas molecule is lower as function of strain. That is the way we choose to manage the gases through the C_2N membrane. To compare with real device, pressures have been converted into strain by solving deformation of circular membrane under uniform pressure, commonly known Hencky's problem. In summary, we can separate He from the other gases at only low pressure owing to the limitation of maximum strain.





The study of structure and dynamics of water molecules in liquid phase using molecular dynamics method

Intuon Chatratin
Kasetsart University, Bangkok, Thailand
intuon.cha@ku.th

Chalernpol Kanchanawarin*
Kasetsart University, Bangkok, Thailand
fscicpk@ku.ac.th

Water is an essential part of life as it plays many crucial roles in cellular processes. For examples, water is the main solvent for biomolecules; such as proteins, DNA, and biomembranes, which act as the surrounding medium for these biomolecules to function as well as to diffuse through. Moreover, in bioenergetics, water molecules form hydrogen bonded networks which allow protons to be transferred and, as a result, ATP (adenosine-triphosphate) can be produced by the protein called “ATP synthase”.

The structure and dynamics of water molecules in liquid phase have been challenging topics for experimental and theoretical studies. Currently, we still do not clearly understand the molecular behaviours of water molecules in bulk liquid as well as in ionic solutions, and at interface regions. Many experimental and simulation evidence revealed that water molecules at the interface regions, for examples, water at water-biomembrane interface, or water confined in carbon-nanotubes, behave quite differently from those in the bulk. In order to understand how these water molecules behave in these complex systems, we have decided to get started by working with the simplest system, i.e. pure water in bulk liquid phase. Then, in the near future, we plan to investigate more complicated systems, such as, water in ionic solutions, water around proteins, and water around biomembranes.

In this work, we aim to study various structural and dynamical properties of water molecules in liquid phase by using molecular dynamics method. We simulated a system consisting of 233 water molecules for 1 ns at the temperature of 300 K and the pressure of 1 atm. Then we calculated the translational and rotational diffusion coefficients of these water molecules. They were found to be $2.7 \times 10^{-5} \text{ cm}^2/\text{s}$ and 1 rad/ps respectively. Moreover, the average number of hydrogen bonds per water molecule were found to be 2.1 hydrogen bonds per water molecule suggesting that these water molecules really formed a long-range 3-dimensional hydrogen bonded network. Moreover, we also computed the hydrogen bonding lifetimes and found that there were two (or more) hydrogen bonding lifetimes, i.e. 0.08, 0.25 and 0.6 ps. Our results agree well with those from previous experimental and simulation studies. The understanding of how these water molecules behave in bulk liquid would help us understand more about how water molecules behave in more complicated systems. Then, in the future we might be able to use these environment-dependent behaviours of water molecules to understand the structure and functions of biomolecules such as proteins, biomembranes and DNA.





Thai Sign Language Website

Pinpuk Phaison
Kasetsart University, Bangkok, Thailand
pinpuk.p@hotmail.com

Usa Sammapun*
Kasetsart University, Bangkok, Thailand
fsciusa@ku.ac.th

At present, there are many deaf persons in Thailand, but the limitations of communication between normal persons and deaf persons or communication among deaf persons themselves still remain. Because the Thai sign language is only known among some deaf persons and it is hard to find the knowledge about Thai sign language from instructional media in Thailand. For example, when learning from a sign language book, a deaf person will not be able to learn how to use muscle and mouth movements to talk correctly because it is hard to follow images in the book. In order to provide many of the benefits in communication with deaf persons and to support the study of Thai sign language, this project thus study, design and develop a Thai sign language website. The website contains many videos of Thai sign words instead of images and displays important information about Thai sign words.

The website is developed with Laravel 5 framework using HTML5, PHP, JavaScript and MySQL. It consists of 2 parts. The first part is back-end for an administrator to insert, edit and delete the information of Thai sign words in this website. Another part is front-end for a user who wants to learn Thai sign language. A user can learn many Thai sign words by searching via categories or sentence and using search functions to find a word or sentence as needed. A user can select search by word or by sentence. If a user searches by sentence, the website will use the “WordCut” JavaScript program to cut a sentence into single words and find the information of each single word to display on the result page.





Finite Volume Method for Shallow Water Equations Using Wet-Dry Cells Detecting Technique

Thanet Markchom
Kasetsart University, Bangkok, Thailand
b5510400048@ku.ac.th

Montri Maleewong *
Kasetsart University, Bangkok, Thailand
Montri.M@ku.ac.th

A finite volume method is widely used to solve shallow water equations in various problems such as simulating flooding or dam-break problem. In general, this method takes a lot of computational time to calculate a new value for the whole domain in every time step. However, some cells in the domain are not necessary to compute, so the wet-dry cells detecting technique was developed to decrease the computational time for simulating the problem. The idea of this technique is to detect and collect the index of wet cells and their neighbors for calculating these cells in each time step so that the computational time will be reduced from neglecting unnecessary computed cells. It is found that the finite volume method with the present technique can reduce the computational time when comparing with the original method. The complexity of our algorithm is depended only wet and wet-dry cells, not the whole cells.

Keywords: finite volume method, shallow water equations, dam-break problem





Fourier Spectral Methods for Solving The Korteweg-De Vires Equation

Teeradech Laisupannawong

Department of Mathematics, Faculty of Science, Kasetsart University,
Bangkok, Thailand
b5510400056@ku.ac.th

Montri Maleewong*

Department of Mathematics, Faculty of Science, Kasetsart University,
Bangkok, Thailand
Montri.M@ku.ac.th

The Korteweg –de Vires equation (KdV equation) is a model for shallow water waves which is nonlinear partial differential equation. In this work, we study about solving the equation using analytical approach and numerical method using the Fourier spectral methods (FSM) with and without integrating factor. Then we use FSM to solve forced KdV equation which is a model for free surface flow over an obstacle. However, FSM can be applied only for periodic condition. When a solution wave reaches a boundary of the domain, the wave appears in the another boundary and the solution wave perturbs the solution in the computational domain. To solve this difficulty, we use a buffer zone to absorb the unexpected wave solution before it reaches the boundary. The results show that this approach can absorb the solution wave in some particular cases.

Keywords: KdV equation, Fourier spectral methods, buffer zone





The values of $\left\lfloor \left(1 - \prod_{k=n}^{\infty} \left(1 - \frac{1}{F_k}\right)\right)^{-1} \right\rfloor$ and $\left\lfloor \left(1 - \prod_{k=n}^{\infty} \left(1 - \frac{1}{T_k}\right)\right)^{-1} \right\rfloor$

Chanokchon Onsri
 Department of Mathematics, Faculty of Science, Kasetsart University,
 Bangkok, Thailand.
 cnc_5689@hotmail.com

Kantaphon Kuhapatanakul*
 Department of Mathematics, Faculty of Science, Kasetsart University,
 Bangkok, Thailand.
 fscikpkk@ku.ac.th

The sequences of Fibonacci $\{F_n\}_{n=0}^{\infty}$ and tribonacci numbers $\{T_n\}_{n=0}^{\infty}$ are defined, respectively, by

$$F_0 = 0, F_1 = 1 \quad \text{and} \quad F_{n+1} = F_n + F_{n-1}$$

$$T_0 = 0, T_1 = T_2 = 1 \quad \text{and} \quad T_{n+1} = T_n + T_{n-1} + T_{n-2}.$$

In 2009, Ohtsuka and Nakamura [1] have found the formula for the integer part of $\left(\sum_{k=n}^{\infty} \frac{1}{F_k}\right)^{-1}$. In 2011, Komatsu [2] gave the formula for the nearest integer of $\left(\sum_{k=n}^{\infty} \frac{1}{T_k}\right)^{-1}$. Recently, Anantakitpaisal and Kuhapatanakul [3] gave a similar result of Komatsu for the integer part of $\left(\sum_{k=n}^{\infty} \frac{1}{T_k}\right)^{-1}$.

Naturally, a question arise: are there the similar formulas for the infinite products of the Fibonacci and tribonacci numbers? In this note, we derive the solution of

$$\left\lfloor \left(1 - \prod_{k=n}^{\infty} \left(1 - \frac{1}{F_k}\right)\right)^{-1} \right\rfloor \quad \text{and} \quad \left\lfloor \left(1 - \prod_{k=n}^{\infty} \left(1 - \frac{1}{T_k}\right)\right)^{-1} \right\rfloor.$$

References

- [1] H. Ohtsuka and S. Nakamura, On the sum of reciprocal Fibonacci numbers, *Fibonacci Quart.* 46/47 (2008/2009), 153-159
- [2] T. Komatsu, On the sum of reciprocal tribonacci numbers, *Ars. Comb.* 98 (2011), 477-459.
- [3] P. Anantakitpaisal and K. Kuhapatanakul, Reciprocal Sums of the Tribonacci Numbers, *J. Integer Seq.*, 19(2016), Article 16.2.1





The Recurrence Formula of the Partition Function

Jintana Thansawangdamrong

Department of Mathematics, Faculty of Science, Kasetsart University,
Bangkok, Thailand.

b5510402130@ku.ac.th

Teerapat Srichan*

Department of Mathematics, Faculty of Science, Kasetsart University,
Bangkok, Thailand.

We study the recurrence formula of the partition function and find the explicit formula of the partition function. Moreover, we also show the fast method to compute some related partition functions.





The Riemann zeta-function and the ergodic transformations

Somchai Chanti

Department of Mathematics, Faculty of Science, Kasetsart University,
Bangkok, Thailand.

b5510402245@ku.ac.th

Teerapat Srichan*

Department of Mathematics, Faculty of Science, Kasetsart University,
Bangkok, Thailand.

We study the properties of the Riemann zeta-function from a probabilistic point of view. We obtain the results; that the value of the zeta-function are small on average.





A problem obtained from integer derivative

Suwitcha Bunrit

Department of Mathematics, Faculty of Science, Kasetsart University,
Bangkok, Thailand.

b5510402261@ku.ac.th

Watcharapon Pimsert

Department of Mathematics, Faculty of Science, Kasetsart University,
Bangkok, Thailand.

fsciwcrp@ku.ac.th

We study the derivative of an integer to be the map sending every prime to 1, which is satisfying the Leibnitz rule and consider the solutions of the differential equation of the form

$$n' = an.$$

Moreover, we also define a new derivative according to prime type and the consequences are investigated.

2010 Mathematics Subject Classification: 11A41, 11A51, 34A99

Keywords: Arithmetic derivative, prime numbers, Leibnitz rule.





Curcumin encapsulation by chitosan-cyclodextrin polymer nanoparticle

Apipol Penkitti

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
b5510402547@ku.ac.th

Thitinun Karpkird*

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscitnm@ku.ac.th

Encapsulation of curcumin with chitosan (CS)-cyclodextrin-citric acid polymer (pbCD) has been prepared in this work. The complexation of curcumin-pbCD has been prepared first and characterized by UV-Vis spectroscopy, $^1\text{H-NMR}$ and infrared spectroscopy (IR). $^1\text{H-NMR}$ showed the aromatic moiety of curcumin in pbCD complex around 7.34-7.53 ppm which confirmed the inclusion complex formation. IR spectrum showed the broad signals from the aromatic moieties of curcumin at 1,407 and 1,630 cm^{-1} carbonyl of citric acid at 1,737 cm^{-1} . The percent yield of curcumin-pbCD was 93.38%. The maximum absorption (λ_{max}) of complex was 431.0 nm in ethylene glycol solvent. The amount of curcumin in pbCD complex was 0.69%w/w. Curcumin-pbCD was encapsulated with chitosan into water dispersible submicron sized CS-pbCD shaperes characterized by using scanning electron microscopy (SEM). The control release and bioactivities of curcumin will be further studied.





Application of porous silicon as a drug carrier material

Kanlaya Singkaew

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
b5510402270@ku.ac.th

Junya Jettanasen*

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscijyk@ku.ac.th

In this research, silicon nanoparticles were designed as drug carriers for curcumin, the promising anticancer drug. Using silicon wafer as starting materials, nanostructured porous silicon (PSi) thin films could be generated by the electrochemical etching with constant current density of 157 mA/cm^2 . The resulted layers had the porosity maximum of 95%. Then, the porous layers were grinded down to nanometer-size particles. The surface of the native nanostructured PSi particles was chemically modified by grafting allylamine via hydrosilylation. The objective of this study is to evaluate the efficiency between freshly-etched and amine-functionalized silicon nanoparticles to use as drug carriers. Curcumin was loaded into silicon nanoparticles by dissolving in ethanol for 2 hours. The release behavior of curcumin was investigated in 4 chosen media i.e., ethanol, H_2O , Phosphate Buffer Saline pH 7.4 and pH 8.0 (a buffer solution that matched ionic concentration of the human body), and this spanned over a period of 24 hours. The amount of loaded and released drug was observed by UV-Vis Spectroscopy. It was found that amine-capped silicon nanoparticles were capable of loading curcumin much more than that of freshly-etched ones by 7.2%. However, the release profiles of both native and surface-functionalized silicon nanoparticles were hardly traceable due to the very few amount of curcumin released in any media.





Synthesis of novel biphenolic derivatives as sensors for anion detection

Manassiri Pensirikul

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand,
b5510402466@ku.ac.th

Boontana Wannalarse*

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand,
fscibnw@ku.ac.th

1,1'-biphenyl-2-yl-5-(dimethylamino)naphthalene-1-sulfonate (L_1) and 1,1'-biphenyl-2,2'-diylbis(5-(dimethylamino)naphthalene-1-sulfonate) (L_2) have been successfully synthesized in one step. Both sensors were characterized by ^1H NMR, ^{13}C NMR, ESI-MS and Elemental analysis. Upon addition of F^- ion, the OH proton of sensor L_1 , disappeared due to deprotonation process. The aromatic protons of sensors (L_1 and L_2) moved to upfield shift because of enhancement of electron density. From fluorescence titration, the fluorescence emission of sensor L_1 (at 217 nm) and sensor L_2 (at 230 nm) were obviously quenched when adding of F^- ion. These results took place through the reverse PET process. The F^- ion also induced color changes in solutions of L_1 and L_2 from yellow to colorless under UV light 365 nm. The 1:1 complexes between sensors (L_1 and L_2) and F^- ion were evaluated by Job's method. The sensors L_1 and L_2 have much more selectivity and sensitivity toward F^- ion over other anions.





Effect of Copper Promoted Silica Supported Cobalt Catalysts on Methanol Selectivity in Fischer-Tropsch Synthesis

Napat Kanokpornwasin

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
boat_napat_kanok@hotmail.com

Pinsuda Viravathana*

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscipdv@.ku.ac.th

Copper-promoted cobalt catalysts supported on Aeroperl300/30 were studied for Fischer-Tropsch synthesis (FTS). All catalysts were prepared by the incipient-wetness impregnation method with the mass ratio (Cu: Co: Aeroperl300/30) of 0, 5, 20: 20: 100. X-ray diffraction (XRD) and X-ray absorption spectroscopy (XAS) were used to examine the phase and oxidation state of the catalysts. Their catalytic activity on FTS was studied in a fixed bed reactor with the H₂:CO volume ratio of 2:1 at 190°C and 10 bar. The products of FTS were analyzed by gas chromatograph (GC) in terms of C₁, C₂-C₄, C₅-C₁₂, C₁₃₊, and methanol selectivity.





Synthesis of trimetal oxide catalysts for catalytic transfer hydrogenation of methyl levulinate

Natthida Choungchai

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
b5510402334@ku.ac.th

Sanchai Kuboon

National Nanotechnology Center, National Science and Technology Development Agency, Thailand Science Park, Pathumthani, Thailand
sanchai@nanotec.or.th

Patraporn Luksirikul*

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
patraporn.l@ku.ac.th

High consumption of fossil fuels has stimulated global effort to explore alternative resources for sustainable production of chemicals and fuels. We propose the synthesis of “gamma-valerolactone” or “GVL” which can be used as a chemical platform for the production of fuels and valued-added chemicals. The GVL was synthesized via catalytic transfer hydrogenation (CTH) of methyl levulinate (ML), a biomass-derived chemical. Many mono, and bimetal nanocatalysts were reported as effective catalysts for various hydrogenation processes; however, there was no report of trimetal oxide catalysts in GVL production.¹⁻³ Therefore, the objectives of this work are mainly described with two parts: (1) The synthesis and characterization of trimetal oxide catalysts based on the use of transition metals such as Cr, Cu, Ni, Fe, and Co. Then, catalysts are performed in CTH of ML to GVL. Our metal catalysts are attractive in the term of finding the economical use rather than the use of expensive noble metal. (2) The evaluation of suitable reaction conditions for CTH of ML to GVL. The trimetal catalysts are developed using solid solution method. The solution mixture of three types metal salts were heated at 200 °C for 2h and subjected to be calcined under air atmosphere at 700 °C for 5h. The obtained catalysts are characterized and confirmed by the combination techniques such as X-ray Diffraction (XRD), Scanning Electron Microscopy (SEM) and Energy Dispersive Spectroscopy (EDS). It is shown that our obtained catalysts are successfully prepared in forms of spinel and oxide of trimetal. To investigate their catalytic performance, the catalysts are employed in GVL production via catalytic transfer hydrogenation of ML to GVL. It is found that the catalytic performance of CTH of ML to GVL is highest at 89% yield, and 99.7% conversion from the CuCoCr trimetal oxide catalysts. The optimized reaction condition to achieve high GVL production yield is found by the use of 0.5 g of catalysts at 220°C for 3 h with using 2-propanol as a solvent. It is hoped that the new catalysts could be used in the CTH of ML to GVL and may facilitate the other application of hydrogenation reactions.

References:

1. Alonso, D.M., Wettstein, S.G., Dumesic, J.M. *Chem. Soc. Rev.* **2012**, *41*, 8075-8098.
2. Deuss, P.J., Barta, K., de Vries, J. G. *Catal. Sci. Technol.* **2014**, *4*, 1174-1196.
3. Climent, M.J., Corma, A., Iborra, S., *Green Chem.* **2014**, *16*, 516-547.





The Development of Metal Oxide Catalysts Supported Alumina for Production of Biofuel via Deoxygenation Reaction of Fatty Acid under Inert Atmosphere

Navapat Krobkrong
Kasetsart University, Bangkok 10900, Thailand
Navapat.k@hotmail.com

Pipat Khongpracha*
Kasetsart University, Bangkok 10900, Thailand
Pipat.k@ku.ac.th

Deoxygenation of vegetable oil is the one of important reaction as high efficient production of renewable diesel, called Bio-hydrogenated diesel (BHD). Moreover, metal oxide catalysts for this reaction was attractive because of non-toxicity to living things and the environment. Therefore, we focuses on Ni-Mo bimetallic oxide catalysts over alumina supported for deoxygenation of oleic acid to find the optimal condition. Molybdenum oxide catalysts with various metal doping (Ni, Co and Cu) and metal loadings (27–34 wt.%) were carried out in a batch reactor in temperature range from 300 to 350°C and different pressure between 10 and 40 bar in pure H₂ and N₂. All catalysts were prepared by incipient witness impregnation method and characterized by XRD, H₂-TPR, ICP-OES, SEM-EDX, BET and N₂ adsorption-desorption technique. The reaction tests revealed that the catalysts exhibited high conversion with mostly 90% in NiMo/Al₂O₃. The contribution of decarbonylation (HCO) or decarboxylation (DCO₂) increases with increasing of pressure, temperature and time in pure N₂. Moreover, saturated hydrocarbons and stearic acid was also observed indicating that dehydrogenation and hydrogenation must occur during reaction. Hydrogenation was deeply investigated using DFT method with Ethane as a model compound. It showed both MoO₃ and NiMoO₄ phase in NiMo/Al₂O₃ could induce this reaction through absorption of H atom on (010) plane. However, trace unsaturated hydrocarbons in liquid products indicated that H₂ that generated from dehydrogenation didn't have enough for hydrodeoxygenation (HDO) pathway.





Electrochemical study of electrodeposited Pt-Sn electrodes for ethanol oxidation

Nitcha Nilapun

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
b5510402351@ku.ac.th

Wilai Siriwatcharapiboon*

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
fsciwls@ku.ac.th

Due to the increasing in environment pollution and the limitation of fossil fuel, fuel cells have been studied extensively for clean and sustainable energy sources. Direct ethanol fuel cells (DEFCs) are devices that can convert the chemical energy stored in ethanol molecules into electrical work. Ethanol is regarded as being attractive since it is easy to be stored compared to hydrogen gas and is less toxic than methanol. However, the key to improve an efficiency of DEFC is to find an appropriate catalyst for an ethanol oxidation at the anode. It is reported that Pt-Sn is the most promising catalyst for the ethanol oxidation in an acid environment. In this present work, Pt-Sn electrodes are prepared by an electrodeposition of Sn on Pt polycrystalline electrodes. The electrocatalytic activities of Pt-Sn electrodes towards oxidation of ethanol in acidic media are investigated by means of cyclic voltammetry. The concentration of ethanol, upper potential of cyclic voltammogram and potential scan rate are varied in order to investigate the effect of these factors on the electrocatalytic activity of the electrodes. Sn coverage on the Pt electrodes and an active surface area of the electrodes are investigated by electrochemical characterisation.





Synthesis and photophysical properties of a copper binuclear complex of tetradentate Schiff base ligands and its DFT study

Nichakan Miengmern

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
b5510402342@ku.ac.th

Songwut Suramitr *

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
fsciswsm@ku.ac.th

Two dinuclear copper(II) complexes, Cu(II)L1 and Cu(II)L2 (where L1 = N,N'-bis(2-pyridinecarboxaldehyde)-para-phenylenediamine and L2 = N,N'-bis(2-salicylidene)-para-phenylenediamine) have been synthesized and structurally characterized. The molecular structures and spectroscopic properties of the ligands and its complex were experimentally characterized by elemental analysis, FT-IR, NMR, UV-Visible and fluorescent spectroscopic techniques and computationally by the density functional theory (DFT) method. The calculated results show that the optimized geometry can well reproduce the structural parameters, and the theoretical vibrational frequencies are in good agreement with the experimental values. These sites give information about the region from where the compound can undergo non-covalent interactions. Natural bond orbital analysis indicates strong intramolecular interactions. On calculation of the electronic absorption spectra, TD-DFT calculations were carried out in solution phase. The energetic behavior of the ligands has been examined in solvent media using the CAM-B3LYP method with the 6-311G(d,p) basis sets. The results obtained by the theoretical are in reasonable agreement with the experimental values.





Synthesis of Amino Nucleosides via Sharpless Amino Hydroxylation Reaction

Norrachon Sakaret

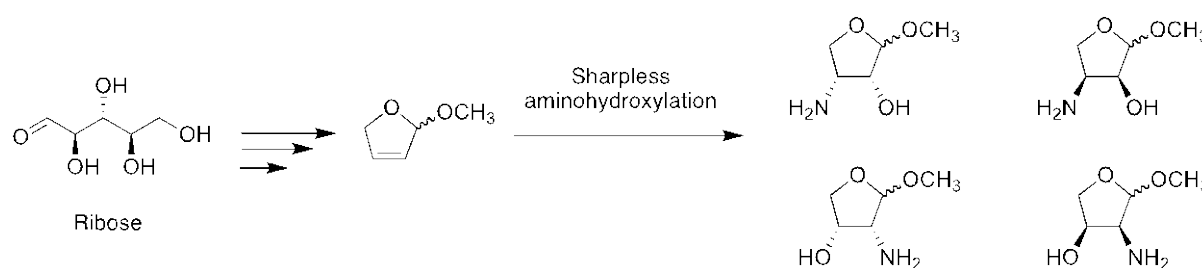
Department of Chemistry and Center of Excellence for Innovation in Chemistry,
Faculty of Science, and Special Research Unit for Advanced Magnetic Resonance
(AMR), Kasetsart University, Bangkok, Thailand

Pitak Chuawong*

Department of Chemistry and Center of Excellence for Innovation in Chemistry,
Faculty of Science, and Special Research Unit for Advanced Magnetic Resonance
(AMR), Kasetsart University, Bangkok, Thailand

Pitak.C@ku.ac.th

Amino nucleosides are commonly found in bioactive natural products such as puromycin. The objective of this project is to synthesize amino nucleosides using the Sharpless amino hydroxylation as the key reaction. Various methods were reported for the replacement of the 3'-hydroxyl group of the ribose moiety to an amino group, for example, the introduction of a nitrogen nucleophile such as azido group followed by catalytic hydrogenation to convert the azido moiety to an amino group. However, this strategy requires a series of protection/deprotection as well as the activation of alcohol. The Sharpless amino hydroxylation enables the installation of hydroxyl and amino groups on a furan ring in one step. Therefore, it would be beneficial if the Sharpless aminohydroxylation can be applied to the preparation of amino nucleosides. Our plan is to prepare amino nucleoside using ribose as a starting material. The methyl glycoside of D-ribose (a mixture of α and β forms) was prepared in good yield. The 5'-hydroxyl group of the resulting glycosides was protected using TBDMSCl. Then, the protected glycoside will be subjected to thiocarbonyl formation, followed by the elimination reaction to provide an alkene intermediate. Subsequently, various conditions for the Sharpless aminohydroxylation will be attempted. The synthetic details, as well as the spectroscopic characterization of riboglycoside intermediates, will be presented.



Selected references:

- 1) Gao L.; Hollingsworth R.I. *J. Org. Chem.* **2005**, 70(22), 9013.
- 2) Sharpless, K. B.; Patrick, D. W.; Truesdale, L. K.; Biller, S. A. *J. Am. Chem. Soc.* **1975**, 97, 2305.





Applications of Metal-Organic Framework

Onpailin Chantaphoom

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
b5510402555@ku.ac.th

Tanwawan Duangthongyou*

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscitwd@ku.ac.th

The design materials based on O_2 sensing is a key of this research. The encapsulation functional guest in the porous MOF is the strategy to produced materials for investigation of sensing dissolved O_2 in water. Anionic Bio-MOF1, $(Zn_8(ad)_4(BPDC)_6O.2Me_2NH_2,8H_2O)$ was a substrate in the synthesis O_2 sensor. Bio-MOF1 was prepared as a host and Zn-(8-hydroxyquinoline) $_2$ (ZnQ $_2$) high fluorescent material was chosen for the functional guest.. Grinding process are the strategy to archieve encapsulated compound, ZnQ $_2$ @MOF. The structure was characterized by powder XRD , IR spectroscopy and uv-vis spectrophotometer. Thin film of produced material was prepared for dissolved O_2 in water by fluorescent technique.





Synthesis of Peptide-conjugated Dendrimers to Target Cancer Cells

Pongtai Chaiputtanapun

Faculty of Science, Kasetsart University, Bangkok, Thailand
b5510400226@ku.ac.th

Witcha Imaram *

Department of Chemistry and Center of Excellence for Innovation in Chemistry,
Faculty of Science, Kasetsart University, Bangkok, Thailand
witcha.i@ku.ac.th

Leukemia is a group of cancers caused by production of abnormal blood cells in the bone marrow. Common symptoms of leukemia are bleeding and bruising, pain in the bones or joints, fever and increased risk of infections. Leukemia can be found in both men and women and it is the most common cancer in children younger than 15 years. In chemotherapy, many drug carriers have been used to improve the delivery and the effectiveness of drugs. One of the most studied drug carriers is dendrimers because of their interesting characteristics such as monodispersity, water solubility, encapsulation ability, and large number of surface groups that enhances both the uptake and retention of compounds within cancer cells.

Chemokine receptor CXCR4 on the surface of the cancer cells is a key that causes spread of cancer cells to target tissues that release CXCL12 because it can act as a ligand for CXCR4 receptor, If CXCR4 receptor is blocked by another ligand, the spread of cancer cells will be decreased. Linear FC131 peptide can be use for that purpose by conjugating them with $-NH_2$ group of the partially acetylated PAMAM.

Herein, we report the synthesis of peptide-conjugated dendrimers to target chemokine receptor CXCR4. The amino groups at the surface of PAMAM dendrimers generation 4 (G4) or generation 5 (G5), which contain 64 and 128 surface $-NH_2$ groups, respectively, were partially neutralized by acetylation to prevent nonspecific targeting interactions during delivery. Then, the obtained acetylated dendrimers were conjugated with FITC that acts as a fluorescence tag to study the interaction between CXCR4 receptor and linear FC131 peptide. The remaining nonacetylated primary amino groups were used for conjugation with linear FC131 peptide. The number of primary amino groups and acetyl groups were determined by potentiometric titration and 1H NMR calibration, respectively. The average molecular weight of the obtained peptide-conjugated dendrimers is characterized by gel permeation chromatography.





Toward the synthesis of anti-cancer and anti-malarial quinazolinone

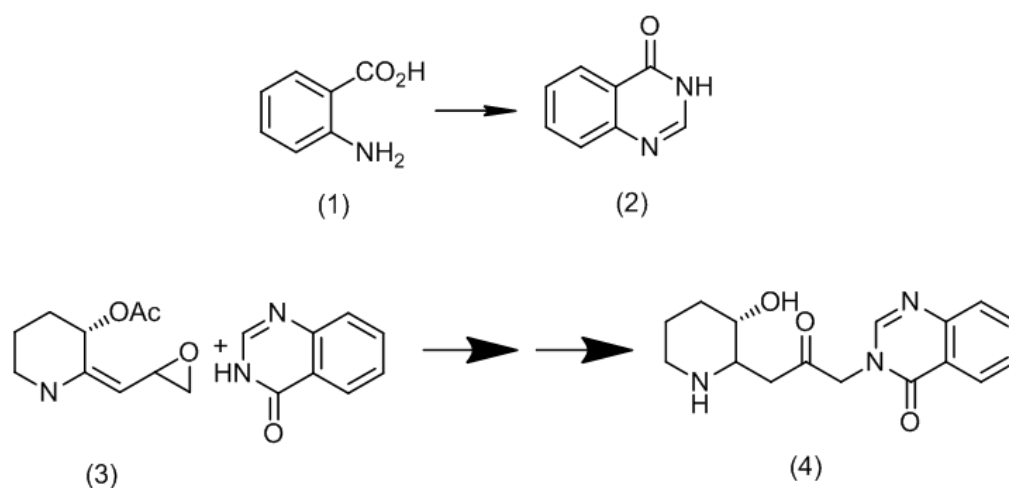
Ponlasak Tamsampaoloet

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
b5510402431@ku.ac.th

Boonsong Kongkathip*

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscibsk@ku.ac.th

Quinazolinone derivative is one of the most famous biologically active compounds, such as anti-cancer and anti-malarial etc. When quinazolinone has the other substitution on the benzene ring as a reactant, it will give the different biological activities. From this information we will synthesis quinazolinone (2) and febrifugine (4) which have anti-cancer and anti-malarial activities, respectively from D-glucose. The quinazolin-4(H)-one (2) will be prepared from the reaction of 2-aminobenzoic acid (1) with formamide and febrifugine will be synthesized from condensation of quinazolin-4(H)-one and peperidine epoxide (3).



Reference

- [1] Kapil J.; Jennifer G.; Micheal W. *Bioorg. Med. Chem.* **2013**, *21*, 7858-7873
- [2] Hui L., Shengjie Y., Qi Z., Hongmei X. *Med Chem Res.* **2014**, *23*, 2584-2595
- [3] Mahendra P. B., S.M.Shata K., Md.Salahuddin. *Int. J. Pharm. Sci. Lett.* **2014**, *5*, 454-458





An approach to develop a facile electrochemical sensor for caffeine by surface modified glassy carbon, and halloysite incorporated graphite electrodes

Preeyanoot Thomuen
Department of Chemistry, Faculty of Science, Kasetsart University,
Bangkok, Thailand,
preeyanoott@gmail.com

Chaiya Prasittichai*
Department of Chemistry, Faculty of Science, Kasetsart University,
Bangkok, Thailand,
fscicyp@ku.ac.th

Caffeine is a nervous system stimulant widely found in several beverages. Numerous methods have been presented to quantify the amount of caffeine in samples but they mostly require complicated or expensive instruments. This project aims for developing a facile electrochemical sensor for caffeine detection using glassy carbon electrode (GCE) and nanotube halloysite incorporated graphite electrode (HGE). Both electrodes were also surface modified with proton conductors to improve the conductivity. Nafion solution was coated on GCE while sulfonic acid was used to decorate the inner surface of halloysite nanotube on HGE. It was found that both modified electrodes yield much better sensitivity for caffeine detection. Interference from some commonly compounds found in the beverages was tested and was found that none of them impeded the caffeine detection. The results were also compared with traditional caffeine detection methods and were found no significantly differences. Finally, the developed procedure will be applied to determine the caffeine amount in commercial beverages.





Target identification of the compounds from *Centella asiatica* (L.) Urb. as inhibitors of Lipoxygenase by using molecular modeling

Supak Pattaweepaiboon

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand.
b5510402521@ku.ac.th

Nuttapon Wiriyanakorn

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand.

Patchreenart Saparpakorn*

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand.
fscipnsk@ku.ac.th

Target identification of the extraction from *Centella asiatica* (L.) Urb. as inhibitors of Lipoxygenase(LOX), which is a cause of inflammation in humans, was studied by using molecular modeling. Binding interactions between extracted compounds and the human LOX proteins were studied via molecular docking with GOLD program using Goldscore, Chemscore, ChemPLP and ASP as scoring functions. The results showed that only scoring values of asiaticoside and madecassoside in the binding site of 5-LOX are higher than those of arachidonic acid, LOX substrate. Thus, asiaticoside and madecassoside could be the inhibitors of 5-LOX. Moreover, the binding energies of arachidonic acid, asiaticoside and madecassoside calculated by quantum chemical calculations showed -119.94, -82.17 and -34.25 kcal/mol respectively. The results of interaction energy also indicated that arachidonic acid, asiaticoside and madecassoside formed an important H-bond interaction to Lys409 with the interaction energies of -20.03, -12.38 and -4.72 kcal/mol respectively. We proposed that asiaticoside and madecassoside could be possible to inhibit 5-LOX. However, asiaticoside and madecassoside activities against 5-LOX might be lower than that of arachidonic acid.





Preparation Ce-substituted in perovskite $\text{La}_{1-x}\text{Ce}_x\text{CoO}_3$ ($x=0-0.20$) for hydrogen production from water

Suphannipha Thara

Kasetsart University, Bangkok, Thailand. b5510402512@ku.ac.th

Wasuwat Prakhongsi

Kasetsart University, Bangkok, Thailand. kao.guard@gmail.com

Sanchai Kuboon

Nanomaterials for Energy and Catalysis Laboratory, National Nanotechnology Center (NANOTEC), National Science and Technology Development Agency (NSTDA), Thailand.

sanchai@nanotec.or.th

Sutasinee Kityakarn*

Kasetsart University, Bangkok, Thailand. fscistsn@ku.ac.th

Renewable energy is the attractive issue to solve the energy resource crisis. Hydrogen gas is a non-pollution, clean and high performance of fuel production. It is the alternative energy source due to the reactant for the fuel production such as for the Fischer-Tropsch synthesis and also the reactant for chemical production under hydrogenation. Photocatalysts like metal oxides or mixed metal oxides are used to produce the hydrogen from water. Perovskites, ABO_3 , are the mixed metal oxides showing the flexible structure and easy to improve their properties can be through the compensation of the metal oxidation state. The designed perovskite structure shows the enhanced photocatalytic properties owing to the valency and vacancy controls. The changes in the band gap energy of perovskites could suppress the recombination of generated electron-hole pairs. Therefore, we have interested to prepare and characterize the Ce-substituted in perovskite $\text{La}_{1-x}\text{Ce}_x\text{CoO}_3$ ($x=0-0.20$) by sol-gel method. The photocatalytic performance is evaluated by hydrogen evaluation from water.

This study focuses on preparation and evaluation of catalytic performance of $\text{La}_{1-x}\text{Ce}_x\text{CoO}_3$ ($x = 0-0.20$) perovskite photocatalysts for hydrogen production from water. The $\text{La}_{1-x}\text{Ce}_x\text{CoO}_3$ perovskites were prepared using the Pechini method. FT-IR, XRD, SEM, and UV-Vis techniques were employed to characterize the structure and evaluate the photocatalytic activity. FT-IR spectrum of the pre-calcined perovskites showed the absorption bands due to the vibration of OH (3402 cm^{-1}), C=O ($1714-1594\text{ cm}^{-1}$), C-O ($1180-1080\text{ cm}^{-1}$), and M-O (590 cm^{-1}), while those of the calcined perovskites showed only the M-O vibration, indicating the esterification of metal citrate and ethylene glycol, and the complete oxidation. XRD patterns of the $\text{La}_{1-x}\text{Ce}_x\text{CoO}_3$ (as calcined) showed rhombohedral crystallite (JCPDS card No. 48-0123) with small amount of CeO_2 and Co_3O_4 at the high molar ratio of cerium doped perovskites and showed crystallite size in the range of 16.4 -25.5 nm, where the crystallite size decreased with increasing the amount of cerium. SEM images of $\text{La}_{1-x}\text{Ce}_x\text{CoO}_3$ showed the constituting particles agglomerated to form flakes when increasing the amount of cerium. The TPR profiles showed two reduction peaks which are associated to Co^{3+} to Co^{2+} at $500\text{ }^\circ\text{C}$ and Co^{2+} to Co^0 at $664\text{ }^\circ\text{C}$. The band gaps of the perovskites were found in the range of 2.40-2.60 eV. The photocatalytic performance of $\text{La}_{1-x}\text{Ce}_x\text{CoO}_3$ for hydrogen production from water was evaluated.





Searching for novel bioactive compounds produced by the fungus *Menisporopsis theobromae* BCC 4162

Thanyaporn Tengsuttivat*

Department of Chemistry, Faculty of Science, Kasetsart University,
Bangkok, Thailand
b5510400072@ku.ac.th

Pakorn Wattana-Amorn

Department of Chemistry, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fscipwa@ku.ac.th

Menisporopsis theobromae BCC 4162 is a seed fungus producing bioactive compounds, menisporopsin A and menisporopsin B. These compounds exhibit a wide range of biological activities such as antimycobacterial, cytotoxicity and antimalarial activities¹. As micro-organisms are a source of invaluable secondary metabolites, this makes us believe that there are more bioactive compounds producing from *M. theobromae* BCC 4162. In this work, menisporopsin A, menisporopsin B, and also their hydrolyzed product were isolated from the ethyl acetate extract using Sephadex LH-20 column chromatography and high performance liquid chromatography (HPLC). These purified secondary metabolites were structurally analyzed using nuclear magnetic resonance spectroscopy (NMR) and mass spectrometry (MS). Furthermore, three types of media were used to screen for production of novel metabolites produced by *M. theobromae* BCC 4162. They are czapex yeast autolysate (CYA), corn meal and yeast extract sucrose (YES). The metabolites produced by these media were analyzed using both thin layer chromatography (TLC) and HPLC. The promising result is from YES medium providing us new metabolic profiles on both TLC and HPLC. Therefore, YES medium was used to culture the fungus *M. theobromae* BCC 4162. The novel compounds were clearly detected on TLC under long-wave UV light (366 nm). These compounds will be further purified and elucidated for their structures using NMR and MS. Moreover, these compounds will be tested for their biological activities.

Reference

- 1 Chinworrungsee, Maneekarn, Prasat Kittakoop, Masahiko Isaka, Pacharee Maithip, Sumalee Supothina, and Yodhathai Thebtaranonth, 'Isolation and Structure Elucidation of a Novel Antimalarial Macrocyclic Polylactone, Menisporopsin A, from the Fungus *Menisporopsis Theobromae*', *Journal of Natural Products*, 67 (2004), 689–92





Synthesis and Characterization of Titanium Complex supported by Salicylbenzothiazole Ligands for the Ring-Opening Polymerization of *rac*-Lactide

Thanyathip Thongsutjaritphan

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
pangrum_happy@hotmail.com

Pimpa Hormnirun*

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscipph@ku.ac.th

A series of titanium complexes supported by salicylbenzothiazole ligands (**1–4**) were prepared from the reaction of one equivalent of titanium isopropoxide ($\text{Ti}(\text{O}^i\text{Pr})_4$) and two equivalents of the appropriate ligands in toluene at room temperature. All complexes were characterized by NMR spectroscopy. The catalytic activities towards the ring-opening polymerizations of *rac*-lactide and ϵ -caprolactone were investigated. Complexes **1–4** afforded polylactides and polycaprolactones with molecular weights close to the theoretical values and narrow PDIs. The ligand substituents of the titanium complexes have no effect on the stereoselectivity of *rac*-lactide polymerization. Atactic polylactide were produced using all complexes.





Synthesis of Lactide from Lactic Acid Using Zeolite Catalysts

Wanatchapan Chinda-in

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
wanatchapan@gmail.com

Tanin Nanok*

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscitnn@ku.ac.th

A direct synthesis of *L*-lactide from *L*-lactic acid has been investigated over four different H-form zeolite catalysts, namely, H-FER, H-ZSM-5, H-Beta, and H-Y, under reflux conditions in toluene at 413 K for 3 hours, and with continuous water removal. The catalytic conversion of *L*-lactic acid to *L*-lactide was determined by ^1H NMR analyses of the reaction mixtures in deuterated dimethyl sulfoxide (DMSO- d_6) and chloroform (CDCl_3). The results showed that the conversion of *L*-lactic acid over zeolite catalysts increases in the order H-FER (28%) < H-ZSM-5 (29%) < H-Beta (36) < H-Y (37%) while the selectivity to *L*-lactide increases in the order H-FER (57%) < H-Y (62%) < H-Beta (91%) < H-ZSM-5 (100%). Based on the pore size and pore structure of the zeolites, the accessibility of the active acid sites to *L*-lactide is responsible for the most crucial conversion factor, however, the product selectivity is mainly controlled by the zeolite pore shape. The highest conversion was observed in large-pore zeolites (H-Beta and H-Y) whereas the highest selectivity was obtained in a medium-pore zeolite (H-ZSM-5). H-FER, a small-pore zeolite, exhibited the lowest conversion and selectivity among other zeolites.





Preparation of Barium Ferrite Coated with Titanium Dioxide as Magnetic Photo Catalysts for Industrial Dyes Degradation

Wanthakan Ketnak

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
kankavy_gig_c3@hotmail.com

Nattamon Koonsaeng*

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscinmk@ku.ac.th

In this study, the magnetic barium hexaferrite ($\text{BaFe}_{12}\text{O}_{19}$) coated with titanium dioxide was synthesized. In the first step, polymethyl methacrylate (PMMA) as the template for the barium ferrite was prepared using a dispersion polymerization technique in the presence of Fenton reagent ($\text{FeSO}_4/\text{H}_2\text{O}_2$) as an initiator. Then, the barium ferrite precursor was mixed with the template. The obtained mixture was subjected for calcination to get the barium ferrite powder. Next, various contents of titanium dioxide prepared by sol-gel process was deposited on the magnetic barium ferrite. After that the calcination process was carried out to get the titanium dioxide coated barium ferrite samples. The samples were characterized by X-ray diffraction (XRD), scanning electron microscopy (SEM), Fourier transform infrared spectrophotometer (FTIR) and vibrating sample magnetometer (VSM). XRD patterns of the samples revealed that the deposited titanium dioxide had the anatase phase. Furthermore, the photocatalytic activity of the prepared magnetic barium ferrite coated with titanium dioxide for degradation of dyes was preliminary studied under UV irradiation. It was found that the magnetic barium ferrite coated with titanium dioxide showed degradation property for commercial dyes.

Keywords: Barium ferrite coated with titanium dioxide, Magnetic, Photocatalysts





Synthesis and characterization of Titaniumdioxide for using in sunscreen

Wimonporn Anusonadisai

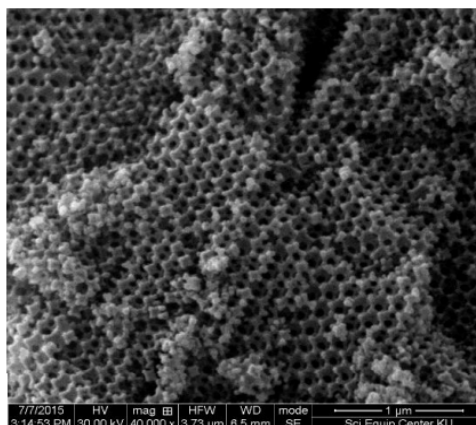
Department of chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
wimonpornans@gmail.com

Surachai Thachepan*

Department of chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscisc@ku.ac.th

Titaniumdioxide (TiO_2) is commonly used as part of sunscreen formulation to protect skin from harmful effects caused by UV light. The optical properties of TiO_2 depend on its structure. Herein, we aimed to increase UV filter efficiency of TiO_2 for sunscreen applications by synthesizing it as an inverse opal ordered structure via colloidal crystal template-assisted method. Firstly, monodisperse polystyrene colloidal spheres of sub-micrometer sizes were synthesized by emulsifier-free emulsion polymerization using potassium persulfate as an initiator. The synthesized spheres were crystallized into a colloidal crystal form and then filled with titanium (IV) isopropoxide precursor. The as-prepared materials were calcined at 500°C for 5 hours in the air to remove polymer template and acquire TiO_2 phase. Finally, the obtained inverse opal TiO_2 were characterized by XRD, SEM, TEM and UV-Vis spectroscopy in order to study the synthesized periodic structure and the UV filter effect for sunscreen application .

Keywords: Titaniumdioxide, Sunscreen, Inverse opal, Colloidal crystal template





Mesoporous Silica-Template Synthesis of Polyaniline-Derived N-Doped Mesoporous Carbons with Cobalt or Nickel as a Counter Electrode for Dye-Sensitized Solar Cells

Wimut Awsakulsuddhi

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
b5510400943@ku.ac.th

Panitat Hasin*

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscipths@ku.ac.th

N-doped mesoporous carbons immobilized by cobalt (Co-MC) or nickel (Ni-MC) with high N content were prepared from *in situ* polymerized mesoporous silica-supported polyaniline (PANI) and were explored as the low-cost counter electrodes for dye-sensitized solar cells (DSCs). The analysis of Co and Ni contents by atomic absorption spectrophotometry (AAS) shows that the synthesized Co-MC contains 19.30 Wt.% of Co (3.28 mmol/g) and the Ni-MC contains 33.27 Wt.% of Ni (5.66 mmol/g). X-ray diffraction (XRD) analysis shows the presence of Co and CoO in the Co-MC composite whereas NiO, Ni(OH)₂ and Ni are imbedded in the Ni-MC composite. Moreover, it was also proved that the addition of Co or Ni species in MC causes an improved its graphitic crystallinity resulting in excellent electrical conductivity. The X-ray photoelectron spectroscopy (XPS) analysis further confirms the presence of Co⁰ and Co²⁺ as well as Ni⁰ and Ni²⁺ on the Co-MC and Ni-MC composites, respectively. Furthermore, the calculated total atomic percentages of pyridinic and quaternary N functionalities are 57.46% and 54.64% on the Co-MC and Ni-MC composites, respectively. These values are higher than that on bared MC (52.60%) leading to significant enhancement of electrocatalytic activity towards I₃⁻ reduction. These results reveal that the Co-MC and Ni-MC composites are the promising electrocatalyst candidates for DSCs.





Production of Biodiesel from Waste Cooking Oil Using Calcium Oxide as Catalyst and Tetrahydrofuran as Co-solvent

Bheechanat Duangdee

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
b5510406569@ku.ac.th

Vittaya Punsuvon*

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscivit@ku.ac.th

Quick lime was calcined to produce calcium oxide and it was explored as a solid catalyst for the transesterification of waste cooking oil with methanol and tetrahydrofuran (THF) as co-solvent. The physico-chemical properties of catalyst were characterized by X-ray diffraction (XRD) and scanning electron microscopy (SEM). The results from characterization should that calcium oxide was successfully synthesized. In the investigation of catalyst activity for transesterification reaction, the parameter affecting the fatty acid methyl ester (FAME) conversion that determined by $^1\text{H-NMR}$ such as catalyst concentration, methanol to oil molar ratio, reaction time and THF to methanol volume ratio were investigation. Under the optimized reaction condition, the FAME conversion at 98.04% was achieved within 1.5 h using 2 wt% catalyst concentration, 9:1 methanol to oil molar ratio and 1:10 THF to methanol volume ratio. The result of FAME conversion also indicated that the presence of a co-solvent decreased the reaction time from 3 h of without co-solvent to 1.5 h of with co-solvent. In addition, fuel properties of the produced biodiesel were also examined and the result were met well with biodiesel standard.

Keywords: Tetrahydrofuran, Fatty acid methyl ester, Calcium oxide, Waste cooking oil, Biodiesel





Production of Biodiesel from Waste Cooking Oil Using Calcium Methoxide as Catalyst and Tetrahydrofuran as Co-solvent

Ratchanan Thitayanapong
University of Kasetsart, Bangkok, Thailand
b5510406577@ku.ac.th

Vittaya Punsuvon*
University of Kasetsart, Bangkok, Thailand
fscivit@ku.ac.th

Calcium methoxide was synthesized by heating calcium oxide at 700°C , contacted with methanol and stirred vigorously at 65°C for 2 hr. Calcium methoxide was researched as a solid catalyst for tranesterification of waste cooking oil with methanol and tetrahydrofuran (THF) as co-solvent. The physical-chemical properties of catalyst were characterized by x-ray diffraction (XRD), Fourier-transform spectrometer (FT-IR), scanning electron microscope (SEM). In the investigation of catalyst activity for tranesterification reaction, the parameter affecting the fatty acid methyl ester (FAME) conversion that determined by $^1\text{H-NMR}$ such as catalyst concentration, methanol to oil molar ratio, reaction time and THF to methanol volume ratio. The result of FAME conversion at 97.67% was achieved within 1.5 hr. using 3 wt% catalyst concentration, 12:1 methanol to oil molar ratio and 1:6 THF to methanol volume ratio. In addition, using co-solvent in biodiesel production spent less time than non using co-solvent in biodiesel production.





Utilization of Ash from Biomass in Silica Filled Natural Rubber

Thitiya Mahaprom

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand.
maha.paloy@gmail.com

Wirunya Keawwattana*

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand.
fsciwyk@ku.ac.th

Silica has been used as reinforcing filler in natural rubber for a period of time as it results in excellent properties for NR vulcanizates. Rice husk ash (RHA), Bagasse ash (BA) and Palm ash obtained from agricultural wastes are mainly composed of silica in the percentage of 80.00%, 57.33%, and 40.20% by weight, respectively. The effect of these fillers on cure characteristics and mechanical properties of natural rubber materials at fixed silica content at 35 phr, was investigated. The results indicated that ashes resulted in greater cure time as compared to the silica. The incorporation of ashes into natural rubber gradually improved compression set but significantly decreased tensile strength and elongation at break. Other properties, such as Young's modulus and hardness, show no significant change. The effect of thermal aging on the mechanical properties of filled vulcanizates was also undertaken. Overall results indicate that ashes can be used as cheaper filler for natural rubber materials where improved mechanical properties are not critical.

Keywords: natural rubber, rubber compound, fillers, rice-husk, bagasse ash, palm ash, mechanical properties





Effect of Epoxidized Natural Rubber as Compatibilizer on Mechanical Properties of Natural Rubber filled with Biomass

Warangkana Paritasung
Kasetsart University, Bangkok, Thailand
warangkana.pa@ku.th

Wirunya Keawwattana, Ph.D.*
Kasetsart University, Bangkok, Thailand
fsciwyk@ku.ac.th

The main objective of this study is to investigate the effect of epoxidized natural rubber (ENR-50) content in the bagasse ash filled- natural rubber (NR) on the cure characteristic and mechanical properties of the vulcanizates. The ashes were incorporated into NR and used ENR-50 as a compatibilizer by varying the compositions of ENR-50 in the filled NR vulcanizates as the following: 100/0, 80/20, 50/50, 20/80 and 0/100 NR/ENR blends. Interestingly, the modulus and hardness were reported to increase with increasing the composition of ENR in the filled vulcanizates. Moreover, the elongation at break levels of vulcanizates was lower with the increase in ENR content up to 50%. This is due to the interfacial interaction between polar filler and matrix that increases the stiffness and hardness of the composites and consequently reduces elongation at break. The SEM images of the fractured surface show better dispersion of bagasse ash in the rubber matrix with the addition of ENR. The result from thermogravimetric analysis (TGA) confirmed the increase in rubber-filler interaction by shifting toward the higher temperature range with the addition of ENR.

Keywords: epoxidized natural rubber; bagasse ash; compatibilizer; mechanical properties; thermogravimetric analysis





Extraction of phenolic compound from *Moringa oleifera* leaves for using as antioxidant in biodiesel

Wuttipong Amornchaiyaphithak

Department of chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
petcaiyifa@gmail.com

Vittaya Punsuvon*

Department of chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscivit@ku.ac.th

This work studies the extraction of *Moringa oleifera* leaves by magnetic stirring using methanol as solvent under reflux condition. The crude extract containing phenolic compound was further used as antioxidant additive for biodiesel. The different parameters affecting the total phenolic content such as weight of dried leaves to volume of methanol ratio, extraction time, and stirring rate were investigated. The result of optimum condition in extraction obtained at 1:10 of weight of dried leaves to volume of methanol ratio, 5 hours of extraction time, 250 rpm of stirring rate and 60°C of extraction temperature. In addition, 1,1-diphenyl-2-picrylhydrazyl (DPPH) radical scavenging capacity was used to assess the antioxidant efficiency of *Moringa oleifera* crude extract. In stabilizing biodiesel, *Moringa oleifera* crude extract was tested compared with synthetic antioxidant tert-butyl-hydroquinone (TBHQ) by measuring their peroxide value (PV). The result indicated that *Moringa oleifera* leaves was the promising source of antioxidant additive for biodiesel with its antioxidant activity as the same as TBHQ.

Keywords: *Moringa oleifera*, Extraction, Biodiesel, TBHQ, DPPH





Measurement of the Reflective Spectrum of Riceberry Grain for Rice Optical Sorter Design

Chiraphat Puksuk
Kasetsart University, Bangkok, Thailand
geniusboy_ralo_zaclubz-@hotmail.com

Ass.Prof.Dr.Noparit Jinuntuya*
Kasetsart University, Bangkok, Thailand
fscinpr@ku.ac.th

Riceberry is the rice with dark purple grain. Studies shown that darker grains will have higher nutrition. Homogeneity of grain colour is considered as the value added to the rice product. Optical sorter is usually used to sort the grain colour. To get the best homogeneity, we need to know the optical properties of the grain. In this project we have measured RGB components of the images of rice grains to investigate the reflection from the grain surface. We found that R-component of the reflected lights from the darkest grains are, on average, two times larger than that of the lightest. We also measured the absorption spectrum of the surface. The results confirm that the absorbents are small for the wavelength less than 450 nm and larger than 600 nm. We use this data to design the light source for the optical sorter. The RGB components are arranged to get the highest contrast between the darkest and lightest grains.





Preparation and optical properties of Mg-doped ZnO nanorods

Chutikan Iaolek

Kasetsart University, Bangkok, Thailand

Sirikanjana Thongmee*

Kasetsart University, Bangkok, Thailand

fscisjn@ku.ac.th

Introduction

Zinc oxide (ZnO) is a II–VI group compound semiconductor, which has a band gap of 3.37 eV. In addition, ZnO is a compound semiconductor that is appropriate for short wavelength optoelectronic applications. The high exciton binding energy (60 meV) in ZnO crystal allows efficient excitonic emission at room temperature. In addition, ZnO and its alloys are having vast device applications such as solar cells, transparent conducting electrode for display panels, light emitters, sensors, varistors, ultraviolet (UV) light detectors. ZnO is transparent to visible light and its conductivity can be increased through doping. There are many types of impurities doping into ZnO nanostructures such as Al, Mn, Gn and Mg. In this work, magnesium (Mg) was used to dope into ZnO for studying the optical properties of ZnO nanorods. Hydrothermal technique was used to synthesize pure ZnO and Mg doped ZnO nanorods.

Experiment

The Mg-doped ZnO powder were prepared by using aqueous solutions of zinc acetate ($\text{Zn}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$), magnesium ($\text{Mg}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$), ethylene diamine tetra-acetic acid (EDTA), ammonia as precursors. The reagents were dissolved in distilled water at room-temperature. The zinc solutions were mixed with magnesium solution under various conditions (0% , 1% , 2% , 3% , 4% and 5%) which Zn/Mg molar ratio of 1:0 , 0.98:0.02 , 0.96:0.04 , 0.94:0.06 , 0.92:0.08 , 0.9:0.1 , respectively. Then, ethylene diamine tetra-acetic acid (EDTA) was added and stirring solution. Finally, ammonia was added under continuous stirring conditions until the pH of mixed solution was adjusted to 10. The resulting solution was placed in a Teflon-lined autoclave. The hydrothermal process was conducted in an oven heated to 180 °C with a 20 hours synthesis time. The autoclave was then removed from the oven and allowed to cool down in air (at room-temperature). The nanostructure deposits were washed several times with distilled water and dried in an oven at 110 °C for 3 hours. Finally, all the samples were analyzed using X-ray diffraction (XRD), Scanning electron microscopy (SEM), UV-visible spectroscopy (UV-vis) and Photoluminescence spectroscopy (PL).

Results

XRD results showed hexagonal wurtzite structure. Peak of Mg disappeared at low concentration. SEM results investigated that 5 mol% of Mg-doped ZnO possesses the best crystallinity and nanorods.





Raspberry Pi Grating Spectrometer

Kanyaporn Ketthong

Department of Physics, Faculty of Science, Kasetsart University, Bangkok, Thailand
ketthong_k@hotmail.com

Noparit Jinantuya*

Department of Physics, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscinpr@ku.ac.th

We have constructed a grating spectrometer using transmission plane grating to diffract light from a light source. A ccd camera, equipped with the Raspberry Pi, is used to detect the spectrum lines. We take an advantage from the bundle Mathematica software with the Raspberry Pi as a powerful image processing tool. The build-in Hough algorithm is used to extract the central line of the spectrum taken by the Raspberry Pi camera module. With 500 lines per centimeter grating and 5 mega pixel ccd sensor, we can achieve the precision of the wavelength to ± 0.5 nanometer. We expect to use the system to as a small and mobile spectrometer to measure the light spectrum, especially from LED source. It can be used also to investigate the diffraction in the basic Physics laboratory class.





Assessment of Radioactivity in soil within Pharnakorn Rajabhat University with High-purity Germanium (HPGe) Detector

Kritsana Khaothong

Department of Physics, Faculty of Science, Kasetsart University Bangkok, Thailand

Teerasak Veerapaspong*

Department of Physics, Faculty of Science, Kasetsart University Bangkok, Thailand
fscitsv@ku.ac.th

The research main objective is to measure and analyze the specific activities of primordial radionuclides (Ra-226, Th-232, and K-40) in 40 soil samples collected from districts in Pharnakorn Rajabhat University. They were measured and evaluated by using a high-purity Germanium (HPGe) detector and gamma spectrometry analysis system at Thailand Institute of Nuclear Technology. The volume standard soil source (IAEA 375-soil) was used to compare efficiency for calculate specific activities. The measuring time of each sample is 10,000 seconds. From the experimental data, it was found that the specific activity ranges from 10.29 - 122.01 Bq/kg for Ra-226, 22.47 - 50.26 Bq/kg for Th-232 and 76.94 -524.14 Bq/kg for K-40 respectively. Furthermore, the value of gamma-absorbed dose rate in air (D), Radium equivalent activity (Raeq), External hazard index (Hex) and Annual external effective dose rate have been evaluated by using the average values of specific activities of primordial radionuclides (Ra-226, Th-232, and K-40) from this study. Moreover, we use Geiger counter to measure radiation in area of every sample. Geiger counter experimental results were compared to the annual external effective dose rate of the calculate by specific activity. It was found that the average of the Annual External Effective Dose Rate calculated in this study was lower than the Geiger counter experimental. Finally, the experimental results were compared to the annual data of the Office of Atoms for Peace (OAP) and, also, global radioactivity measurement and evaluation. It was found that the average of the Annual External Effective Dose Rate calculated in this study was lower than the global one.

Keywords: Specific Activity, Radium equivalent activity, External hazard index, Annual external effective dose rate, Geiger counter





Invention of Insect Egg Counting Device Based on a Machine Vision

Montira Kamchon

Department of Physics, Faculty of Science, Kasetsart University, Bangkok, Thailand
montira.k@outlook.co.th

Chatchawal Wongchoosuk*

Department of Physics, Faculty of Science, Kasetsart University, Bangkok, Thailand
chatchawal.w@ku.ac.th

Atirach Noosidum*

Department of Entomology, Faculty of Agriculture, Kasetsart University,
Bangkok, Thailand
fagrarn@ku.ac.th

Thailand is in the top rank of the productions and exporters of sugar in the world. In 2015, Thailand is ranked as the world's second largest exporter and ranked fourth in the world for sugarcane production. However, serious problem of sugarcane production can usually occur from outbreaks of disease and insect pest (Cane borer). One can be solve this problem is to feed *Trichogramma confusum* for control the Cane borer. Although *Trichogramma confusum* can kill the pest before the damage occurs, number of *Trichogramma confusum* releasing into the sugarcane field should be controlled in order to avoid any risks. In this work, we have designed and invented insect egg counting device based on machine vision that provides a fast monitoring of numbers of *Trichogramma confusum* eggs. A device consists of imaging system, egg oviposition pad, and image analysis system. The primary results showed that counting eggs machine exhibits 100% accuracy when there were a few eggs (< 20 eggs). The accuracy decreased with a lot of eggs (>50). The techniques for improvement of accuracy will be evaluated and discussed in details.





Constraints on Dark Matter Annihilation from Synchrotron Radiation

Nattapon Teeprachai

Department of Physics, Kasetsart University, Bangkok, Thailand
nattapon.te@ku.th

Maneenate Wechakama*

Department of Physics, Kasetsart University, Bangkok, Thailand
mwechakama@gmail.com

There are many evidences for the existence of dark matter. From cosmological observations, we found that a quarter of the Universe is dark matter, but we don't know what it is. Dark matter can be interacted by gravitational force and only have weakly interaction with the weak force. There is no interaction with the electromagnetic force and the strong force. We can measure the amount of dark matter precisely from gravity but the properties of dark matter particles remain a mystery. The property of dark matter particles is a major problem in cosmology and particle physics. However, we can measure the properties of dark matter by direct detection and indirect detection. The direct detection has not found any evidence of dark matter. Our research is based on the assumption of dark matter indirect detection. The indirect detection assumes that dark matter particles and dark matter antiparticles can annihilate into standard model particles which we can detect such as electrons, positrons, protons, anti-protons, neutrinos and photons. Therefore the signature of dark matter particles can be investigated from the productions of dark matter annihilation. In this work, we consider the electrons and positrons because the other particles could be explained by astrophysical background sources.

We are interested in synchrotron radiation. We consider the interaction between electrons-positron and magnetic field. The synchrotron radiation will produce photons in microwave frequency. It is our purpose to study the synchrotron radiation in the Milky Way Galaxy from Planck data. We are looking for the constraints of dark matter properties such as mass of dark matter particles and annihilation cross section. To find the constraints, we have analyzed Planck data by subtract the point sources and disk emission. We have applied the algorithm which removes the outlier outside 3σ . We have computed the upper limits of dark matter annihilation cross-section by comparing the observational data to our model. In our model we have considered diffusion-lose equation. We have included the diffusion model, energy loss processes, i.e. inverse Compton scattering, synchrotron radiation, Coulomb collision, Bremsstrahlung and ionization, and source term. To get the upper limits, the theoretical models must not exceed the observational data.

We have studied synchrotron radiation in the Milky Way by using data from Planck satellite. We have calculated the upper limits of dark matter annihilation for the different channels such as electron, muon, tau, bottom and top channels. From our calculations, the tightest constraint comes from the electron channel when the mass of dark matter particles is about 10-100 GeV. Synchrotron radiation can be a tool to study the properties of dark matter particles.





Thermal property of solid measured by photothermal deflection technique

Pongsakorn Tipmonta
Kasetsart University, Bangkok, Thailand
pongsakorn825@gmail.com

Puchong Kijamnajsuk*
Kasetsart University, Bangkok, Thailand
puchong.k@ku.ac.th

Photothermal deflection is one of the photothermal techniques. This technique can measure the thermal properties of materials without damaging the sample. The principles of the technique resemble mirage phenomena in nature. The sample holder is mounting on 3D translation stage. The 523 nm green laser diode, connected to chopper for the Intensity modulated laser, is shone on the surface vertically. This is called "Heat beam". The photon energy, which is absorbed by the sample, changes into heat energy and spreads all around the sample as frequency Intensity modulated. Investigated refractive Index on surface sample used laser low-energy, called "Probe beam". Probe beam skim of surface sample and are vertical pump beam. Probe beam is passing to Heat beam laser. The air close sample surface has temperature more than the over air layer. Probe beam deviate from the beam direction. The measures by Quadrant Photo Diode and The voltage signal, amplitude and phase, from the Quadrant Photo Diode is sent to a lock-in amplify. It calculates average thermal conductivity.

Keywords: Photothermal Deflection; Photothermal Deflection Technique; Photothermal effects





Development of Wind Turbine System for Electricity Generation From Exhaust Waste Air in an Industry

Sarun Arunragsa

Department of Physics, Faculty of Science, Kasetsart University, Bangkok, Thailand
not_2151@hotmail.com

Chatchawal Wongchoosuk*

Department of Physics, Faculty of Science, Kasetsart University, Bangkok, Thailand
chatchawal.w@ku.ac.th

Wind power is a clean energy source that can be served as an alternative to fossil fuel-generated electricity. In this work, we have developed a wind turbine system and used for generation of the electricity from constant air flow (waste wind produced from a machine, i.e. the machine is used to separate cotton fibers from its seeds) in an industrial factory. The model of wind turbine is based on 500 W vertical axis wind turbine. The effects of blade number, blade angles, and blade shape have been investigated for the most efficient blade design. The primary results show that the power output of wind turbine system strongly depends on the pitch angle of designed blade. The optimal angles of attack and parameters will be systematically investigated. Theory behind blade design will be highlighted.





Chilled-plate hygrometer with Arduino and Raspberry Pi

Sataporn Mulkamdee

Department of Physics, Faculty of Science, Kasetsart University, Bangkok, Thailand
Sataporn.Mulkamdee@gmail.com

Noparit Jinuntuya*

Department of Physics, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscinpr@ku.ac.th

We have constructed a chilled-plate hygrometer using Arduino controlled Peltier plate as a temperature controller and Raspberry Pi with camera module as a sensor. An aluminum plate is cooled down by the Peltier plate to a dew point temperature. A proportional–integral–derivative controller (or PID controller) is used through Arduino microcontroller to achieve the precision of ± 0.2 °C on the Peltier. A ccd camera, equipped with the Raspberry Pi, is used to detect the droplet formation on the metal plate. By placing a macro lens on the ccd sensor, the camera module is used as a microscope to “see” the water droplet with diameter as small as 0.1 millimeter. We expect to use the system to monitor the humidity in the metrology research laboratory at Physics department. It can be used also as a direct investigation of the dew formation in the basic Physics laboratory class.





First-principles calculations of carbon impurities in rutile TiO_2

Supparat Charoenphon
Kasetsart University, Bangkok, Thailand
icreamiie_csc@hotmail.com

Pakpoom Reunchan*
Kasetsart University, Bangkok, Thailand
fscippr@ku.ac.th

Using density functional theory (DFT) calculation within the generalized gradient approximation (GGA), we investigate the energetics and electronic structures of carbon (C) impurities in rutile polymorphs of TiO_2 . The predominant species of C impurities in the O-poor and O-rich growth conditions are identified through their formation energies. Under O-poor condition, we find that the substitutional C on O site (C_O) and the $\text{C}_i\text{-V}_\text{O}$ complex, in which C located offsite and bind with the nearest O vacancy, are energetically favorable for all values of Fermi level in the band gap. Under O-rich condition, it is found that C prefers to substitute Ti, forming substitutional C on Ti site (C_Ti) and exclusively stable for all values of Fermi level in the band gap. The interstitial C (C_i) is never stable for any equilibrium growth conditions. It is revealed that the C impurities can induced localized states in the band gap. We suggest that C_O is an origin of visible light absorption in *n*-type rutile TiO_2 fabricated under oxygen deficient growth conditions.





Properties and microstructure of lightweight aggregate produced from waste materials

Supranee Siangma

Department of Physics, Faculty of Liberal Arts and Science, Kasetsart University
Kamphaeng Saen Campus, Nakhon Pathom, Thailand
supranee_36.com@hotmail.com

Suteerapun Punlert

National Metal and Materials Technology Center, Klong Luang,
Pathum Thani, Thailand
suteerap@mtec.or.th

Pitak Laoratanakul

National Metal and Materials Technology Center, Klong Luang,
Pathum Thani, Thailand
pitakl@mtec.or.th

Rinyapat Sukkae

Department of Physics, Faculty of Liberal Arts and Science, Kasetsart University
Kamphaeng Saen Campus, Nakhon Pathom, Thailand
mint_08075@hotmail.com

Rudeerat Suntako*

Department of Physics, Faculty of Liberal Arts and Science, Kasetsart University
Kamphaeng Saen Campus, Nakhon pathom, Thailand
rudeerat_p@hotmail.com

This objective of this research is to produce lightweight aggregate from waste from industry. Physical properties and microstructure of lightweight aggregate made from clay, fly ash from industry and waste glass have been investigated. Clay/fly ash/glass mixes have been rapidly sintered at temperatures 1000°C. The lightweight aggregate mixed with various ratio of clay:fly ash:glass. The density, water absorption and compressive strength were determined. The microstructure was observed by optical microscopy. Clay:fly ash:glass mixes were 20:20:60 produced lightweight aggregate with the density of 1089.45 kg/m³, water absorption of 0.69% and compressive strength of 12.05 MPa. Major crystalline phases in sintered materials were quartz (SiO₂), albite (NaAlSi₃O₈) and calcium aluminium silicate (Ca₂Al₂Si₂O₈). This work indicates that clay combined with fly ash and waste glass can be used to produce lightweight aggregate with properties comparable to commercial aggregates. Fly ash and glass are potential resources that are currently waste materials. The processing involving pelletising and sintering is similar to that required for other commercial lightweight aggregates produced from shales and clay, and therefore processing costs are expected to be similar. However, the costs and environmental impacts makes the production of clay/fly ash/glass lightweight aggregate a viable option.





Dark Matter Constraints from PAMELA, H.E.S.S, Fermi and AMS-02

Suwitchaya Setthahirun

Department of Physics, Kasetsart University, Bangkok, Thailand
Locker_hero_firn@hotmail.com

Maneenate Wechakama*

Department of Physics, Kasetsart University, Bangkok, Thailand
mwechakam@gmail.com

The vast universe, there are various mysteries still waiting for the answer. The problem of dark matter is one of them. There are many cosmological evidences for the existence of dark matter such as large scale structure, gravitational lensing, and rotation curves of galaxies. The observations suggested that the Universe consists of dark matter for 26.8%. Although we know about the existence of dark matter in the Universe, we still don't know what dark matter made of. Consequently, it becomes an important problem in cosmology and particle physics. Physicists are trying in various ways to answer this problem. Recently, there is an attempt to measure the properties of dark matter by direct detection. However, the direct detection has not found any evidence of dark matter. Alternatively, indirect detection which is based on the assumption that dark matter and anti-dark matter can annihilate into particles that we can measure e.g. electrons, positrons, protons, anti-protons and neutrinos. Therefore the signature of dark matter particles can be seen by the particles that are produced from dark matter annihilation.

In this research project, we have investigated dark matter properties, such as mass of dark matter particles and annihilation cross-section. We have used the cosmic rays electron and positron data from Payload for Antimatter Matter Exploration and Light-nuclei Astrophysics (PAMELA), high-energy stereoscopic system (H.E.S.S), Fermi large-area telescope (Fermi -LAT), and the Alpha Magnetic Spectrometer (AMS-02), which measured at different energy levels at the solar neighborhood. To find the upper limits of dark matter annihilation, we have compared the electron and positron fluxes to our model. In our model, we have calculated the electron and positron spectrum by using the diffusion-loss equation. We have included the diffusion, energy loss processes (such as inverse Compton scattering, synchrotron radiation, Bremsstrahlung, Coulomb collision and ionization), and source term. We have found the upper limits of dark matter annihilation into different channels, i.e. e^+e^- , $\mu^+\mu^-$, $\tau^+\tau^-$, $t\bar{t}$, $b\bar{b}$. To find the constraints on dark matter annihilation for each channel, the model fluxes must not exceed the observational fluxes.

Our results indicated that the tightest constraint comes from the positron flux of AMS-02 for the electron and muon channels. The mass of dark matter particles less than 10 GeV is excluded by the positron flux of AMS-02. We can use the electron positron fluxes at the solar neighborhood to constrain the properties of dark matter particles.





Application of Image Processing to the Viscosity Measurement Laboratory

Tanatsaparn Tithito

Department of Physics, Kasetsart University, Bangkok, Thailand
cream.aa@hotmail.com

Noparit Jinuntuya*

Department of Physics, Kasetsart University, Bangkok, Thailand
fscinpr@ku.ac.th

We have constructed a machine vision base on Raspberry Pi and its camera module to measure the viscosity of a transparent liquid using the falling ball method. The system is used as a motion tracker to track the position of the metal ball moving in a liquid. The images of the falling ball are analysed by the Raspberry Pi bundled Mathematica software to determine the terminal velocity of the ball. The results is then used to calculate the viscosity coefficient of the liquid. We expect that our system can reduce many pitfalls and sources of uncertainty when the measurement is perform manually. Due to the ability of the system to do real time measurement, we plan also to use the system to improve learning efficiency of the viscosity measurement in the basic Physics laboratory class.





Epidemic modeling of Dengue fever using one-dimensional lattice model

Worachapha Banyongkid*

Department of Physics, Kasetsart University, Bangkok, Thailand
s3013310103@gmail.com

Chalermopol Kanchanawarin

Department of Physics, Kasetsart University, Bangkok, Thailand
fscicpk@ku.ac.th

Dengue fever is one of the main tropical diseases that threatens world population in more than 110 countries. Currently there is still no effective way to help prevent and control the disease from spreading. The spreading of Dengue fever can be considered as a non-equilibrium phase transition process that depends on the interactions between the population of two species, i.e. humans and mosquitoes, which contract the disease from one another. The disease can exist in one of two phases, i.e. active phase (spreading phase) and absorbing phase (not spreading phase), that depends on many parameters, such as the number of people contracting the disease, the diffusion rate of mosquitoes and the number of mosquitoes.

In this study, we used one-dimensional lattice model to investigate the spreading patterns and the phase transition of Dengue fever in two following models, i.e. 1) a static human model with each human fixed on each lattice site, and 2) a dynamic human model with humans being able to move to other lattice sites and being initially distributed in specific patterns. For each time step, there are five events happening, i.e. human infection and recovery, and mosquito infection, diffusion, and replacement. By starting our model with a single infected site, we can observe the time evolution of the epidemic and study the phase transition by specifically varying the number of mosquitoes in the system. In our static model with 5,000 humans (lattice sites), we found that the phase transition occurred when the number of mosquitoes reached 10,600. Moreover, we also found that the Dengue fever spreaded like a wave with its wave-front moving at a constant speed depending on the diffusion rate of mosquitoes. With the understanding of the principal features of Dengue fever epidemic based on our simple lattice model, this may allow us to be help prevent the disease from spreading in the near future.





KUrun application on Android OS

Thanes Sriamornruttanakul

Department of Computer Science, Kasetsart University, Bangkok, Thailand
benz.thanes@gmail.com

Aekchai Wattana

Department of Computer Science, Kasetsart University, Bangkok, Thailand
ekachai1.1@hotmail.com

This article presents the development of application for activity tracking. After surveying mobile application which are popular and intend. An application for a mobile device in running and health is important. Firstly, we searched information about the application that support an exercise available on the store and used them for improving our application. Then we learned about calculating calories and technologies needed to develop a program. Accelerometer Sensor technology is available for smartphones. The accelerometer is measured on 3-axis(x,y,z). This technology can be used in the application. The objective of our application is to develop an effective exercise. At the beginning, we divided work in 3 parts. The first part, we designed an application layout. The second part, we developed application by android studio (JAVA). The work is divided into packages: the user interface use to input information detail and record result for applied in other functions, the workout interface, users can use workout exercise supporting tool to show footstep, calories, distances, average speed and time, and the last package is database section use to record data and show information and graph .The last part, we installed it on the smartphone to test the application.

The experimental result of this application is found that the operation of an application is user friendly. It can be used in everyday life perfectly. However, our application is not as accurate as the wearable devices. Our results are deviated, because there are many factors involved, such as the age and variance of users. In the future, we will increase our accuracy and develop more useful functions.





Eye Movement Application on Eye Tribe Tracker

Bhanuwit Sirayobhas

Department of Computer Science, Kasetsart University, Bangkok, Thailand
bhanuwit.sirayobhas@gmail.com

Normally we use our hand to control a computer or electronic devices, but for some people it hardly for them to use their hand to control it. Therefore the motivation of this project is to find the ways that help people with disabilities to control the devices efficiently by themselves. Furthermore, normal people can control it easily and make it more comfortable. So eye movement is the method we try to use to control the devices. The result of this project is to enable disabled person to control the devices with their eyes.

The application enables a user to control the devices, such as a web camera, with the user's eye movement. A web camera is mounted on a pan-tilt servos that can rotate 180 degrees in eight directions. The view captured by a web camera will change in a direction according to the direction of eye movement on a computer screen.

The system comprise of four components: a program for calculate and calibrate a gaze position, an eye tracker, a microcontroller, and a web camera. In this project, eye position on the screen is detected and tracked by using Eye Tribe Tracker. Eye Tribe Tracker composes of a set of sensors that are used to locate features of the eyes and estimate point of gaze on a computer screen. The program determines a direction of eye movement by dividing a computer screen into nine regions (i.e. 3x3 grids), which corresponds to eight directions and one center region. After calibrating eye positions in the center region on a computer screen with real world positions, the direction of eye movement (or a degree of rotation for controlling a servo) is then determined by the position of gaze on grids. After that, the program sends a degree of rotation to a servo via a pan-tilt servos Arduino kit in order to control the pan and tilt head. Finally the servos move in the direction according to the eye movement.

A web camera can be replaced by various devices, such as CCTV. Moreover, you can make this system wireless by plugging the servos into a receiver, and controlling the pan and tilt head via a transmitter. By this way we can control the devices from a remote distance.





Stroke and Heart Disease for Application

Chatinya Jundit

Department of Computer Science, Kasetsart University, Bangkok, Thailand
chatinya.j@ku.th

Panisa Apikulchatkit

Department of Computer Science, Kasetsart University, Bangkok, Thailand
panisa.a@ku.th

Stroke and Ischemic Heart Disease (SIHD) are usually found in the elderly or people whose family backgrounds are related to SIDH. Most of the patients are more likely to be male than female. All of these risks cannot be avoided. The factors of non-infectious diseases that people can avoid are diabetes, obesity, blood pressure, heart disease and high blood cholesterol. However, there is more risk of the patients in Thailand currently due to lower level of attention to health. The paced society, stress at work or family, lack of exercise and health care are probably causes of the risk. They lead to non-infectious diseases and finally bring about SIDH. The guide is in another channel of access to information for those who are interested in the study guide, preventing and protecting themselves. Thailand is the second ranked country of the highest death from SIDH. People should know about SIDH and how to prevent themselves. Today, mobile phones are generally used and also play a vital role in people's life. The mobile application has been developed to distribute information on the diseases and the way to take care people who suffer from SIDH. The objective of this study is to develop an application for SIDH. The application gives users a guide which can approach conveniently to the information.

Software tools used for developing this application include Android Studio 2.0, Adobe Photoshop CS6, Adobe Illustrator CS5, SQLite 2.8, Genymotion 2.0.3 and DB Browser for SQLite. The Operating System for this application is Android 4.3.

This application provides information on SIDH. There are various functions available in the application which are the following five main functions: 1. SIDH information; the function providing information on the causes, symptoms, treatment methods and methods of SIDH prevention: 2. User data; calculating BMI and BMR and recording record weight, waist circumference and blood pressure: 3. Emergency recorder; recording emergency numbers for calling or sending users' address and message and can also see maps, websites and hospitals call number: 4. SIHD checking up and 5. Reminder; notification to take pills and a doctor's appointment





Word Search in The Wordland By Unity for Mobile Game

Chirapont Tamronglak

Department of Computer Science, Kasetsart University, Bangkok, Thailand
chirapont.t@ku.th

Chanon Khamprasoet

Department of Computer Science, Kasetsart University, Bangkok, Thailand
chanon.kh@ku.th

Currently, there are many game applications on mobile phones. They bring fun and enjoyment to players of all ages. Word Search in The Wordland is also one of them but distinctive in English vocabulary enhancement feature.

During game playing, a player must find all randomly chosen English words hidden in a puzzle using shortest time. Word Search in The Wordland conserves the classical features of generic word search game, while adds story, scenes, characters and monsters into it. A game begins when a player picks his/her favorite character and gets into an adventure in the Wordland. In this journey, he/she will face with monsters and must pass all of them in order to finish the game. Within the Wordland, which full of magics and surprises, a player must conquer all monsters by quickly finishing all word searches. The game consists of 2 modes: Classic mode, which similar to a regular word search game, and Knowledge mode, which the player has to fight monsters and finish them to pass through the next levels. Dictionary is a special feature of this game. The player may find meaning of words they do not familiar with.

This game is created using C# programming language and Unity, a utility for game development on multiple platforms, for mobile devices.





Construction of Unmanned Aerial Vehicle Model for 4 Propellers

Prapakorn Nakvanich

Department of Computer Science, Kasetsart University, Bangkok, Thailand
Prapakorn.n@ku.th

Jenjira Praphasinsap

Department of Computer Science, Kasetsart University, Bangkok, Thailand
Jenjira.p@ku.th

The objectives of this research was study construct and designing Unmanned Aerial Vehicle (Unmanned Aerial Vehicle: UAV) Models. Control the direction of flight by computer software instead of human. In the past UAV often used in the military to patrol the area and spy enemy. Currently, Unmanned Aerial Vehicle (UAV) commonly used widely and extensive. It often applied to a variety of purposes including survey devastated areas or area is not accessible etc. UAV can control from long distance but control of radio remote control which it's difficult. Force UAV must have some knowledge and expertise. Thus, can be controlled without damage to the UAV. This research to study information of Unmanned Aerial Vehicle (UAV) modeling for easier to use by computer software. First, creating the model and assembling UAV by Internet of Things (IOT) compose of control and transceiver part. In control part, write C Program on microcontroller board to processor and Signal to UAV can be driven. After that UAV calibrate. When installing the device and adjusting for UAV can fly smoothly.

The planned of UAV to test flight control and record flight patterns. There is six patterns including Takeoff -Down, Takeoff - Turn Left, Takeoff - Turn Right, Takeoff - Turn Left - Turn Right, Fly Wide of the left and Fly Wide of the right. Then design screen of UAV system controller on computer look at easy to use for the human. The control screen is 3 model including manual control screen was button on-screen display. Automatic control screen by enter the desired value in the control screen for UAV can fly and can save flying pattern and pattern control screen by Click on a flight pattern that is assigned to it. So anyway this research will be a model for the development of the auto pilot in the future.





Android Application for Thai Tourist in Japan

Jitra Jarupha

Department of Computer Science, Kasetsart University, Bangkok, Thailand,
jitra.j@ku.th

Jainam Lappipat

Department of Computer Science, Kasetsart University, Bangkok, Thailand,
jainam.l@ku.th

Nowadays the number of Thai tourists who travel abroad are increasing. And one of the most popular country that Thai tourists visit is Japan. The purpose of this study is developing Android applications for Thai tourism in Japan. This application works on Android OS, it provides many useful functions : the basic terminology used in the communication, simple sentences to communicate, popular attractions and the basic courtesy to residents on Japan.

Many Thai tourists travel to Japan by themselves because they are independent and want to spend unlimited time to travel. However, language is one of problem for Thai tourists. Travelling in Japan without knowing Japanese make a visit in Japan more difficult. So an application has been developed and provide information about basic Japanese vocabulary for traveling. The categories of vocabulary are General, Food/Drink, Attraction, Transport, Shopping, Personal Effects, Emergency, Accommodation and Date/Times, including map display system for Attraction, terminology search system, my favorite vocabulary system, basic courtesy to residents in Japan. Focus on simple sentences that frequently used in situations. Thai pronunciation and Japanese pronunciation sound for daily usage and able to communicate in basic Japanese for Thai tourist are provided. Further, this application also recommends popular tourist destinations in Japan. Further, more information include culture and manners that should do or not do in tourist attractions and another places. Software tools used for developing this application include Andriod Studio, Adobe Photoshop CS6, SQLite and JAVA. The Operating System for this Application is Andriod. This application for travelling in Japan is one option that is easy to use and easy to download to smart phone or other mobile devices.

In summary, application program development for Thai tourists in Japan can be used for android operating system on smartphones. Users can search for Japanese vocabulary, with an audio function, and tourist popular attractions in Japan. Other functions include 1. popular tourist destinations, 2. do and not to do manners and 3. contact with Ambassador of Thailand in Japan. This application give users a more useful information while travelling in Japan.





Review-KU Website

Kanokwan Chooklinhom

Department of Computer Science, Kasetsart University, Bangkok, Thailand
kanokwan.kch@gmail.com

Supansa Srimala

Department of Computer Science, Kasetsart University, Bangkok, Thailand
supansa.sr@ku.th

Sethavidh Gertphol*

Department of Computer Science, Kasetsart University, Bangkok, Thailand
sethavidh.G@ku.ac.th

Review-KU is a website designed to help students in Kasetsart University choosing classes for registration. The website contains information about subjects and professors divided into semesters. Students who studied a subject in a specific semester can vote, comment, and review that class.

Vote score is shown in percent. Full score is 100 and is divided 4 sections: teaching quality, difficulty of examination, amount of homework, knowledge gained. Grade given is shown as percentage of student who gave vote (grade derived from vote). Comment is students' opinion, which is a free-form text comment about each sections of the class. Students can also give a truthful opinion about the class too.

Review-KU Website is developed with Laravel framework which use PHP and HTML for displaying web page. CSS is used for page setting and decoration. Database is MySQL managed by PHPMYAdmin. We use XAMPP as a server. Users are categorized into 2 roles

- User: a user can read and search for review without creating an account. A user who logs in can vote, comment, send message, request to add-edit subject/review, request to delete improper comment and reply to comment. In addition, each user has a list of recommended subjects that is suggested by the system.
- Admin: An admin has authorities to manage website. His role is to manage request from user (request to add, edit and delete subjects and comments) including adding new review forms when semester starts and managing members.

We hope that students can get real details about a subject and find a suitable subject that match their needs so not to waste time and opportunities in study. In addition, we hope this project is one channel of class evaluation and help improve teaching and curricular in a fast changing world.





Thai Sign Language Website

Pinpuk Phaison

Department of Computer Science, Kasetsart University, Bangkok, Thailand
pinpuk.p@hotmail.com

Usa Sammapun*

Department of Computer Science, Kasetsart University, Bangkok, Thailand
fsciusa@ku.ac.th

At present, there are many deaf persons in Thailand, but the limitations of communication between normal persons and deaf persons or communication among deaf persons themselves still remain. Because the Thai sign language is only known among some deaf persons and it is hard to find the knowledge about Thai sign language from instructional media in Thailand. For example, when learning from a sign language book, a deaf person will not be able to learn how to use muscle and mouth movements to talk correctly because it is hard to follow images in the book. In order to provide many of the benefits in communication with deaf persons and to support the study of Thai sign language, this project thus study, design and develop a Thai sign language website. The website contains many videos of Thai sign words instead of images and displays important information about Thai sign words.

The website is developed with Laravel 5 framework using HTML5, PHP, JavaScript and MySQL. It consists of 2 parts. The first part is back-end for an administrator to insert, edit and delete the information of Thai sign words in this website. Another part is front-end for a user who wants to learn Thai sign language. A user can learn many Thai sign words by searching via categories or sentence and using search functions to find a word or sentence as needed. A user can select search by word or by sentence. If a user searches by sentence, the website will use the “WordCut” JavaScript program to cut a sentence into single words and find the information of each single word to display on the result page.





Prototype of Thai song ontology for semantic search

Krissada Mantanoo

Department of Computer Science, Kasetsart University, Bangkok, Thailand
mantanookrissada@gmail.com

Chanon Rungrussamicharoen

Department of Computer Science, Kasetsart University, Bangkok, Thailand
chanon.run@ku.th

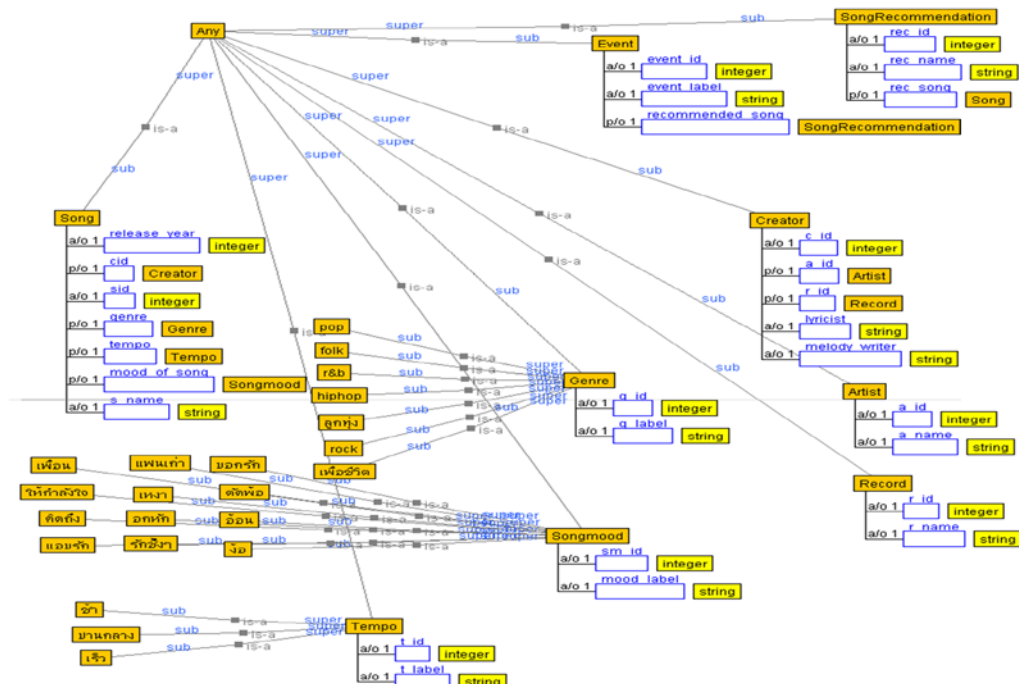
Nuanwan Soonthornphisaj*

Department of Computer Science, Kasetsart University, Bangkok, Thailand
fscinws@ku.ac.th

Ontology can be applied to describe concepts and relations that exist in a specific domain. In this study, we create a Thai song ontology using Hozo ontology editor. The concept of Thai songs as well as their attributes are designed and exported to OWL file. Our ontology contains the concept of Thai song such as song mood, genre, tempo, event and song recommendation.

The data collection consisting of 200 Thai songs is stored in database using MySQL. Then all data tables are mapped to the ontology using Ontology Application Management Framework. We create a set of rules that can be applied for song recommendation. The application can recommend the set of songs having the theme matched with the event for user. Our system can suggest the songs for a variety of events such as farewell party, wedding party, Birthday party. The output shows the song name, artist so that user can further search to get his preferable songs. Note that there is no function for song playing in order to avoid the copyright infringement.

Keywords: ontology, recommender, semantic search, Thai song





Thai Korean Mobile Application for Tourists

Kullapad Ratanatayarom

Department of Computer Science, Kasetsart University, Bangkok, Thailand
kullpad.r@ku.th

Jareewan Sarapon

Department of Computer Science, Kasetsart University, Bangkok, Thailand
jareewan.s@ku.th

Language is important for communication in business and tourism. Korean is the national language and also consisted of it's own alphabets and speaking language. Moreover, some Thai people have a passion for traveling in various popular places in Korea. According to statistics, the number of Thai tourists in South Korea are increasing each year. In 2555 there were 395,984 Thai tourists which increased 28 percents from the year 2554. In January, 2559 there are 39,032 Thai tourists who travel to Korea which was reported by the Korea Tourism Organization. In addition, people also pay attention on culture, music, and food of South Korea as well. It is the concept in the preparation of this application. An Application for Thai tourist in Korea (TTK) is an android application which provides information for Thai users who travel in South Korea. The users are general people who interested in Korean culture or other people who want to travel in Korea.

There are several functions provided by TTK application such as Korean vocabularies that user can listen to the pronunciation of Korean vocabularies, Seoul tourist information including address, operating hours, admission ticket, public transportation, website and a map that show the location of tourist place. And information of Royal Thai Embassy in Seoul and Hospital, Favourite function, Search function that can find the vocabulary that are provided, Courtesy information. Lastly, Currency conversion from Korea Won to Thai Baht. In addition, Software tools used for developing this application include Android Studio, Adobe Photoshop version 12.0.3, Adobe illustrator CS5, Database SQLite and Genymotion. The programming language for develop this application is JAVA. The operating system for this application is Android.

The development of an android application for Thai tourist in Korea is successful and met the objective. Because Currently, there are many people around the world use application on smart phones and smart phone has a role in the daily life of human beings. So, the application on mobile phone is a better alternative that provides useful Korean knowledge, easy to use and can be accessed anywhere. Moreover, it may help Thai people to communicate with Korean conveniently as well.





Thai Chino Application on Android OS for Chinese Tourist

Methsawat Thanapairnt

Department of Computer Science, Kasetsart University, Bangkok, Thailand
methsawat.t@ku.th

Jirapat Intaaue

Department of Computer Science, Kasetsart University, Bangkok, Thailand
Jirapat.i@ku.th

At present, a large amount of Chinese tourists travel in Thailand, and the numbers are increasing every year. So it's extremely significant to develop Thai Chino Application (TCA) for helping Chinese tourists. This application works on Android OS. This application is useful for Chinese tourists who travel to Thailand individually or travel with group tour. It's useful for Chinese tourist to learn about Thailand attractions and Thai vocabulary in order to communicate with people conveniently.

TCA was developed for android operating system. Developing tools include Android Studio, SQLite and Java Language. By the main programs works are primarily consisted of 4 sections: word, place and attractions, search and favorite words. In the section of the word page, 9 categories include Basic, People, Number, Airport, Eating, Emergency, Hotel, Shopping, Transport. Each category has the relevant terminology in each particular category. When pressing the terms in the category, there will be a word of the language, so users can listen to the words pronunciation and the vocabulary. They can also be set as favorite words. With the display, it will show the attractions by various sectors within the country of Thailand and can vote for favorite place/attraction. As the results, it is expected that users will get the knowledge about basic vocabularies of Thailand. Tourists, especially Chinese information received, some of the most interesting and popular places in the country with Thailand and this application also includes the codes of conduct in Thailand. They include the manner what should be done and what should not be done in Thailand.





The electrical on-off switch devices via Internet

Panudet Samittiwuttikul

Department of Computer Science, Kasetsart University, Bangkok, Thailand
Panudet.sa@ku.th

Natapat Thanahiranpat

Department of Computer Science, Kasetsart University, Bangkok, Thailand
Thanakorn.tha@ku.th

Raspberry Pi is a credit-card sized computer. The objective of this to research was using Raspberry Pi general-purpose input/output (GPIO) port to control the relay module to turn on or off electrical devices and measure temperature via Internet.

The electrical switch device is an electronic circuit board using GPIO port to connect a device. We connect Raspberry Pi to relay modules to turn on/off electrical device. We also added temperature sensor into it to know the room environment temperature for decision to turn on heater or air conditioner. The electrical switch use JavaScript and HTML to command GPIO port and build user interface. In addition Python script was used to background running to manage switch such as blink LED light. The user interface will come with user security login, menu buttons to control electrical devices and room temperature.





Kidney Care For Android Application

Suwisan Prommuak

Department of Computer Science, Kasetsart University, Bangkok, Thailand
suwisan.p@ku.th

Chitipat Mueanpaopong

Department of Computer Science, Kasetsart University, Bangkok, Thailand
chitipat.m@ku.th

Kidney disease can occur to anyone, no matter how old they are. The smartphone usage are widespread, and taking a part in daily life. Therefore the idea is to develop the application so that the concerned people are able readiness to take care for themselves away from kidney disease.

The people are paying attention to be good healthy and take care of themselves. Now we have a lot of researches of how to have good healthy and we have many sickness information. These made us realized about kidney disease so we made this application for kidney patients and whoever interested about kidney disease. This application software tools used for developing this application include Android Studio, DataBase SQLite and Genymotion. The programming language for developing this application is JAVA. The operating system for this application is Android.

It have many interesting functions for users and users will get knowledge about information of this disease, for example, this application have function for giving information and advice about how to take care of patient, giving information about hospital, blood test results can be recorded to tracking the symtoms in the form of a graph and it can save patient's information whether to notify appointment or alert for taking the medicine.





"Easy Travel" all-in-one personal travelling consultant application

Thitipan Pantaeng

Department of Computer Science, Kasetsart University, Bangkok, Thailand
thitipan.p@ku.th

Varanyu Visunsirigoon

Department of Computer Science, Kasetsart University, Bangkok, Thailand
varanyu.v@ku.th

Umaporn Sirathranont*

Department of Computer Science, Kasetsart University, Bangkok, Thailand
fscipam@nontri.ku.ac.th

Travelling is becoming global lifestyle and holiday choices for people of different social groups. Tourism industry is therefore gaining more profits especially in Thailand and other countries with specific landmarks and attractions. Planning for a trip requires a great deal of effort and time.

However, with a great travelling plan, it does not always guarantee that your life will be easy when in different countries and among people who speak different languages. This study aims to facilitate travellers by creating the mobile application which is acting as your personal travelling helper. "Easy Travel" application includes features such as 24-hour chat with the tour agencies and travelling consultants, GPS map and group location spotter which will allow the group members to locate themselves with GPS real time tracking system. In addition, the application allows users to create their question board the way in which the private group conversation can be set up and utilised. "Easy travel" application is therefore all-in-one application for travellers.

Keywords: travelling, GPS, application, helper, question board





Bangkok Smart Life on Android OS

Warangkana Senasathian

Department of Computer Science, Kasetsart University, Bangkok, Thailand
warangkana.se@ku.th

Bangkok's traffic has been getting worse according the BBC news and Thai PBS. The best choice is the Bangkok rapid transit system. Although, it is still not cover Bangkok completely, but in the near future the government plans to expand more. The stations will increase more than hundred stations. That make it covering all areas in Bangkok. Travelling by train is the priority of the trip in Bangkok.

Bangkok Smart Life is an application that helps the route navigation when traveling by rapid train in Bangkok. The functionality of the application has cover all of routes. For the example, Sukhumvit line, Silom line, Airport Rail link line, etc. The application shows and describes about routes and lines. The function shows stations to change lines include total time. It also has the option to count stations. The user can be alerted when the train arrived to the destination. The application can be applied in three languages: English, Thai and Chinese languages for tourists or foreigners that have purpose for traveling or working in Bangkok that can be more comfortable. This application also have functions to find the landmarks in bangkok all around the stations. That can be more comfortable than a guide book. The function map on application shows a map for each mass transit system line by set apart. That makes it so clearly and easy to use. This application developed on the Android Studio environment and Java programming language. At the beginning, we compare the applications function with the other mass transit system application (Metro Tokyo Subway from Japan and Singapore MRT from Singapore) which have a inclusive functionality for mass transit system application and also respond to requirement from user. As a result, our application friendly with user and also be easy-to-use application.

Bangkok Smart Life is developed for to practical daily life. Therefore, We uploaded this application on Google play. We did survey research and questionnaires for user satisfaction in easy-to-use, designing application colors, appealing, accuracy of languages and accuracy of navigation system. Overall the user satisfaction is about 76.67 percents. Most of them said it is accuracy of navigation system. They complained about application appealing.





Influence of Synoptic Conditions on Rainfall Behavior in Bangkok

Arunrung Ketsri

Department of Earth Sciences, Kasetsart University, Bangkok, Thailand
wintereve1412@gmail.com

Pongsakorn Jiwapornkupt*

Department of Earth Sciences, Kasetsart University, Bangkok, Thailand
fscipsw@ku.ac.th

The aim of this study is Influence of synoptic conditions on rainfall behavior in Bangkok (2011-2015). Analysis of Rainfall according to 5 seasons as follow Northeast Monsoon Season (NM), Summer Intermonsoonal Season (SIM), Onset Southwest Monsoon Season (OSM), Southwest Monsoon Season (SM), Winter Inter Monsoonal Season (WIM).

The result revealed that the Northeast Monsoonal season (NM: November-February) the main synoptic conditions that influence precipitation are active high pressure and heat low (AH&HL), confluence of the low level flow (CON). Daily rainfall amount in range of light to moderate rain. Rainfall distribution is 20-40%. Summer Intermonsoonal season (SIM: March -April) the main synoptic conditions that influence precipitation are AH&HL. Daily rainfall amount in range of light to heavy rain. Rainfall distribution is 20-80%. CON daily rainfall amount in range of light to moderate rain. Rainfall distribution is 20-80%. Onset Southwest monsoonal season (OSM: May-June) the main synoptic conditions that influence precipitation are weak southwest monsoon (WSW) and active southwest monsoon (ASW). Daily rainfall amount in range of light to moderate rain. Rainfall distribution is 20-60%. This season rains almost everyday. Southwest Monsoonal season (SM: July-September) the main synoptic conditions that influence precipitation are WSW, ASW, weak inter tropical convergence zone (WITCZ). Daily rainfall amount in range light rain. Rainfall distribution is 40-80%. The influential movement of tropical storm and low depression (DEP&LOW) daily rainfall amount in range heavy rain. Rainfall distribution is 60-80%. Winter Inter Monsoonal season (WIM: October) the main synoptic conditions that influence precipitation are AH&HL daily rainfall amount in range light to moderate rain, Rainfall distribution is 20-60%, WITCZ daily rainfall amount in range light to heavy rain. Rainfall distribution is 40-60%, DEP&LOW daily rainfall amount in range light to heavy rain. Rainfall distribution is 60-80%.





**Distribution of Polycyclic Aromatic Hydrocarbons (PAHs) in Leachate from
Ban Kam Bon Landfill, MueangKhonKaen District,
KhonKaen Province, Thailand**

Bussakorn Annaj

Department of Earth Sciences, Kasetsart University, Bangkok, Thailand
annaj_bsk@hotmail.com

Unnop Homchan

Department of Earth Sciences, Kasetsart University, Bangkok, Thailand
fsciunh@ku.ac.th

Polycyclic Aromatic Hydrocarbons (PAHs) are toxicants that are dangerous to organisms. They are carcinogenic, mutagenic and teratogenic. PAHs is a group of persistent organic pollutants (POPs) that can accumulate in the environment for a long time. This research aimed to study species and quantity of PAHs contaminated in leachate, ground water, surface water and soil in Ban Kam Bon sanitary landfill and vicinity, Mueang Khon Kaen District, Khon Kaen Province. Sampling were taken on 19-20 February, 2016; 2 effluent leachate samples from treatment systems, 5 ground water samples from monitoring wells and 4 soil samples in landfill and 2 surface water samples from Old Sam Jan and New Sam Jan reservoirs near landfill. Leachate, ground water and surface water samples were extracted by Solid Phase Extraction (SPE C-18) and soil samples were extracted by sonication. The extracted solution were analyzed for 16 PAHs by High Performance Liquid Chromatograph (column: C-18, mobile phase; acetonitrile:water = 70:30). The results showed that total PAHs in ground water was highest in monitoring well NO.6 following by No. 4,3,2 and 5 respectively, and naphthalene was mostly found. In surface water, New Sam Jan was more contaminated by PAHs than Old Sam Jan. PAHs contamination in soil was higher than ground water and surface water; especially, soil sample in station 1 at garbage dump. Carcinogenic PAHs found in ground water, surface water and soil were chrysene, benzo(b)fluoranthene, benzo(a)pyrene but benzo(a)anthracene found in only ground water.





Application of Resistivity and Induced Polarization Measurement to Investigate Tree Root Form for Bioengineering Purpose

Chalermpon Wungsumpow

Department of Earth Sciences, Kasetsart University, Bangkok, Thailand
b5510406283@ku.ac.th

Desell Suanburi*

Department of Earth Sciences, Kasetsart University, Bangkok, Thailand
fscidss@ku.ac.th

Landslide hazard have various occurrence in Thailand, by main factors of widely deforestation. Which damage property and people life. To protect landslide occurrence bioengineer technique was applied by enhancement slope stability at has risk zone by vetivers. The efficiency to search for root systems by measurement to root zone boundary. The study on root investigation was carried by using resistivity and induced polarization measurement to detect root form laboratory. Model design in laboratory, acrylic square box with 40 cm width, 60 cm height, and 80 cm length was setup. Vetivers were planted half in this acrylic box. The measurement was design with Electre II software to get the most appropriate one. Dipole-dipole and Schlumberger configuration (24 electrodes, spacing 0.03 m.) with 70 cm length was set. The study started from used measuring in laboratory. The modify ground instrument (Syscal R1 Switch-48) for laboratory. The results show the difference between root boundary and soil layers. The resistivity values of root boundary to be close to soil layers about 20-30 ohm.m. The induced polarization values of root boundary very low chargeability about 5 mV/V and soil layers background 10 mV/V. Consequently, using resistivity and induced polarization measurement can also avoid cutting or damaging the roots which affect the root efficiency to protect the soil stability and landslide risk.





Shallow Marine Seismic Survey in the Offshore Ban Laem, Phetchaburi, Thailand

Chanika Sarachai

Department of Earth Science, Faculty of Science, Kasetsart University,
Bangkok, Thailand
b5510406291@ku.ac.th

Passakorn Pananont*

Department of Earth Science, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fscipkp@ku.ac.th

This study conducted a shallow marine seismic reflection survey in the offshore Ban Laem district, Phetchaburi province to determine geological structure in this area such as the shallow sediment structure and paleochannel that is very useful to marine seismic survey in Thailand.

The seismic survey was conducted in a W-E direction for about 50 kilometers with study 48-channel streamer cable. The data quality of the shallow marine seismic survey is greatly enhanced through multichannel data processing. The results revealed some interesting evidences in this area such as the accumulation of sedimentary for 70 m thick. In addition, paleochannels can be imaged with good resolution.





Developing Integrated Techniques; GPR, Gradient magnetic and EM to Locate Water Pipeline Position under Asphaltic Road

Chanon Lumpoo

Department of Earth Sciences, Kasetsart University, Bangkok, Thailand

chanon_lompoo@outlook.com

Assist. Professor Desell Suanburi*

Department of Earth Sciences, Kasetsart University, Bangkok, Thailand

fscidss@ku.ac.th

The golden line monorail Bangkok Mass Transit System Project is going to be constructed on Charoen Nakhon and Somdet Chao Phraya Road, Klong San District, Bangkok to manage traffic problem. Charoen Nakhon road where water pipeline is located along which engineering foundation construction is needed to avoid water pipeline (Diameter \approx 1,500 mm and \approx 2 m depth). Location of water pipeline is should be determined by Applied GPR, Gradient Magnetic and EM Technique. There are 13 survey lines on these Road with 30 – 100 m spacing which cover 4 lanes (from 6 lanes) of asphaltic road. GPR technique with 400 MHz antenna for targets depth of 4 m was selected as 1st priority method. Then EM with moving coil technique 400 Hz with perpendicular planar configuration (PERP) 4 m separation was attempted to support GPR result. Vertical Gradient Magnetic measurement by 1 m sensors spacing was also carried out at the same reading position of GPR. The results of GPR data show hyperbolic, Gradient Magnetic data were negative peak (reference from background about 2000 nT) and EM data were positive peak (reference from background about 200 ohm/m) where the water pipeline position. GPR technique clearly identified water pipeline position while Gradient Magnetic and EM can support GPR data except some location of survey line may affected from various noise. In case of wet surface environment, GPR signal were unclear, Gradient Magnetic and EM may better support data.





Characteristic of Aggregates Rocks on the Alkali-Silica Reaction at U Thong District, Suphan Buri Province, Thailand

Chinnasit Harueanmit

Department of Earth Sciences, Faculty of Science, Kasetsart University,
Bangkok, Thailand
b5510406313@ku.ac.th

Krit Won-In*

Department of Earth Sciences, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fscikrit@ku.ac.th

This research aims to study of Alkali-Silica Reaction (ASR) expansion potential of different aggregates which were collected from three mines at U Thong district, Suphan Buri province, Thailand. The samples were tested by using several methods namely; Petrographic, Accelerated Mortar bar Test (AMBT), X-Ray Diffraction (XRD) and Chemical Analysis (XRF). The aggregate in this study was meta-limestone. The physical and chemical analysis of limestone aggregates were mostly calcite, which has high CaO and low SiO₂ contains in chemical compositions. The AMBT expansion results indicated the larger expansion of samples than the suggested values of the standard which indicated the potential ASR deleterious expansion. Also, the studies of thin section revealed the evidence of ASR gel at the aggregates' rim, inside the aggregates and in the matrix.

This result used to classify the qualities of limestone aggregates from U Thong district, Suphan Buri province, Thailand, which should avoid using in large-scale construction such as highway and a huge building, but could be used in small-scale construction such as a home.





Geology of Ban Na Phun gem deposit, Na Phun sub district, Wang Chin district, Phrae province

Harnarong Sisamlee

Department of Earth Sciences, Faculty of Science, Kasetsart University,
Bangkok, Thailand
harnarong.s@ku.th

Krit Won-in*

Department of Earth Sciences, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fscikrit@ku.ac.th

Ban Na Phun deposit is well known as the blue sapphire deposit which associated basaltic rocks. These basalt was the Den Chai – Wang Chin basalt that was the alkaline basalt by DMR 1987. This research aims to study physical and chemical characteristics of basalt in Na Phun sub district, Wang Chin district, Phrae province by Petrography , X-ray diffractions and X-ray fluorescence. Those basalts were flowed 2 time and lied on itself. These two layers are charaterized vesicular basalt (Upper) and highly weathering basalt (Lower) .There were gem-bearing basalt indicated by xenocryst of spinel in two layers.

XRF showed the chemical compositions of the rock such as silica oxide 39.7 - 49.1% potassium oxide 1.71 - 2.94% and other oxide. The rocks were alkaline basalt, most of examples were nepheline foidite , other examples were tephrite basanite and trachy basalt confirmed by their SiO₂ content and K₂O content.

There were many kinds of gemstones sapphire, ruby, black spinel, garnet, zircon, olivine and pyroxene, in the primary source and secondary source. These gemstones have been transporting and depositing in streams and ground surface. This research might be a beneficial development in mining or natural tourism.





Rock Slope Stability at Huai Tha Pon Reservoir in Muang Phetchabun District Phetchabun Province

Kaninsak Sinchai

Department of Earth Sciences, Kasetsart University, Bangkok, Thailand

Kannaree Chuangcham*

Department of Earth Sciences, Kasetsart University, Bangkok, Thailand

The objective of this research aimed to analyze the rock slope stability of the spillway of Huai Tha Pon Reservoir in Muang Phetchabun District, Phetchabun Province. The geological field data was collected, including rock type, dip and strike of discontinuity, slope face, wall strength, RQD, spacing of discontinuity, discontinuity conditions and ground water condition. The engineering rock classification was classified following the Rock Mass Classification System (RMR). Moreover the rock slope stability was analyzed by means of Kinematic Analysis (Stereographic Interpretation), Slope Mass Rating technique (SMR) and Factor of Safety Analysis (FS).

From the finding, it is found that the geology of the Hui Tha Pon Reservoir was covered by sandstone interbedded with shale, Mesozoic era cretaceous period. For rock slope stability analysis, it is revealed that in the southern part of spillway of Huai Tha Pon Reservoir From U shaped arch to kilometer 0+50 has a SMR value in the range of 62 to 71 with factor of safety more than 1.5 falls within the class II which indicating good of rock slope stability. The area of kilometer 0+60 to 0+90 has a SMR value in the range of 45 to 57.65 with factor of safety 1.3 falls within the class III which indicating normal or partial of rock slope stability. As for the area to the northern part of the spillway of Huai Tha Pon Reservoir From U shaped arch to kilometer 0+70 has a SMR value in the range of 64 to 73.75 with factor of safety more than 1.5 falls within the class II which indicating good of rock slope stability. The area of kilometer 0+80 to 0+90 has a SMR value is 50 with factor of safety 1.3 falls within the class III which indicating normal or partial of rock slope stability.

Therefore in can be summarized that the whole picture of spillway of Huai Tha Pon reservoir has high of rock slope stability. However, the both sides of kilometer no 0+60 to 0+90 of spillway should be remarked to reinforce the stability of slope by mean of wire mesh screening and rock bolting.





Characteristics of Ruby Samples, Borai, Trat

Kronsoung Rohitrattana

Department of Earth Sciences, Kasetsart University, Bangkok, Thailand
kornsoung@gmail.com

Somrudee Satitkune*

Department of Earth Sciences, Kasetsart University, Bangkok, Thailand
fscisrd@ku.ac.th

Ruby from Thailand is a notable gemstone and very popular in gem. In Thailand, ruby is from basaltic genesis and it has been found not only primary deposit but also secondary one. The famous ruby deposit in Thailand is from Borai district, Trat province known as “Siamese ruby”. The objective of this research is to identify the ruby samples from Borai deposit, Trat province by specific gemological instruments.

As the results, the physical properties of ruby from Borai deposit are reported that specific gravity (S.G.) is 3.86, refractive index (R.I.) are 1.764 - 1.784. Siamese ruby samples are red to purplish red due to their trace elements. The samples with high Cr_2O_3 content could be shown deep red color, however, the samples with the high Fe_2O_3 and TiO_2 mixing with Cr_2O_3 content could be produced purplish red. There are typical inclusions in ruby samples from this source including needle-like inclusion, finger print and some mineral crystal inclusions. In addition, the samples are inert under UV fluorescence. In Thailand, ruby is from basaltic genesis and was found all both, primary deposit and secondary deposit.





Rainfall Amount from Influence of Tropical Cyclone in Thailand.

Ladda Tasaso

Department of Earth Sciences, Kasetsart University, Bangkok, Thailand
num_ladda1704@hotmail.co.th

Pongsakorn Jiwapornkupt*

Department of Earth Sciences, Kasetsart University, Bangkok, Thailand
fscipsw@ku.ac.th

The amount of rainfall from the influence of Tropical Cyclones in Thailand (1992 -2011) were studied. The objective is to study rainfall amount from the influence of Tropical Cyclones in Thailand by the information collected from Tropical Cyclone and the daily rainfall data. It was found that the geographical location of the Tropical Cyclones passage is in between the 2 oceans including the Pacific Ocean (the South China Sea) and the Indian Ocean. During 1992 to 2011 there were 41 Tropical Cyclones moving across Thailand (around 2-3 Tropical Cyclones per year). Depression is the general level of Tropical Cyclones found in Thailand.

The results revealed that there were 7 Tropical Cyclones moving across Northern Region during July to September. The affected timing is 3-5 days and all the depression. Daily rainfall amount in range of moderate to very heavy rain (29.1 – 111.1 mm/day). The ratio of maximum daily rainfall from tropical cyclone (R_T) and the average monthly rainfall (30 years) (R_a) is 6-20%. There were 17 Tropical Cyclones moving across North-eastern Region during August to October. The affected timing is 3-5 days and there were 5 tropical storms, and 12 depressions. Daily rainfall amount in range of moderate to very heavy rain (45.5 – 263.4 mm/day). The R_T/R_a ratio is 7–34%. There was 1 Tropical Cyclone moving across Eastern Region on October. The affected timing is 3-4 days and all the depression. Daily rainfall amount in range of very heavy rain (38.8 – 84.7 mm/day). The R_T/R_a ratio is 15.89%. There were 16 Tropical Cyclones moving across Southern Region during October to December. The affected timing more than 5 days and there was 1 Tropical Cyclone that the typhoon, there were 2 tropical storms, and 13 depressions. Daily rainfall amount in range of heavy rain to very heavy rain (65 – 298 mm/day). The R_T/R_a ratio is 7–20%. Incidentally, the central and the west-southern didn't have Tropical Cyclone parts of Thailand but have been influence by Tropical Cyclone.





The Measuring Earthquake on May 5th2014 in Chiang Rai Province

Nutchanon Swangwan

Department of Earth Sciences, Kasetsart University, Bangkok, Thailand
Kupohquixtar@gmail.com

Passakorn Pananont*

Department of Earth Science, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fscipkp@ku.ac.th

This research conducts a measurement the seismic intensity of the earthquake on May 5th 2014 in Chiang Rai province by surveying damages and questionnaires and constructing a seismic intensity map.

The study suggests that the seismic intensity according to Modified Mercalli Intensity Scale (MMI) in Chiang Rai province is level 2-8. The highest seismic intensity cover areas including Dong Mada subdistrict, Chom Mok Kaeo subdistrict, Bua Sali subdistrict in Mae Lao district and San Sai subdistrict in Mueang Chiang Rai district and Than Thong subdistrict in Phan district, which has seismic intensity of level 8. And the least seismic intensity cover area including Khun Tan district in Chiang Rai province and Chun district in Phayao province which has seismic intensity of level 2. The result can be applied for planning and mitigation of earthquake hazard of Chiang Rai province in the future.





Characteristics of Blue Sapphire from Phrae Province

Nutnicha Sripadungjaroen

Department of Earth Sciences, Kasetsart University, Bangkok, Thailand

Nutnicha-nut-@hotmail.com

Somruedee Satitkune*

Department of Earth Sciences, Kasetsart University, Bangkok, Thailand

fscisrd@ku.ac.th

The sapphire gem deposit in Ban Bo Kaew, Denchai district, Phrae province is the high potential source of blue sapphire in northern Thailand. The blue sapphire is a variety of gem corundum composed of aluminium oxide (Al_2O_3) and some trace element such as Fe^{2+} and Ti^{4+} . This study is aim to the characteristic of blue sapphire from Phrae province by basic and advanced gemological instrument. As the result, the colors of sapphire ranged from medium blue to dark blue; the refractive indices were 1.762-1.770 with 0.008 birefringence value. The blue sapphire was considered to belong to uniaxial negative crystal; specific gravity values were ranged from 3.95 to 4.10. The internal feature under microscope are growth zoning, two-phase (liquid and gas) and multiphase (liquid, gas and crystal). The chemical composition of sapphire are analysed by energy dispersive x-ray fluorescence spectrometer (ED-XRF). The absorption spectra on blue sapphire investigated by UV-Vis-NIR spectrophotometer show $\text{Fe}^{3+}/\text{Fe}^{3+}$ and $\text{Fe}^{2+}/\text{Ti}^{4+}$ indicating to cause of blue color. It can be use as essential data base to signify the characteristics of blue sapphire from Ban Bo Kaew gem deposit.





Preliminary study of Gemstone deposit at Bo Rai District, Trat Province

Pathomphong Suwannasin

Department of Earthsciences, Faculty of Science, Kasetsart University,
Bangkok, Thailand
pathomphong.s@ku.th

Krit Won-in*

Department of Earthsciences, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fscikrit@ku.ac.th

Bo Rai district in Trat province is well known as the “SIAM RUBY” which associated the alkali basaltic rocks. This research aims to study physical and chemical characteristics of basalt in Bo Rai district, Trat province. The rock type in this study area included of mainly sedimentary rock as meta-greywacke and the extrusive rock as alkaline basalt. The survey result shows mostly greywacke outcrop and 2 alkali basalt outcrops which there area about 50 sq.m. Two alkali basalt outcrops were found at Watsaentum that far form west of Bo Rai district 20 km. and Ban Neonprasert. Geological map (DMR, 2012) shows many outcorp more than 2 locations geologic map, This geologic map more than outcrop of basalt. This investigation also showed that this area were sedimentary basins and had fractures caused by tectonic, then molten lava repeatedly extruded through the fractures and covered the sediment on the surface time by time. Finally, the extruded lava formed the geology of Bo Rai district.

XRF should the chemical compositions of the rock include by silica oxide 39.50- 48.00% potassium oxide 0.27- 2.76% titanium oxide 1.09- 2.59% and other oxide. The rock were alkaline basalt most of example nepheline, foidite other example tephritebasanite confirmed by their SiO₂ content and (K₂O+Na₂O) content.

By geological survey Bo Rai district found granet, ruby, black spinel, zircon and etc. These gem minerals were transported and deposited in streams and ground surface, which researcher hope that it could be develop in to mining industry.





Stratigraphy of Nong Yai Gniess and surrounding rock units, Chonburi Province

Sarawut Buranrom
Department of Earth Sciences, Faculty of Science, Kasetsart University,
Bangkok, Thailand
b5510406453@ku.ac.th

Prayath Nantasin*
Department of Earth Sciences, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fscipyn@ku.ac.th

Geology in study area is comprised of high-grade metamorphic rock unit, Triassic granite and Quaternary unconsolidated sediments. Contacts between these rock units are not clearly observed in the field due to covering of Quaternary sediments. High grade metamorphic rock which has been defined as Precambrian rock unit, consist of mica-schist, quartz mica-schist, schist, biotite gneiss, biotite-hornblende gneiss and quartz-feldspar-biotite gneiss. Intercalated massive lenses of quartzite and marble are also found. Based on field observation, high-grade metamorphic rocks can be subdivided into 4 units including leucosome, mesosome, melanosome, and migmatite. Melanosome is a dominant rock. Carboniferous rock is consisted of slaty shale. Triassic granite is consisted of biotite granite, biotite-muscovite granite and gneissic granite.

Geological structures in the area consist of fault, fold, foliation and lineament. All of them are NW-SE trending with the dip angle of about 50-90 degree.

Petrographic study show that high grade metamorphic rocks in the area are porphyroblastic texture. Most mineral are subhedral to euhedral and some crystals show granoblast and lepidoblast. Some minerals were deformed by tectonic events.





Geochemistry of mafic metamorphic rocks in Nong Yai Gneiss at Chonburi Province

Sayrung Rungsaphrom
Department of Earth Sciences, Faculty of Science, Kasetsart University,
Bangkok, Thailand
b5510406453@ku.ac.th

Prayath Nantasin*
Department of Earth Sciences, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fscipyn@ku.ac.th

The main objective of this project is to identify the protolith of those mafic metamorphic rocks occur in the Nong Yai Gneiss. Such metamorphic rocks are recently assigned to be the tectonic line or suture zone between Sukhothai Fold Belt to the east and Shan-Thai Terrane to the west. Therefore, this study might contribute some tectonic significance of the Nong Yai Gneiss.

Mafic metamorphic rock is the predominant rock type in the Nong Yai Gneiss. Five representative samples of this rock type have the geochemical characteristics of 47.21-61.50 wt% SiO_2 , 14.5-16.7 wt% Al_2O_3 , 5.37-10.65 wt% FeO_t , 2.37-6.13 wt% MgO , 5.66-14.98 wt% CaO .

The AFM diagram shows that four samples belong to calc-alkaline series whereas one sample falls in the boundary between tholeiitic and calc-alkaline series. However, we interpret here that protolith of these mafic metamorphic rocks are basaltic rocks that have been related to volcanic arc setting which is the western side of the Sukhothai Fold Belt.





Water filter of Iron and Hardness Removal in Groundwater from Ceramic Adsorbent

Sirilux Junjaem

Department of Earth Sciences, Kasetsart University, Bangkok, Thailand
b5510406445@ku.ac.th

Kannaree Chuangcham*

Department of Earth Sciences, Kasetsart University, Bangkok, Thailand
fsciknr@ku.ac.th

This study aimed to study the adsorption behaviors of Fe onto bentonite-based ceramic adsorbent. The conditions during all the experimental runs were: pH 7 and temperature 25 °C and natural bentonite was burnt at 600 °C for 12 hrs. The results showed that the sorption of iron in soil bentonite-based ceramic adsorbent, generally exhibited an *S-type* isotherm characterized by an initially small slope that increases with adsorptive concentration. The Linear isotherm is considerably better fit. Moreover, the physicochemical properties of soil (cation exchange capacity, clay content and organic matter) reflected the behavior of iron adsorption. From the experiment, it can be concluded that the bentonite –based ceramic is suitable for iron adsorption. However, this experiment induced precipitation in adsorption process. In summary, bentonite –based ceramic adsorbent is feasible to reduce iron contaminated in environment.





Distribution of heavy metals in leachate from Ban Kam Bon Landfill, Khonkaen Province, Thailand

Tapadee Sankapan

Department of Earth Sciences, Kasetsart University, Bangkok, Thailand

taenteentaen@gmail.com

Unnop Homchan*

Department of Earth Sciences, Kasetsart University, Bangkok, Thailand

fsciunh@ku.ac.th

Ban Kam Bon village in the Khonkaen Province is inhabited of villager and agricultural land adjacent to the large landfill. So, contamination of pollutants such as heavy metals distributed from the landfill to the environment should be studied. This research aimed to study the contamination of heavy metals in leachate, groundwater, surface water and soil in Ban Kam Bon Landfill and vicinity, to compare the concentrations of heavy metals in the leachate, groundwater, surface water and soil with the standard and to study the distribution of heavy metals from the leachate into the environment. Field study and sampling were conducted in 19-20 February 2016. Leachate samples were collected from influent and effluent of leachate treatment system, groundwater samples from 6 monitoring wells, soil samples from 4 stations in landfill and surface water samples from 2 reservoirs, Old Sum Jan and New Sum Jan. Leachate and water samples were filtrated through filter paper No.42. Soil samples were added HCl and HNO₃ and digested by microwave digestion. All samples were analyzed for 6 heavy metals (Pb, Cd, Cr, Ni, Mn, Cu) by ICP-OES (inductively coupled plasma-optical emission spectroscopy). The results were illustrated as followed: In leachate, Cr in Influent and effluent leachate 1 (8.0 and 5.5 mg/l) were higher than the leachate quality standard (5.0 mg/l). Leachate treatment system could reduce Cr in both effluent 1 and effluent 2 about 31.25% and 43.25% efficiency respectively. Pb in effluent 1 and effluent 2 (6.2 and 17.1 mg/l) were higher than the leachate quality standard (5.0 mg/l). Cd in effluent 2 (1.9 mg/l) was higher than the leachate quality standard (0.5 mg/l). In ground water, Cu in monitoring well No.4 and No.6.(0.006 mg/l and 0.014 mg/l) were higher than the groundwater quality standard (<0.003 mg/l). In soil and surface water, the heavy metals concentrations were complied with standard. Contamination of heavy metals may cause adverse effects on the environment and public health in the study area. So, hazardous waste should be separated from general waste and disposed in secure landfill .Monitoring of heavy metals in groundwater and should be done continuously.





Ground Penetrating Radar Investigation at Archaeological site Mueang Bua Roi Et province, Thailand

Techin Nantivipavee
Department of Earth Science, Faculty of Science, Kasetsart University,
Bangkok, Thailand
b5510406356@ku.ac.th

Krit Won-In*
Department of Earth Science, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fscikrit@ku.ac.th

This study conducted a ground penetrating radar investigation at archaeological site Mueang Bua Roi Et province that aimed to study the technical data processing about GPR in archaeological evidence and also to identify and locating anomalies of archeological significance in this area. Within the survey, the GPR SIR-3000 has been used connected to 400 MHz antenna. The raw data has been enhanced through processing program “REFLEXW”. In addition, software program is designed for the complete processing 2D, 3D seismic reflections. The archaeological sites there are main factors chose to use depend on the location that affect the anomalies of GPR revealing the archaeological remains.

The result, GPR was accurated location of the object reflections as well as determination of their configuration in this area. Archeological site Mueang Bua found the anomalies of GPR, which was detected radar signals reflected (hyperbola) in several areas and expected to be a signal that is reflected from objects beneath the surface. The artifacts and gravel could be detected. The site has more signal reflected to the Administrative Office of Mueang Bua in a 250 square meters. There is a test pit to 2-3 meters depth in comparison to previous archaeological excavation pit. And width of a hyperbola cloud be identify the size of artifacts in the ranging from 0.5 -1.5 m and most antiquities that found are pottery sherds in sacrifice sites.





Study of The Suitable Existing Environment of Chongsarika Landfill Site by 2D Resistivity Imaging

Teerasuk Kladsri

Department of Earth Sciences, Kasetsart University, Bangkok, Thailand

b5510406372@ku.ac.th

Desell Suanburi *

Department of Earth Sciences, Kasetsart University, Bangkok, Thailand

fscidss@ku.ac.th

The exist subsurface geological structure study at Chongsarika landfill, Phatthana Nikhom district, Lopburi province. Then the application of 2D resistivity reading continuously through the whole section was perform to inspect the exist subsurface geological structure of subsurface. Five survey lines, 3 lines in E-W and 2 lines in N-S direction, with 10 m line separation and 5 m electrode spacing were locate cover on land. 60 multielectrode equipment was introduced with automatic reading for 250 m long. Dipole-dipole array (for 2D inversion mode) and Schlumberger array (for modified processing and creating 1D inversion model) were used for all reading. 2D resistivity reading was successfully carried out to obtain nice natural conditions data set. Low resistivity zone found at the eastern and southern part of study area, are presented as fracture in limestone zone which may presented as high risk of the leakage point from landfill.





Shallow Marine Seismic Reflection Survey in Coastal of Sam Roi Yot District, Prachuap Khiri Khan Province

Thamonwan Thailae
Department of Earth Sciences, Kasetsart University, Bangkok, Thailand
maymanutd24@gmail.com

Passakorn Pananont*
Department of Earth Sciences, Kasetsart University, Bangkok, Thailand
fscipkp@ku.ac.th

This study conducts a shallow marine seismic reflection survey to the east of shoreline of the Sam Roi Yot district, Prachuap Khiri Khan province in order to identify geological structure such as sedimentary structure, paleo-channel and faults. The survey line is 42 km in length. The seismic survey used 48 channel streamer. Seismic data processing and interpretation reveals interesting geological structures such as unconformities, paleo-channels, fault boundary that continues from the Ranong Fault on shore.





Shallow Marine Seismic Survey between Cha-Am District, Phetchaburi, and Sattahip District, Chonburi

Thanakorn Maneewat

Department of Earth Sciences, Kasetsart University, Bangkok, Thailand

tor-thanakorn@hotmail.com

Passakorn Pananont*

Department of Earth Sciences, Kasetsart University, Bangkok, Thailand

fscipkp@ku.ac.th

Currently, there are only a few organizations that prepare or study on geology of seabed of the Gulf of Thailand that could be utilized for supporting the operation in various fields for national development such as coastal engineering for port construction, oil and natural gas piping, etc., environmental marine geology and coastal fields for finding sand resources to recovery coastal erosion. Accordingly, this research aims to study subsurface geological features by using seismic reflection for shallow data of the sea in the upper Gulf of Thailand. The survey line was located between Cha-am District, Petchaburi Province and Sattahip District, Chonburi Province, with the approximate length of 60 kilometers. This research design was conducted by using sparkers source providing high frequency and 24 multi-channels hydrophones providing high-resolution data. Data obtained from the survey were processed by computer, such as frequency filtering, SRME, deconvolution and migration, etc.

The results obtained from interpretation of seismic data were as follows. Seabed mostly consisted of thick sedimentation and some geographic features of paleo-channel were also found in several areas of the survey area. The data obtained from this research's survey covered the depth of 150 meters approximately which is good for shallow applications.





The analysis of covariance based on the effect on Boer crossbred goats consuming four different food recipes

Aphatsanan Tangkhunaphiphat*, Kanyawee Suwannarat, Nattinee Khampan,
Porntip Sirimahachaikul, Pudit Viriyameta and Chutima Sirichatra
Department of Statistics, Faculty of Science Kasetsart University, Bangkok, Thailand
fscicms@ku.ac.th

The purposes of this research are 1) to study out the method of covariance analysis by data used as secondary data received from Forage research, Bureau of animal nutrition development, Department of livestock development 2) to apply the knowledge of statistics i.e. descriptive statistics, regression analysis, analysis of covariance and statistical distribution 3) to compare different recipes, which affect the weight of Boer crossbred goats. This research includes 16 samples of the goats tested using 4 different treatments to compare the treatments' effectiveness, testing using CRD (Completely Randomized Design). The statistics used in this research are Levene's test, F-test, Shapiro-Wilk test (SPSS), Durbin-Watson test, Kruskal-Wallis test, Runs test, and Analysis of covariance.

The analysis of covariance based on the effect on Boer crossbred goats consuming four different food recipes shows no significant difference at level of significance of 0.05 and the regression coefficients of all treatments are equals this mean can use pooled regression coefficient.

Keywords: Analysis of covariance, Covariate





The Comparison of Forecasting Methods for Thai Gold Bar Price

Kanokkarn Kumhomkul, Nutchanok Amornthawornsak

Patravee Ghinwala, Awatsada Suchartpong and Prasit Payakkapong

Department of Statistics, Faculty of Science, Kasetsart University, Bangkok, Thailand

fscipsp@ku.ac.th

The objective of this research is to study how to use the appropriate prediction manner for forecasting gold-bar price in Thailand and the methods utilised to forecast this are Double Moving Average, Weighted Moving Average, Double Exponential Smoothing, and the Box Jenkins Methodology. Besides, the information used in this thesis is the daily secondary cell one starting from 1 Jan, 2015 – 30 June, 2015 and another one is the monthly information starting from July, 2006 – June, 2015. Apart from this, the criterion used in this comparison is Mean Square Error: MSE and Mean Absolute Percentage Error: MAPE but the one that gives the lowest correction measurement value will be selected.

According to the research, it is found that there are two most appropriate methods of forecasting daily gold-bar price in Thailand; the Weighted average, where k equals to 2 by having the weighted value of 0.90 and 0.10, and the Box Jenkins, ARIMA(2, 1, 3) model. However, the appropriate method for monthly gold-bar price in Thailand is the Box Jenkins ARIMA (1, 1, 1) model.

Keywords: Weighted Moving Average, Box-Jenkins Methodology, gold-bar price





A Comparison of Forecasting Models for The Number of Tourists Traveled in Thailand Case Study: Countries in ASEAN Region

Tanachot Hongsittiwong, Jutharath Thankittikoon, Donruedee Rubkwan,
Supakan Wisetchonlaha and Saowapa Chaipitak*
Department of Statistics, Faculty of Science, Kasetsart University, Bangkok, Thailand
jutharath.t@ku.th

The objective of this paper is to compare three forecasting techniques which are Winter, Box-Jenkins and decomposition techniques for the number of tourists traveled in Thailand, especially Laotians, Malaysian and ASEAN. These three methods are generally used in time series having the trend and seasonal components. Based on the data of seventy-two monthly tourists numbers collected from October 2009 to September 2015, forecasting models from the three techniques are conducted. By comparing its MSE and MAPE, it was shown that for Laotians and Malaysian time series of tourist numbers, Box-Jenkins gave the best fit. However, for ASEAN tourist data Winter method obtained the best model. In addition, the numbers of tourists from Laotians, Malaysian and ASEAN, for the next three, six and twelve months are also predicted.

Keywords: MSE, Winter, Box-Jenkins, Decomposition





A Comparison of Forecasting Methods for Water Supply Consumption in Bangkok, Thailand

Kantaya Yimtien, Kanokporn Nonpriwan, Natthaphon Noimaliwan,
Suwapat Sondee and Thidaporn Supapakorn*

Department of Statistics, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscitdps@ku.ac.th

The objective of this research is to find the appropriate model for forecasting water supply consumption in Bangkok, Thailand. Three methods are considered, which are the Decomposition, Exponential Smoothing Winter and Box-Jenkins methods. Then, the efficiency is compared by the Mean Square Error and the Mean Absolute Percentage Error. The data is separated into two groups. The first group consists of sixty values from January 2010 to December 2014 for determining the models. There are eight values of the latter group from January to August 2015 in order to find the Mean Square Error and the Mean Absolute Percentage Error. The results show that the Exponential Smoothing Winter is the appropriate method to forecast water supply consumption for twelve months in the future because of the lowest in Mean Square Error and Mean Absolute Percentage Error.

Keywords: Decomposition, Exponential Smoothing Winter, Box - Jenkins





The Comparisons of Efficiency of Mean Estimators in Simple Random Sampling when Correlation Coefficient is Negative

Kotchakorn Rueangsri*, Nuthatai Chawaruttanakul, Penpayom Montreekul,
Suvimon Hialong and Phuwit Sopradit
Department of Statistics, Faculty of Science, Kasetsart University
kotchakorn.ru@ku.ac.th

The purpose of this statistical project is to compare the efficiency of five mean estimators such as unbiased estimator, ratio estimator, regression estimator, product estimator and modify product estimator, which was modified by Wuttichai Apidach and Surunya (2014), in simple random sampling when correlation coefficient is negative by comparison with coefficient of variation. This statistical project was simulated bivariate normal distribution to 9 populations with SAS version 9.4. Each of population consists of study variable (Y) and auxiliary variable (X) in 1,000 pairs. The both have mean (μ) is 500 and variance (σ^2) is 200 and correlation coefficient (ρ) are -0.1, -0.2, -0.3, ..., -0.9. Sample sizes of all estimators have 3 levels, which are small ($n = 20, 30, 50$), medium ($n = 100, 150$) and large ($n = 200, 250, 300$)

The results show that regression estimator has the most efficient in all cases. The second and the third efficiency are product estimator and unbiased estimator respectively. The poorest efficient estimators are ratio estimator and modify product estimator.

Keywords: simple random sampling, regression estimator, product estimator, ratio estimator, unbiased estimator





Efficiency Comparison of the Confidence Interval Estimations for a Proportion Parameter in the Binomial Distribution

Nattawan Tiplert*, Porapha Wiboonjaroensri, Minta Aomkratoom,
Intuorn Tanee and Juthaphorn Sinsomboonthong
Department of Statistics, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscijps@ku.ac.th

The objective of this research is to compare the efficiency of confidence interval estimation of five methods—Wald, Score, Rigorous Formula, Jeffreys and ZL methods—for a proportion parameter in the binomial distribution. The criteria for a performance comparison in this study are the confidence coefficient examination and the average width of the confidence interval. The studied factors consist of three groups of sample size (n) are as follows: the small sample size is $n = 5, 10, 15$, the medium sample size is $n = 30, 50, 70$ and the large sample size is $n = 100, 500, 1000$. In addition, the proportion parameter p is defined at $0.05, 0.07, 0.09, 0.10, 0.30, 0.50, 0.70, 0.90$ and the 95% confidence intervals are constructed for five methods. Monte Carlo simulations are conducted for 72 situations and there are 2,000 repetitions for each situation. It is found that the Rigorous Formula method has a good performance for a sample size of 10 and the parameter p is equal to 0.30 or 0.70. The average width of the Jeffreys method tends to have the smallest value for almost all sample sizes and almost all parameters p except p is equal to 0.30, 0.50 and 0.70. The Score method has a good performance for all sample sizes and the parameter p is equal to 0.50. In addition, the Wald method has a good performance for a sample size is greater than 100 and the parameter p closes to 0.10 or 0.90. For the ZL method, it seems to have a good performance when a sample size is very large ($n=1000$).

Keywords: Confidence interval estimation, proportion parameter, binomial distribution, confidence coefficient





EFFICIENCY COMPARISONS OF STATISTICAL TESTS FOR TESTING INTERACTION EFFECTS ON FACTORIAL DESIGNS

Chawisa Khrootmuang, Phrompiriya Pinagapho, Prompan Hiranmongkolrat,
Areerat Tonnum and Ampai Thongteeraparp
Department of Statistics, Faculty of Science, Kasetsart University, Bangkok, Thailand
fsciamu@ku.ac.th

The purpose of this study was to compare the ability of controlling type I error and the power of the tests from five statistical tests for interaction effects on factorial designs: F-test which is the parametric statistic, Rank transformation test (FR-test), Winsorized mean test (FW-test), Modified mean test (FM-test) and Adjusted rank transform test (ART-test) which are the nonparametric statistics. The data considered in this study have normal, chi-square and uniform distributions of error. 2x2 factorial designs are used to study with the sample sizes of 12, 16 and 24 and 3x3 factorial designs with the sample size of 27.

As a result, level of factor A and B and a number of replications cause the ability of controlling type I error. ART-test trends to have more ability of controlling type I error if level of factor A and B and a number of replications increase, however FM-test trends to have less ability of controlling type I error if distributions of error are uniform as well as level of factor A and B and a number of replications decrease. F-test, FR-test and FW-test have ability of controlling type I error in every situations. For power of the tests, when sample sizes are considered, the five statistical tests trend to increase the power of the test. F-test, FR-test, FW-test and FM-test give approximate power of the test while ART-test gives the highest power of the test.

In conclusion, ART-test, which is parametric statistic, can be effectively used to analyze the interaction effect between factor A and B in factorial design when the sample sizes are 16 or 24 and have Chi-square distribution of error.

Keywords: factorial design, adjusted rank transform test, type I error, power of the test





A Comparison of Parameters Estimation Method between Ordinary Least Squares and Maximum Likelihood for Response Surface Analysis

Piyaporn Chote, Punyawee Fasawang, Thanaporn Hengpoocharoen,
Jirapan Sirichat and Chantha Wongoutong

Department of Statistics, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscictw@ku.ac.th

The objective of this research would like to study and compare the efficiency of parameters estimated between Ordinary Least Squares and Maximum Likelihood in Central Composite Design (CCD) for Response Surface Analysis. By considering these methods from the R-Square (R^2) and Mean Square Error (MSE). Using the results of each situation.

This study applied two mathematical functions to solve the problem of experiment consist of two factors and one response. The situation can be separated by following the function has the highest degrees of polynomial are two and three. Each function assign variance of residual two levels with replication at center points in the Central Composite Design (CCD) is three and five. Finally this research has eight situations.

By simulation results using ordinary least squares method and maximum likelihood method in CCD for Response Surface Analysis. Both methods have the same results in term of parameters estimate R^2 and MSE. Considering replication at center points of the experiment by using three and five points, where the variance of the errors is low the results of mean (response) will be similar. But the variance of the errors is high replication at center points of the experiment by using three points some trial of experimental not found curvature. This problem needs the steepest ascent/steepest descent to move for curvature this reason experimental points increase. While replication at center points of the experiment by using five points can be found curvature in every trail of experiment.

Keywords: Ordinary Least Squares (OLS) , Maximum Likelihood (MLE),
Central Composite Design (CCD) , Response Surface Methodology (RSM)





The Comparative of Correction for Heteroscedasticity in Simple Linear Regression

Piyaboon Kunakornjittirak, Nattapol Thumrongweerawat

Titapron Benkan, Pupe Sudsila* and Apinya Hirunwong*

Department of Statistics, Faculty of Science, Kasetsart University, Bangkok, Thailand
pupeagreat@hotmail.com

This research is a comparative study of three methods on correction of heteroscedasticity. The three methods are Box and Cox data transformation (BXCX), Weighted Least Squares method with the unknown actual weights could be estimated by dividing the data into 3 groups (WLS_3) and by dividing the data into 4 groups (WLS_4). The comparison criterion of correction effectiveness is defined as the percentage of the accepted null hypothesis after correction by Goldfeld and Quandt test. Monte Carlo simulation is used to generate data which repeated 1000 times in simple linear regression for each case by SAS 9.4. The situation in case of cross sectional data is used in this research when the variance of error varies with the independent variable as $\varepsilon_i \sim N(0, X_i^\delta)$. This research decided to use two format of variance of error. Format 1, the variance of error decreases when the independent variable increases ($\delta = -2.0, -1.8, -1.5, -1.3, -1.0, -0.8, -0.5$) and format 2, the variance of error increases when the independent variable increases ($\delta = 0.5, 0.8, 1.0, 1.3, 1.5, 1.8, 2.0$). The sample sizes of 15 20 and 30 are considered for significant level of 0.05.

The result showed that the WLS_3 was able to solve problem as well as the WLS_4 for all level of the variance of error in format 1 and 2 and improving when sample size is increase. The BXCX was able to solve problem but not good enough. The WLS_3 is the best to solve heteroscedasticity.

Keywords: Box and Cox, Weighted Least Squares, Goldfeld and Quandt, Heteroscedasticity





A Comparison study of Multiple Regression Analysis and Fuzzy Multiple Regression Analysis

Chaninart Sumonkosit, Tanasat Tititananchai, Wasinee Supa,
Siriluck Kitpipat and Boonorm Chomtee

Department of Statistics, Faculty of Science, Kasetsart University, Bangkok, Thailand
fsciboc@ku.ac.th

The objective of this study is to compare the multiple linear regression analysis and fuzzy multiple linear regression by using SAS for the two data sets: regression and fuzzy data. The criteria are the mean square error (MSE) and mean absolute percentage error (MAPE).

The result of the study is found that: The multiple linear regression analysis is more effective than the fuzzy multiple linear regression base on the *MSE* and *MAPE* for the two data sets.

Keywords: Multiple regression, Fuzzy logic, Fuzzy linear regression, Possibilistic regression





Sunter Sampling Method and Its Efficiency

Veerapat Taweepaya*, Kotchakorn Onkum, Roekkrit Chanpen,
Rattiya Pech-in and Mena Patummasut

Department of Statistics, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscimnp@ku.ac.th

The purpose of this research is to study Sunter sampling and its efficiency. Sunter sampling is compared to simple random sampling and stratified sampling. In simulation study, four population data are generated by using R program, and the simulation consists of 1000 iteration for each sampling method. Three sampling methods are compared by using mean squared error and relative efficiency.

The result shows that Sunter sampling is more efficient than simple random sampling and stratified sampling in case of unequal sizes of sampling units and high relationship between study variables and auxiliary variables.

Keywords: Sunter sampling, Unequal probability sampling, Sampling with probability proportional to size





Lactic acid bacteria (LAB) found during Tempe production and Tempe products from different plastic bag packaging

Ananya Yingjaroentana

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
b5510404299@ku.ac.th

Surang Suthirawut*

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscisrs@ku.ac.th

There are various methods for making Tempe. Our study used method as following ; first soaking of soy bean overnight, dehulling, boiling, second soaking without changing water for 20-24 hrs, second boiling, draining before inoculation with tempe starter, packing in plastic bag and incubation for 24-36 hrs. We focused on step of second soaking of cooked soy bean which consequently resulted in spontaneous acidification by microorganism. Total bacterial, enterobacteria and lactic acid bacteria were examined from 6 samples of soaking water obtained after 24 hrs of cooked soybean soaking as mentioned above. We found that pH of soaking water varied from 5-5.5. Total bacteria, lactic acid bacteria and enterobacteria were investigated at 10^8 - 10^9 , 10^8 - 10^9 and 10^7 cfu/ml, respectively. The results indicated that LAB should play important role on spontaneous acidification. Most of isolated LAB were conventionally identified as *Enterococcus* sp., *Pediococcus* sp. and *Lactobacillus* sp. Study of Tempe packaging by pin pricked holes PE bag and LDPE bag with zip lock and non zip lock were compared. Microbial quality of tempe were examined and the results showed 10^8 - 10^9 cfu/g of both total bacteria and LAB, 10^7 cfu/g of enterobacteria and 10^5 cfu/g of endospore forming bacteria. No different level of bacteria found among treatments indicated that both PE bag and LDPE bag were suitable for tempe packaging. Anyway, PE bag is more preferable because of inexpensive cost and easy to buy.





Isolation of actinomycetes in Bang-Kachao and their capability to produce plant growth promoters

Chonlada Chinorn

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
chonlada_chi@hotmail.com

Kannika Duangmal*

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscikkd@ku.ac.th

Actinomycetes are Gram-stain positive bacteria that are widely distributed in soil. They contribute significantly to the turnover of complex biopolymers of organic matter in ecosystems. They are also well known as producers of many secondary metabolites with an application in agriculture and the ability to promote plant growth. Bang-Kachao is a large green area nearby Bangkok, located in Phra Pradaeng, Samut-Prakan province. The expansion of urban community causes the problems of agriculture in the area. In this study, actinomycetes from Bang-Kachao were isolated and screened for their abilities to produce plant growth promoter. Soil samples were collected from five different locations of Bang-Kachao. Soil was air-dried at room temperature for a week and used for actinomycetes isolation by serial dilution method. Soil suspension from each sample was spread on starch casein agar and humic acid vitamin agar, which were supplemented with nalidixic acid (25 µg/ml) and ketoconazole (100 µg/ml) to prevent unwanted bacterial and fungal growth, respectively. The plates were incubated at room temperature for 2 weeks and the actinomycetes count in these samples was recorded. The result showed that the total count of actinomycetes from these samples on starch casein agar and humic acid vitamin agar were between 3.7×10^3 to 9.8×10^4 CFU g⁻¹ dry soil and 2.7×10^3 to 2.2×10^6 CFU g⁻¹ dry soil, respectively. Actinomycetes colonies with differential characteristics were purified on yeast extract-malt extract agar (ISP2) and kept for long term preservation in 20% (v/v) glycerol at -20°C. In total, 81 actinomycete isolates were recovered from these soil samples. In order to study their plant growth promoting activities, Chrome Azurol Sulphonate (CAS) agar and Pikovskaya's medium were used to detect the siderophore production and phosphate solubilization abilities, respectively. The result showed that 27 isolates had ability to solubilize phosphate and 40 isolates produced siderophore. Identification of these actinomycetes isolates based on 16 rDNA sequences analysis showed that they were members of the genus *Streptomyces*.





Expression profile of ATG16L1 protein in liver tissue of patients with hepatitis B virus-related hepatocellular carcinoma

Harutai Sakai

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand

jeminy71@gmail.com

Ingorn Kimkong*

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand

fsciiok@ku.ac.th

Hepatitis B is a common type of hepatitis caused by hepatitis B virus (HBV). This infectious disease leads to an inflammation of liver cells. Cirrhosis and hepatocellular carcinoma (HCC) may also develop. ATG16L1 is a member of autophagy-related protein family. Many studies suggested that the autophagy play an important role in the replication of HBV, which might lead to chronic liver disease and cancer development. So, this research aims to study the expression of ATG16L1 protein in liver tissue of patients with HBV-related HCC. In this study, liver tissue from HBV patients with liver cancer who verified by the histological test were obtained from King Chulalongkorn Memorial Hospital. The expression of ATG16L1 protein in tumor liver tissues and adjacent non-tumor liver tissues was analyzed by Western blotting. GAPDH protein was used as internal control. Our study found that ATG16L1 protein level was increased in tumor liver tissues (7 of 10 sample pairs) when compared to adjacent non-tumor liver tissues. This finding suggested that ATG16L1 protein may involve in the development of HBV-related liver cancer. However, functional significance of ATG16L1 should be clarified in the future.

Keywords: hepatocellular carcinoma, hepatitis B virus, autophagy, ATG16L1





Phenanthrene Biodegradation by Co-cultivation of Two PAHs Degrading Bacteria

Jagrapong Poomchat

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
jpf_poomchat@hotmail.com

Chetsada Pothiratana*

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fsciscd@ku.ac.th

Churapa Teerapatsakul

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscicpt@ku.ac.th

Surachai Thachepan

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscisct@ku.ac.th

Phenanthrene is one of polycyclic aromatic hydrocarbon compound (PAHs) consisting of 3 fused aromatic rings. PAHs are widely contaminated in environment and difficult in removal because of their low solubility in water. These compounds are known for their carcinogenic and mutagenic properties. Using Phenanthrene enrichment cultivation, bacterial strains belonging to *Bacillus subtilis* and *Pseudomonas* sp. were isolated. The aim of this research was to study the potential of co-cultivation between *Bacillus subtilis* No.34 and isolated *Pseudomonas* sp. No.33 strains for phenanthrene biodegradation. *Bacillus subtilis* No.34 showed a low potential in phenanthrene biodegradation; however, produced endospores. On the contrary, isolated *Pseudomonas* sp. No.33 efficiently degraded phenanthrene, but was not able to form endospore. The antagonistic test was performed to identify the co-culture that showed no deleterious effect. The phenanthrene biodegradation was examined in mineral salt medium (MSM) with a final concentration of phenanthrene of 200 ppm at a shaking speed of 150 rpm at 37 °C for 6 days of incubation. Phenanthrene concentration was measured with UV-VIS spectrophotometry. Interestingly, the defined co-culture of *Pseudomonas* sp.No.33 and *Bacillus subtilis* No.34 showed the higher efficacy of phenanthrene biodegradation than that of pure cultures after 6 days of incubation.





Measurement and Isolation of Airborne and Surface Microorganisms in Indoor Environments

Jirachaya Boonpramuanvit

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand

jirazz07@hotmail.com

Thunyapat Thongyen

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand

ectpt@ku.ac.th

Pinsurang Deevong*

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand

fsciprd@ku.ac.th

High-levels exposure of airborne microorganisms is recognized as a cause of respiratory symptoms and diseases among people. The main objectives of this study were to measure and isolate the airborne microorganisms in air and surface in indoor environments and also study on an influence of human activity on the vertical distribution of airborne microorganisms. Air samples were taken before, during and after human's activities inside four locations concerning dissimilar conditions and factors. Four sampling areas were located in Thailand capital. They were 1) a lecture hall at Kasetsart University, 2) The Blood Bank of Phramongkutklo Hospital, 3) The Medicine Department of Veterinary Hospital in Bangkhaen and 4) a nightclub. The particles were collected in the indoor and outdoor areas using an Andersen N6 six stage impactor and swabbing technique.

Total airborne bacteria (TAB) and fungi (TAF) were measured in colony forming unit (cfu)/m³ of air collected from each environment. Amount of the airborne microorganisms was generally higher during human occupancy than before and after the occupancy. Average concentrations of TAB and/or TAF in indoor air from the Veterinary hospital and nightclub were higher than those outdoor. The maximum concentration of airborne contaminants contained 551, 307, 1905, 2809 bacterial cfu/m³ and 431, 636, 1406, 2095 fungal cfu/m³ in the lecture hall, the Phramongkutklo hospital, the Veterinary hospital and the nightclub, respectively. The results support that vertical distribution of airborne microorganisms is thought to be human movement and occupant activity in the confined environments. Actinomycetes were less numerous in all air samples. Macroscopic characterization showed that the bacterial white colonies were dominant followed by the yellow and orange colonies. Microscopic study revealed great number of 303 bacterial isolates purified from all of different air and surface samples. Gram-positive cocci shaped bacteria were dominant and most frequently found in the samples collecting by both sampling methods. The airborne pathogens such as *Staphylococcus aureus*, *Staphylococcus epidermis*, *Micrococcus* sp. were basically identified using the selective medium (Mannitol salt agar) and biochemical testes. The ability to become drug resistant was tested using disk agar diffusion method.

Keywords: airborne microorganism, indoor air, impactor, swabbing technique
human occupancy, airborne pathogens, antibiotics resistance





Studies on the Effect of Mushroom Extracts Against Liver Cancer Cells

Jiraporn Kantajinda

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
j_kantajinda@hotmail.com

Ingorn Kimkong*

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fsciiok@ku.ac.th

Yaovapa Aramsirujiwet

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fsciypt@ku.ac.th

Hepatocellular carcinoma (HCC) is the most common cancer worldwide, and the third leading cause of cancer mortality. Recently, many mushroom extracts have been reported as the sources of health supplements and substances against several types of cancer in human. So, the aim of this research is to study the effect of Eringii mushroom (*Pleurotus eryngii*) extract on liver cancer cells (HepG-2 cell lines). Eringii mushroom derived from organic farm were extracted with absolute ethanol ($\geq 99.8\%$) and were dried by evaporation. HepG-2 cell lines were cultured in 96-well plate (10^4 cells/well). Various concentrations of Eringii mushroom extract (10, 100 $\mu\text{g}/\text{mL}$) were added and incubated for 24 h. The effect of Eringii mushroom extract on cell viability of HepG-2 cell lines was examined using trypan blue exclusion assay. The results showed that Eringii extract at 100 $\mu\text{g}/\text{mL}$ exhibited higher effect than 10 $\mu\text{g}/\text{mL}$ of Eringii extract with cell viability of 84.96% and 95.06%, respectively. However, these preliminary results should be confirmed in further study.





Biosorption of heavy metals by Lactic Acid Bacteria isolated from soil in Bang Kra Jao

Juthathip Nuamthong

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
the-t-tiipz@hotmail.com

Wanna Malaphan*

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fsciwnpl@ku.ac.th

Heavy metal contamination in nature such as soil and water is quite a big problem due to increasing number of industry and wastes. Natural remediation process is quite slow and may lead to heavy metal accumulation in soil and water which may be recontaminated to food supply chain. Therefore, bioremediation by microorganisms is challenging. Bangkrajao is the agricultural area of various economic plants especially Namdokmai Mango (*Mangifera indica* L.), which have a sweet taste and popular for export. In this study, lactic acid bacteria are interested due to its safety history microorganisms. Isolation of LAB from soil was conducted on MRS with 0.2% sorbic acid (MRSS), MRS with 0.2% sorbic acid and 0.5% NaCl (MRSSN) and Kanamycin-Esculin Agar (KEA). The total of 104 isolates was obtained and two groups were noted for gram positive short rod and gram positive cocci which accounted for 84.32 and 15.38%, respectively. All isolates were screened for biosorption of heavy metals (Ag, Pb) by agar plate method. Point inoculation of each LAB isolates were performed on MRS agar incubated at 37°C for 24h in facultative anaerobe condition. After the colony developed on agar plate then overlaid with 7 ml soft agar containing 0.006M of heavy metal (Ag, Pb) and incubated at 37°C for 15 min. to allow organisms to accumulate the dissolved metal. Biosorption of heavy metal was visualized by exposed to gaseous H₂S, and then observed the light halo around the colony as a positive. Only 68 isolates showed biosorption of Ag which accounted for 65.38% of all isolates. Similarly, 79 isolates showed a positive biosorption to Pb which accounted for 75.96% of all isolates. Results obtain indicated that most of LAB can be used as bioremediation microorganisms.





Isolation and Physiological Characterization of Xylose-Utilizing Yeasts Isolated From Soil Around Pang Sida Waterfall and of Yeasts Isolated From Soil in The Peat Swamp Forest (Pru To Daeng)

Kwanhathai Rungtivaruangrong

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
kwanhathaiiii@gmail.com

Savitree Limtong*

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
scistl@ku.ac.th

Noppon Lertwattanasakul

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscinple@ku.ac.th

Because of the increasing concern regarding petroleum costs and global warming, worldwide has been shown the production of bioethanol as a renewable energy source, especially from renewable resources. In the near future, it is expected that a source for low-cost ethanol production will be lignocellulosic biomass such as agricultural and forestry residues. To find potential yeasts with ability to ferment ethanol from xylose, we isolated yeasts from soil around Pang Sida waterfall and soil from the peat swamp forest (Pru To Daeng) by enrichment technique in yeast extract-peptone-dextrose medium and dilution plate method in 2% xylose-containing synthetic medium supplemented with 0.1% sodium azide, respectively. Forty-five isolates and eight isolates were obtained from the two locations. The shape and budding type of isolated yeast cells were mostly ellipsoidal and multilateral budding, respectively. In addition, most isolated yeasts had ability to ferment ethanol from 4% glucose and utilize xylose as a carbon source at 30°C. The result showed that SD5-1 produced the highest ethanol concentration of 2% w/v. A production of extracellular enzymes such as amylase, lipase, protease, endoglucanase, exoglucanase and beta-glucanase was tested. Of fifty-three yeast isolates, we found that 4, 27, 7, 11 and 1 isolates produced amylase, lipase, protease, endoglucanase, exoglucanase and beta-glucanase, respectively. None of yeasts isolated could produce exoglucanase. All of yeasts isolated are being identified by DNA sequencing of the D1/D2 domain of 26S rDNA gene and their primary sequence will be compared with known species in the public databases.





Survey of *Escherichia coli* O157:H7 in ready-to-eat salads

Methawee Sriprasit

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
methawee.s10@hotmail.com

Kooranee Tuitemwong*

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscikrt@ku.ac.th

Thailand will become aging society in the near future and Thai people are health conscious and turn to have much vegetable in their diets. The safe foods are also important to this group. Outbreak of *E. coli* O157:H7 in the United States through the consumption of salads was reported in 2006. Two hundred and fifty hospitalized with 31 kidney failure and 3 deaths. The objective of this study is to evaluate safety of salad (n=50) for *E. coli* O157:H7 in Bangkok (including Minburi, Bang Kapi, Bag Khae and Bang Khen) using standard conventional method. Six hundred and seventy eight colonies from CT-SMAC were isolated. Ninety-six of them were black with methallic sheen on EMB and 7 of them shown IMViC tests +++-. However, slide agglutination with O157 and H7 antiserum were negative for all isolates. In conclusion, it appears that all salads tested are free from *E. coli* O157:H7 and safe for the consumers.





Isolation of actinomycetes from Bang-kachao and their ability to produce plant growth promoters in saline condition

Mongkol Wimonsoponkitti

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
Pervert_36@hotmail.com

Kannika Duangmal*

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscikkd@ku.ac.th

Soil salinity is one of the major environmental problems that reduce plant growth. Bang-kachao is a large green area which is known as “the lungs of Bangkok” due to it is an agricultural area that surrounded by big city. This area has been reported for the result of sea water that increase soil salinity and gave an effect to reduce plant productivity. Actinomycetes are an important group of Gram-stain positive bacteria that well known as the majority sources of secondary metabolites, including antibiotics and enzymes. They are widely distributed in soil and have been reported for their ability to promote plant growth and help plants to overcome plant stress, including salt stress. Therefore, the objectives of this research were to isolate actinomycetes from soil samples at Bang Kachao, using selective isolation media supplemented with NaCl. The isolates were evaluated for the ability to produce plant growth promoters in saline condition. In this study, soil samples were collected from five different locations of Bang-Kachao. Actinomycetes were isolated from these samples using starch casein agar and humic acid vitamin agar, which were supplemented with 1.5% NaCl, nalidixic acid (25 µg/ml) and ketoconazole (100 µg/ml). The result showed that the total count of actinomycetes from these samples on starch casein agar and humic acid vitamin agar were between 0.23×10^4 and 9.53×10^4 CFU g⁻¹ dry soil, respectively. Actinomycetes colonies with differential characteristics were purified on yeast extract-malt extract agar (ISP2) and kept for long term preservation in 20% (v/v) glycerol at -20°C. A total of seventy-three actinomycetes isolated recovered from these soil samples were tested for siderophore production on Chrome azurol S (CAS) agar supplemented with 1.5% NaCl and phosphate solubilization ability on Pikovskaya agar supplemented with 1.5% NaCl. The result revealed that twenty-one isolates showed an orange color zone around the colonies on Chrome azurol S agar, which were siderophore producing strains. Twenty-two isolates produce clear zone around the colonies on Pikovskaya agar, which were phosphate solubilizing strains. Six isolates were positive for both siderophore production and phosphate solubilization. Identification of representative of these actinomycete isolates based on 16 rRNA gene sequences showed that were members of the genus *Streptomyces* and *Pseudonocardia*. The actinomycetes strains which produced plant growth promoters in saline condition may be beneficial to promote plant growth in this area.





Isolation and screening of plant growth promoting bacteria from soil in Num Dok Mai mango plantation in Bangkachao

Napaporn Kajadpai

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand

Pumin Nutaratat

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand

Nantana Srisuk*

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscints@ku.ac.th

Bacteria are the most microorganisms in soil. Some of them have the abilities for promoting plant growth. In this study soil samples were collected from Num Dok Mai mango plantation in Bangkachao and used for bacteria isolation by direct method on NA medium. Then 137 bacterial isolates were studied on their plant growth promoting traits. These bacterial strains were investigated for production of indole-3-acetic acid (IAA) in the presence of 0.1% (w/v) L-tryptophan. The amount of IAA was determined by a colorimetric method using Salkowski reagent. Results showed that the isolate BSSN1-3 produced the highest IAA concentration (207.41 $\mu\text{g/ml}$). However, eight bacterial isolates which are BSSN1-3, BSSN1-5, BSSN3-5, BSBS1-5, BSBB1-12, BSBB2-18, BSBS3-1 and BSBB1-1 produced IAA more than 90 $\mu\text{g/ml}$. These isolates were therefore selected for the study on their phosphate solubilizing and siderophore producing activities by agar plate assay using Pikovskaya's (PVK) and chrome azurol sulfonate (CAS) media, respectively. Among 8 isolates studied, BSSN1-5 solubilized phosphate while BSSN1-3 and BSSN3-5 showed both phosphate solubilizing activity and siderophore producing activity. In addition, these isolates were tested for their antagonistic activity against *Colletotrichum gloeosporioides*, the fungal pathogen causes anthracnose disease in mango. By using dual culture assay, the isolate BSSN1-5 exhibited the strongest antagonism against the pathogen. We therefore selected the isolate BSSN1-3 on the basis of plant growth promoting properties together with antagonistic activity to be identified by 16s rDNA sequence analysis.





Screening and Identification of Phytase-Producing Fungi

Natchaya Chatchavalrat

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
b5510403969@ku.ac.th

Saeree Jareonkitmongkol*

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
saereej@gmail.com

Forty-seven soil samples were collected from various places in Thailand such as agriculture area, community area, and husbandry area. They are screened for phytase-producing filamentous fungi by using a phytase-screening medium supplemented with an antibiotic (streptomycin) and the phytase-producing filamentous fungi were selected by observing clear zone formation around the colony. Seventy-four isolates which can degrade phytate and form clear zone around the colony were selected and nineteen isolates were found to degrade phytate most efficiently. The highest phytase-producing fungi strains were isolated and identified using morphological analysis under microscope. Most of them are identified to be *Aspergillus* and *Penicillium*.





Single Laboratory Validation of Silica Nanoparticles Test Kit (SNPs) for *Campylobacter jejuni* Chicken and Products

Nattarat Wongsuwan

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
b5510400030@ku.ac.th

Kooranee Tuitemwong*

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fsckrt@ku.ac.th

Campylobacter jejuni is found mainly in poultry and products and considered the major causative agent of gastroenteritis in man. The rapid detection comparable to the standard method is crucial for the intervention and control of the pathogen. The objective of this study was to perform a single laboratory method validation of the antibody conjugated dye-doped silica nanoparticles (SNPs) developed in our laboratory against a standard method (mCCDA with PCR confirmation) using ISO16140 guidelines. It was found that the SNPs has relative accuracy, specificity, and sensitivity of 92%, 100%, and 86.7%, respectively. The inclusivity (30 *C. jejuni* strains of chicken and human isolates) and exclusivity (50 intestinal origin strains) were both 100%. The relative detection limit was 10^3 cells/g (ml). The SNPs test kit was comparable to the conventional method.





Strain improvement of by induced mutation of *Bacillus pumilus* DMKUB39 and its optimization for enhancing of β -xylanase production

Nattha Yongwattana

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
b5510403951@ku.ac.th

Srisakul Trakarnpaiboon

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
srisakul31@gmail.com

Vichien Kitpreechavanich*

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fsciwck@ku.ac.th

β -xylanase have direct potential applications in industries such as food feed and drug industry, the paper industry, and it also used for enzymatic production of xylooligosaccharides from xylan for further application in other industries. Most of the xylanases known to date are optimally active at temperatures below 50 °C and unstable at high temperature. Therefore, the objectives of this study were to improve high level β -xylanase production and stable at high temperature of *B.pumilus* DMKUB39 by ultraviolet irradiation and ethyl methylsulfonate (EMS) mutagenesis and study on optimization for β -xylanase production by the selected mutant strain. The result showed that the best mutant strain (E19) achieved by increased β -xylanase activity from the populations generated by EMS mutagenesis at 9.68% survival. The β -xylanase production of E19 produced 864.58 U/ml increasing 1.8-fold and remained β -xylanase activity increase 120.95% when kept at 60 °C for 1 h, compared to the wild type. The optimized concentration of wood xylan and peptone in the basal medium using central composite design were found to be 8 g/l and 15.5 g/l, respectively at the cultivation in 250 ml shaking flask of speed 150 rpm at 48 h. The medium optimization resulted 1,113.26 U/ml increased β -xylanase activity. For characterization of crude enzyme, the maximum activity of β -xylanase were found at pH 5.5 and 50 °C, respectively. The β -xylanase was stable at pH of 4.5-5.5 and temperature of 30-55 °C.





Isolation and Screening of Thermo Stable Extracellular Alkaline Protease Producing Bacteria from Green Areas in Bangkokjao

Natthanicha Sukphodee

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
Pornchanan36@gmail.com

Pinsurang Deevong*

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fsciprd@ku.ac.th

Alkaline protease is one of the most important classes of industrial hydrolytic enzymes. The industrial demand for alkaline proteases with favorable properties continues to enhance the investigation for new producing alkaliphilic isolates and new enzymes. The alkaline proteases have various industrial applications including leather, pharmaceutical, protein processing, food and peptide synthesis industries. In this study, bacteria isolated from soil and water samples were collected from green areas in Bangkokjao, Phra Pradaeng, Samut Prakan, Thailand. The isolated bacteria were tested their abilities to produce the proteolytic enzymes and many isolates showed activity of the alkaline proteases at high pH and temperature. Moreover, optimum conditions (pH and temperature) for producing the enzyme were tested. A total of 96 different isolates were purified and characterized. All isolates were tested their ability to degrade skimmed milk on solid media with different pH (7, 9 and 12), temperatures (35, 50 and 55 °C) and NaCl concentrations (1.5 and 3.5%). Morphological characterizations of the isolates were based on macroscopic and microscopic approaches. The results revealed that, the isolates SS-1, SS-2(1) and SS-7 showed activity of their alkaline proteases at the extreme pH and temperature (55 °C and pH 12). Biochemical tests and analysis of 16S rRNA genes were used for bacterial identification of the thermo stable extracellular alkaline protease producing bacteria. The isolates and enzymes will be useful for applications in detergent industry and waste treatment.

Keywords: alkaliphilic, alkaline protease, bacteria, proteolytic enzymes





Isolation and Physiological Study of Yeasts Isolated from Soil in Sirindhorn Peat Swamp Forest Nature Research and Study Center (Pa Pru To Daeng), Narathiwat Province

Nichakorn Sadoyu

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
nichakornsadoyu@gmail.com

Savitree Limtong*

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscistl@ku.ac.th

Noppon Lertwattanasakul

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscinple@ku.ac.th

Nowadays, Energy demand for industrial, agriculture and population are increasing dramatically. Therefore, this study concerned in finding yeast from organic soil at Sirindhorn Peat Swamp Forest Nature Research and Study Center (Pa Pru To Daeng), which can produce ethanol, synthesize extracellular enzymes and studying their characteristics. Three strategies, enrichment technique, enrichment technique with addition of 1% absolute ethanol and dilution plate method were employed to isolate yeasts from 12 soil samples. A total of 44 yeast isolates was obtained by using a yeast nitrogen base containing 2% D-xylose medium supplemented with 0.02% w/v chloramphenicol and 0.25% w/v sodium propionate. The shape and budding type of isolated yeast cells were mostly ellipsoidal and multilateral budding. Screening for ethanol production from glucose-containing yeast extract-peptone broth at 150 rpm shaking cultivation revealed that most isolated yeasts had ability to ferment ethanol from 4% glucose and utilize xylose as a carbon source at 30°C. The result showed that the isolate TD(1)05-1 produced the highest ethanol concentration of 0.81% w/v, which was higher than that produced by the control strain *Saccharomyces cerevisiae* Sc90 cultivated under the same condition. Notably, none of them could ferment xylose. Some of the yeasts isolated could synthesize the extracellular enzymes. The isolate TD (1)05-1 was identified as *Cyberlindnera subsufficiens*. The other yeast isolates are being identified by DNA sequencing of the D1/D2 domain of 26S rDNA gene and their primary sequence will be compared with known species in the public databases.





The Effect of Medical Mushroom Extract on the Growth of Liver Cancer Cells

Nisachon Chamchaeng

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
bewbnc@gmail.com

Yaovapa Aramsirujiwet*

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fsciupt@ku.ac.th

Ingorn Kimkong

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fsciok@ku.ac.th

Mushrooms are the source of valuable food from nature which include their medicinal properties. Many report about the mushrooms extract as anticancer agent were published. In this study, the medicinal mushroom *Hericium erinaceus* (Monkey's head mushroom) was extracted with ethanol using rotary evaporator. The mushroom extract was tested for its anticancer property to liver cancer cells (HepG2) in vitro. The liver cancer cells (HepG2) were cultivated in 96 well plate using dulbecco's modified eagle medium (DMEM) supplemented with 10% fetal bovine serum (FBS) and antibiotics (penicillin and streptomycin) and incubated in 5% CO₂ incubator at 37°C for 24 hours. Afterwards, the liver cancer cells were move to new dulbecco's modified eagle medium (DMEM) supplemented with the mushroom extract at concentration 10 and 100 µg/ml then the cells were incubated in 5% CO₂ incubator at 37°C for 24 hours. The tested cells were stained with 0.4% trypan blue and done cell counted using Haemacytometer. The live cells indicated by colorless cells because trypan blue could not stained but the dead cells appeared to blue color because of stained with trypan blue. The result show that the Monkey's head mushroom extract with ethanol could inhibited the growth of liver cancer cells (HepG2) but required high concentration.





Study of soybean soaking water and amount of fungal inoculum to quality of tempe

Nuwara Jumnonngit

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
ab7757402@gmail.com

Surang Suthirawut*

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscisrs@ku.ac.th

There are many factors during tempe production that related to microbiological properties of tempe such as soaking period ,moisture content of cooked soybean , acidic condition of cooked soybean and acidic cooked soybean draining period before inoculation step. We aimed to study of microbiological properties from tempe products based on different type of soaking water and amount of tempe inoculum. Two different sources of filtered water used for soaking period resulted in different final pH of cooked soybean soaking water. Cooked soybean soaking water from 1st source and 2nd source could decrease pH to 5.5 and 5.2 , respectively. Ammonia quantities obtained from tempe products from 1st source was consequently higher than 2nd source. However , results of total bacteria, enterobacteria and endospore forming bacteria counts from those tempe products were almost in same level at 10^9 , 10^8 - 10^9 and 10^6 - 10^7 cfu/g, respectively. In addition, study of different amount of fungal inoculum (2.4×10^6 , 3.75×10^6 , 4.8×10^6 and 7.5×10^6 spores per 500 g soy bean) showed that microbiological quality of tempe products . These results indicated same that kinds of soaking water and amount of fungal spore inoculum in level of 10^6 per 500 g of soybean were not affected to microbial quality in tempe. Dominated enterobacteria frequently found were conventionally identified as *Klebsiella pneumoniae* subsp. pneumonia and subordinately found *Enterobacter* sp. whereas *Serratia* sp. was rarely found. Dominated endospore forming bacteria were conventionally identified as *Bacillus thuringiensis* and unidentified endospore forming bacteria.





Expression profile of ATG16L1 protein in hepatitis B virus infection

Ongon Chotiwutidachar

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
P-M_LF@hotmail.com

Ingorn Kimkong*

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fsciiok@ku.ac.th

Hepatitis B virus (HBV) infection is a major global health problem. Chronic infection by HBV can lead to severe liver diseases including liver cirrhosis and hepatocellular carcinoma that is one of the leading causes of cancer-related death in the world. Autophagy is an important pathway for host defense against viruses. So, this research aims to study the role of protein in autophagy pathway that involve in HBV infection. In this study, we used western blot technique to detect the expression of ATG16L1 protein in three types of liver cell lines including immortalized human hepatocytes (THLE-2), human hepatoma cell line (HepG2) and human hepatoma cell lines transfected with HBV genome (HepG2.2.15). Our study found that the expression of ATG16L1 protein increased in HepG2.2.15 and HepG2 cell lines when compared to THLE-2 cell lines. This result suggests that ATG16L1 protein, which is a member of autophagy-related protein family might has an important role. However, the role of ATG16L1 in HBV infection and liver cancer development is needed to prove and clarify in further study.





Characterization and optimization of microalgae *Schizochytrium* sp. for DHA production

Paisan Tongam

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
B5510404108@ku.ac.th

Deunrat Chonudomkul*

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscidrc@ku.ac.th

DHA is an omega-3 polyunsaturated fatty acid. Its structure is a carboxylic acid with 22 carbon atoms and six *cis* double bonds. DHA plays a significant role in human cognitive ability and brain physiology. It is a primary structural component of the human brain, cerebral cortex, skin, sperm, testicles and retina. There are reports showed that the marine microalgae within the genus *Schizochytrium* sp., is a primary producer of DHA in large amounts. The objectives of this research were isolation and screening of *Schizochytrium* sp. obtained from the mangrove forests along the Gulf of Thailand. Isolation was carried out on Glucose Yeast extract Peptone agar (GYP) supplemented with chloramphenical. The colonies of *Schizochytrium* sp. were picked up and maintained on modified GYP agar plates containing 3% glucose. One hundred and forty-five isolates of *Schizochytrium* sp. were obtained for screening by using GYP broth containing 3% glucose in duplicate and incubated at 25 °C C for 36 hours in a rotary shaker at 115 rpm. The results showed that 17 stains contained relatively high DHA contents ranging from 20 - 32% of total fatty acids. Tertiary screening revealed that one strain namely *Schizochytrium* sp. SAS 7.20 had the highest DHA content at 32% of total fatty acids. This strain should be further studied for optimal conditions to improve the DHA production. To optimization difference concentrate sugar at 3%, 5%, 7% and temperature 25 °C, 30 °C

Keywords: DHA, *Schizochytrium* sp., Mangrove forest, Thailand





Isolation and screening of plant growth promoting yeast from soil in Num Dok Mai mango plantation in Bangkachao

Panpilar Meekamol

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand

Pumin Nutaratat and

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand

Nantana Srisuk*

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscints@ku.ac.th

Soil sample were taken from six districts in mango plantation area in Bangkachao, Samut Prakan province, Thailand. Two hundreds and nineteen yeast isolates were obtained from soil by enrichment method in yeast extract dextrose (YPD) broth, pH 6.5 ± 0.2 , and plated on YPD agar supplemented with chloramphenicol and sodium propionate and adjust pH based on the pH of soil sample (pH 5.5, 6.5, 7.5 and 8.5) for selection. The aim of this study was to isolate and screen for plant growth promoting yeast from mango plantation soil to apply as biocontrol agent as well as mango plant growth promoting yeast. All of yeast isolates were tested for indole-3-acetic acid (IAA) production in YPD broth supplemented with 0.1% L-tryptophan. Thirty four isolates produced high concentration of IAA (more than $99 \mu\text{g/mL}$). These isolates were then investigated for phosphate solubilizing ability on Pikovskaya's agar and siderophore production on Chrome Azural S (CAS) agar. Only one isolate i.e. YSSN2-1 showed phosphate solubilizing activity whereas three isolates i.e. YSSN2-1, YSBC2-15 and YSBC2-19 showed siderophore production. Eleven isolates that produced higher IAA concentration than $150 \mu\text{g/mL}$ (YSSN1-14, YSSN1-1, YSBC3-11, YSSN1-11, YSBY1-1, YSSN2-1, YSBB2-7, YSBC1-23, YSBB2-13, YSBB3-9 and YSBB2-11) were investigated for antagonistic activity against *Colletotrichum gloeosporioides*, a pathogenic fungi causes antracnose disease in mango. Dual culture assay was performed on potato dextrose agar (PDA). After 5 days incubation at $30 \pm 2^\circ\text{C}$, all tested isolates showed inhibition of pathogen growth. The isolate YSNN1-11 possessed the highest percentage of antagonistic activity. However, the isolate YSSN2-1 was chosen due to its ability on IAA production as well as phosphate solubilizing ability and siderophore production. This isolate was therefore subjected to strain identification using molecular technique.





Study of Cereal Grains Used in Solid State Cultivation of Mushroom Mycelia for Hydrophobin Extraction

Patcharin Mathurapojanakul

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
m.meiji.pat@gmail.com

Chetsada Pothiratana*

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fsciscd@ku.ac.th

Churapa Teerapatsakul

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscicpt@ku.ac.th

Surachai Thachepan

Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscisct@ku.ac.th

Hydrophobins are small, about 10 kDa sized active proteins that are produced by filamentous fungi and mushrooms. They are able to self-assemble into an amphipathic protein layer at hydrophilic/hydrophobic interfaces, resulting in the change of wettability of the target surfaces. Hydrophobins show surface activity which can reduce surface tension of water. They can be used in biotechnological and medical application. The aim of this research were to develop the techniques for solid state cultivation of mushroom mycelia using cereal grains for higher yield of aerial mycelia earned in a shorter period compared to the conventional static liquid cultivation and hydrophobin extraction. Mycelia of *Agrocybe cylindracea* and *Trametes* aff. *maxima* No14 were inoculated on three cereal grains; sorghum, barley and corn. Mushroom mycelia growths were determined by glucosamine content measurement. The result showed that Barley showed the highest glucosamine content among the examined cereal grains. The crucial steps of hydrophobin extraction; pretreatment of mycelia and hot SDS-buffer treatment, were studied in order to develop the efficient extraction techniques suitable for solid state culture. The crude hydrophobin extracts were measured their concentration using Bradford assay and separated using SDS-PAGE.





Production of Tempeh starter in laboratory scale and shelflife

Pawanrat Prayodamornkul

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
notez_0727@hotmail.com

Surang Suthirawut *

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscisrs@ku.ac.th

Tempe is a traditional fermented food of Indonesia. Produced by fermentation of cooked soy bean and *Rhizopus oligosporus*. At the present, tempe product is widely available in Indonesia. As tempe is gradually well-known among Thai vegetarians but there is still no commercial product of tempe starter originated in Thailand. This study aimed to make tempe starter in laboratory scale. Four treatments of various substrates were done by using rice bran mixed with water at ratio 10:5 or rice bran supplemented with corn flour, rice flour or soy flour and mixed with water at ratio 9:1:5, respectively. After that each 15 gram of sterilized substrate in polypropylene bag was inoculated with 0.2 gram of *Rhizopus oligosporus* dry powder spore (approximately 10^7 cfu/g), incubated at room temperature for 2-3 days or until the appearance of greyish black of fungal mycelium was observed. The mycelium of each treatment was subsequently cut into small pieces and dried 6 hours at 40-42 °c in hot air oven or until the dried mycelium weight reduced more than 50%, then crushed into powder by sterile mortar and pestle. Tempe starter powder of each treatment were divided into 2 zip lock polyethylene bags for storage at room temperature and 4 °c in the refrigerator. Before storage step each treatment of tempe spore powder were subsequently enumerated on PDA supplemented with Rose Bengal 0.13% for fungal spore count and also contamination of endospore forming bacteria and *Enterobacteria* were determined. The results showed initial fungal spore at $3.8 - 5.5 \times 10^7$ cfu/g which decreased to $1.2 - 3.8 \times 10^7$ cfu/g after 4 months storage. Moreover, no endospore forming bacteria and enterobacteria at 100 times dilution samples was detected. No significant different of spore count was found among treatment. However, we found that storage at 4 °c showed more number of fungal spores than storage at room temperature in every treatment.





Selection of endophyte *Bacillus* spp. against *Phytophthora* sp. and characterization their antagonistic mechanisms and plant growth promotion properties

Phanumas Nguanprasert

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
b5510404116@ku.ac.th

Chatsuda Sakdapetsiri

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
chatsuda.sakdapetsiri@gmail.com

Vichien Kitpreechavanich*

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fsciwck@ku.ac.th

Orchid is important flower in Thailand. Black rot disease caused by *Phytophthora palmivora* is one of the most serious orchid diseases. Biological control is an alternative way because safe and environmentally friendly it effective, than chemical control. Recently, *Bacillus* spp. have been reported the ability to inhibit growth of many phytopathogens. The aim of this study were to select endophytic *Bacillus* spp. against Black rot disease causing *Phytophthora palmivora*, their antagonistic mechanisms and their ability on plant growth promotion. In this research, five isolates (1ER19, 1EL23, 2ER28, 2ES50, 1ER52). From 35 endophytic *Bacillus* spp. isolates previously isolated from wild orchids showed high ability to inhibit growth of *P. palmivora* (inhibition zone more than 17 mm) by dual culture method. All five isolates were used to study antagonistic mechanisms such as volatile compound, fungal cell wall degrading enzymes (protease, cellulase, chitinase and glucanase) and of antifungal substance productions and to investigate plant growth promotion properties (IAA, NH₃, siderophore productions, and phosphate solubilized). The results indicated that antagonistic mechanisms of all 5 stains were the production of protease, cellulase, glucanase and antifungal substances. Nevertheless, it was found that all stains had the plant growth promotion characters that produced siderophore, IAA and ammonia, excepted isolate 1ER52, was also able on phosphate solubilization.





Detection of *E.coli* O157:H7 by Loop-mediated isothermal amplification (LAMP) technique.

Phisurang Konjanda

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand

phisurang@hotmail.com

Chaivat Kittigul*

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand

fscicvk@ku.ac.th

E. coli O157:H7 is important bacteria which causes bloody diarrhea, nephritis (hemolytic uremic syndrome), renal failure or fatal. In this study detection of *E. coli* O157:H7 was developed by using loop mediated isothermal amplification (LAMP) assay which is highly specific and sensitive method for amplification of the target genes. LAMP uses 4-6 primers specific to 6 regions of target gene. In this study gene *rfbE* which code for O antigen, *stx1* and *stx2* genes which code for shiga like toxin of *E. coli* O157:H7 were target genes for amplification. The condition used in LAMP was at 63 C for 60 minutes. Reading of result was done by naked eye observation of hydroxynathol blue (HNB) color change from purple to sky blue color in positive samples and no color change in negative samples. Confirmation of result was done by agarose gel electrophoresis followed by staining with ethidium bromide which showed ladder band of DNA. The result of experiment showed that LAMP test can specifically detect *E. coli* O157:H7 and have no cross reaction with 8 other bacteria (*Bacillus*, *Shigella*, *Salmonella*, *Serratia*, *Pseudomonas*, *Proteus*, *Enterobacter*, *E. coli*). Sensitivity of LAMP was determined to be at least 0.0001 ng/ μ l DNA of *E.coli* O157:H7.





The effects of an extract of persimmon to control diseases in strawberries

Pornpattra Songrak

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
guggiff_love@hotmail.com

Yaovapa Aramsirujijwet*

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fsciyp@ku.ac.th

Strawberries are an important economic plant in Northern part of Thailand. The important problem to cultivate this plant is the pathogen especially the fungal pathogen which reduced the yield of strawberries. The fungicide is widely used to reduce the fungal pathogen but this method could harm to customers and also the farmer who used it. The aim of this research is to study the efficiency of the persimmon extract to control the growth of fungal pathogen in strawberries. Two strains of persimmon, Xi Chu and Hong Mei, were extracted with ethanol and kept at 4 °C before used. Preliminary test, an agar well diffusion method was done with 5 fungal pathogens, *Colletotrichum gloeosporioides*, *Pestalotiopsis sp.*, *Rhizoctonia sp.*, *Aspergillus sp.* and *Fusarium oxysporum*. The result show that the persimmon extract could inhibited the growth of *Colletotrichum gloeosporioides* and *Pestalotiopsis sp.* so we used these fungi to done a detached leaf technique. Two strains of strawberries, 80 and 329, were used and 2 methods were performed. The first method, the persimmon extract was dropped on strawberries leaf 30 min before inoculated the fungi. The second method, the fungi were inoculated on strawberries leaf 24 hr before the persimmon extract was dropped on the leaf. The symptom of disease was checked after 3 day. The results show that the first method could control the disease cause by *Colletotrichum gloeosporioides* but not for *Pestalotiopsis sp.* in both strains of strawberries and persimmon. In contrast, the second method could not control the disease in both strains of strawberries and persimmon. This result indicated that the persimmon extract could control the disease cause by *Colletotrichum gloeosporioides* in strawberries if we use before the disease appear.

Keywords: strawberries, persimmons extract, fungal pathogens in strawberries.





Anti-fungal plant disease properties of lactic acid bacteria isolated from soil

Pretti Srisoi

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
pan_12537@hotmail.com

Wanna Malaphan*

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fsciwnpl@ku.ac.th*

Fungi constitute the largest number of plant pathogens and are responsible for a range of serious plant diseases. They damage plants by killing cells and/or causing plant stress. Fungi enter plants through natural openings such as stomata and through wounds caused by pruning, harvesting, hail, insects, and mechanical damage. This research is aimed to evaluate efficacy of Lactic acid bacteria (LAB) isolated from soils in Thailand as biocontrol agents against fungal soil-borne pathogens. Direct spreading on MRS with 0.2% sorbic acid (MRSS), MRS with 0.2% sorbic acid and 0.5% NaCl (MRSSN) and Kanamycin-Esculin Agar (KEA) were used for the isolation of lactic acid bacteria. The total of 88 isolates were randomly picked 27 (MRSS), 50 (MRSSN) and 11 (KA), respectively. All isolates were gram positive with 88% short rod shape, 2% long rod shape, and 10% coccus shape. Antifungal properties on inhibition of hyphal growth were tested by dual culture method against 3 soil-borne pathogens which are *Colletotrichum gloeosporioides*, *Fusarium moniliforme* and *Curvularia lunata*, incubated at room temperature (28°C) for 3-5 days then the zone of inhibition (mm) were observed. None of the isolate showed inhibition activity on hyphal growth of all fungi tested but nutrient competitiveness was observed as slow growth was noticed compared to control especially for isolate MRSSN62. Moreover, inhibition of spore germination against all 3 fungi was also performed. It seems that at high initial concentration of spore (10^4 spores/ml), inhibition of spore germination was slightly observed and could be due to the low concentration of organic acid produced in a culture media. Therefore, to apply this lactic acid bacteria as a biological control agent, the initial concentration of fungal spore should be considered.





Isolation and Identification of Chitinase-Producing Bacteria from Khung Bang Kachao

Sakawrat Uamtet

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
b5510400501@ku.ac.th

Patcharaporn Siwayaprahn*

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscippsp@ku.ac.th

Chitinases are important enzymes in the agriculture for biological control of phytopathogenic fungi, in the environment for waste treatment and useful in the biofuel, food and textile industries. The objectives of this study were to isolate and identify chitinase-producing bacteria from soil of Khung Bang Kachao, Samut Prakan Province. Twenty-seven bacterial isolates were selected for identification of bacteria. Soil bacterial count of culturable cell numbers was 3.9×10^7 CFU/g. All the isolated showed 40.74% of Gram negative rod-shaped bacteria and 59.26% of Gram positive bacteria (44.44% of Gram positive rod-shaped bacteria and 14.82% of Gram positive cocci bacteria). To study on morphological and biochemical characteristics showed similarity with genus *Corynebacterium* (6 isolates), *Aeromonas* (5 isolates), *Bacillus* (3 isolates), *Lactobacillus* (3 isolates), *Pseudomonas* (3 isolates), *Staphylococcus* (3 isolates), *Serratia* (2 isolates), *Proteus* (1 isolate), and *Streptococcus* (1 isolate). Only one strain of chitinase producing bacteria (BC12) was found. The BC12 was identified on the basis of morphological, biochemical characteristics and 16s rRNA gene sequence analysis revealed 99.84% similarity with *Aeromonas sanarellii* Strain LMG 24682. The BC12 showed the highest chitinase activity (1.15 units/ml) in Tryptic soy broth (TSB) with 0.3% colloidal chitin at 37 °C for 6 days. Chitinase from the BC12 will be further study on biocontrol of plant pathogens.





Mechanisms of epiphytic yeasts against fungal pathogens in rice seedling rot disease *in vitro*

Satawan Kongsomjit

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand

satawan_2536@hotmail.com

Savitree Limtong*

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand

fscistl@ku.ac.th

Rice seedling rot disease, caused by plant pathogenic fungi namely *Helminthosporium oryzae* and *Curvularia lunata*, is one of the important problems on rice production. The fungi infect rice in seedlings phase, seedlings may show brownish discoloration below or above the soil and are stunted, turn yellow, and eventually could die consequent to ultimately affect rice seedlings productivity. Antagonistic yeasts is possible to control this disease by direct mechanisms that directly inhibit pathogenic fungi (e.g. competition for nutrients and space, production inhibitory compounds of volatile organic compounds and fungal cell wall degrading enzymes) and indirect mechanisms that promote plant growth (e.g. production of siderophores and solubilization of phosphate and zinc oxide). The aims of this research were to study inhibitory mechanisms on fungi causing rice seedling rot disease (*H. oryzae* DOAC 2293 and *C. lunata* DOAC 2313) and to determine plant growth promoting activity of antagonistic yeasts, as well as to study the potential of the selected antagonistic yeasts to control seedling rot disease in plant in laboratory. Among 12 strains of yeasts isolated from plant leaves, *Wickerhamomyces anomalus* DMKU-RP25 effectively inhibited *H. oryzae* DOAC 2293 and *C. lunata* DOAC 2313 by competition of nutrients and space. *Torulaspora globosa* DMKU-RP31 produced volatile compounds to inhibit *C. lunata* DOAC 2313 with efficacy of 60.4%. The production of fungal cell wall degrading enzymes i.e. chitinase, β -1,3-glucanase and protease by all antagonistic yeasts were investigated. *Kodamaea ohmeri* DMKU-RP233 produced protease on skimmed milk agar with the enzyme activities index (EAI) of 0.73. *W. anomalus* DMKU-RP25 produced β -1,3-glucanase activity with 3.8 U/ml when cultivated in potato dextrose broth containing cell wall of *H. oryzae* DOAC 2293. No chitinase was produced by all yeast strains. Only *W. anomalus* DMKU-CP122 produced siderophores. While only *K. ohmeri* DMKU-RP233 showed the ability to solubilize phosphate and zinc oxide with the solubilization efficiency (SE) of 1.37 and 1.43, respectively. In glasshouse experiment, *W. anomalus* DMKU-RP04, *W. anomalus* DMKU-RP25 and *T. globosa* DMKU-RP31 could control rice seedling rot disease caused by *H. oryzae* DOAC 2293.





Optimization of tannase production from fungi in liquid medium supplemented with agricultural residue

Sattraporn Kasamewitch

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
b5510404213@ku.ac.th

Churapa Teerapatsakul*

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscipt@ku.ac.th

Tannase catalyses the hydrolysis of ester bond of tannins to produce gallic acid and glucose. Tannase finds application in pharmaceutical, food and beverage industry. Optimization of the culture conditions and medium composition is necessary for tannase production. *Trametes polyzona* KUcpt01, *Trametes elegans* RRIT01 and *Fusarium solani* were showed a potential candidate of tannase producer in primary screening. To engineer the production of tannase by fungi, a four-level Box–Behnken factorial design was employed to optimize the culture medium composition. This statistical approach enabled rapid identification and integration of key medium parameters for fungi, resulted the high tannase production. The expression of fungal tannase was found to be influenced by culture conditions such as pH, concentration of carbon source, nitrogen source and guava leaf.

Keywords: Box–Behnken Design, Media optimization, Tannase, White rot fungi





Diversity of soil fungi from Bangkajao district and screening for their xylanase and laccase production

Sireen Pummala

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand

pixxyfly@hotmail.com

Yaovapa Aramsirujwet*

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand

fscipty@ku.ac.th

Role of fungi in the environment as a decomposer which break down the soil organic matter are widely known. It is estimated that there are approximately 1.5 million fungi species in the world, of which around 4.6% are known. However, the studies from 2001-2010 represent the new 210 species of fungi in Thailand which divided into Ascomycetes 78 species, Anamorphic fungi 48 species, Basidiomycota 45 species and yeasts 39 species, indicating that there are many kind of fungi in the environment. Samut Prakan province has a green area well known as Bangkajao district, with a variety of microorganisms inhabiting it. They represent the resource from an ecological. This area are surrounded by Chao Phraya River (freshwater) and Gulf of Thailand (brine). Due to the conditions of this area, fungi inhabiting must be halophile, or at least halotolerant.

The aim of this study was to isolate, identify and screen for their enzymes (xylanase and laccase) production. Hence, the research work was carried out to isolate. Soil from 5 different places in the district were collected and mixed well. Due to the conditions of this area, fungi were isolated from soil using Potato Dextrose Agar, Potato Dextrose Agar with 1.5% NaCl and Martin's Rose Bengal Agar by pour plate technique and spread plate technique. Then identify by their morphological characteristic using slide culture technique. Sixty-five strains were isolated and maintained in Potato Dextrose Agar Slants. The morphological studied indicated that the isolated fungi belonging to Deuteromycota, Ascomycota and Zygomycota. The common fungal species found in this study were *Aspergillus* spp. To screen their xylanase and laccase production, the isolated fungi were be cultivated on Potato Dextrose Agar plates containing beechwood xylan and 0.1% guaiacol, respectively and checked for enzyme production. The result showed that only *Codinaea* sp. presented laccase production. The xylanase producing fungi in this study were mostly *Aspergillus* spp. , *Trichoderma* spp. and *Penicillium* spp. .

Keywords: fungal diversity, Bangkajao, xylanase, beechwood xylan, laccase, guaiacol





Study on the Effect of Succinate, Fumarate and Hydrophobin on Growth and Ethanol Fermentation in the Thermotolerant Yeast *Kluyveromyces marxianus* DMKU 3-1042

Sujamas Komsoongnurn

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
sujamas.sujamas@gmail.com

Savitree Limtong

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscistl@ku.ac.th

Noppon Lertwattanasakul*

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscinple@ku.ac.th

With the inevitable depletion of the world's energy supply, there has been an increasing worldwide interest in the production of bioethanol from renewable resources. A high-temperature fermentation technology is expected to help reduce cooling cost, efficiently achieve simultaneous saccharification and fermentation, reduce the risk of contamination, and offer stable fermentation even in tropical countries. *Kluyveromyces marxianus* DMKU 3-1042 is one of the most thermotolerant yeasts, which was suitable in this technology because this yeast is able to grow until 49°C and utilize various sugars as a carbon source. On the basis of transcriptome analysis in our previous study on ethanol fermentation from glucose at 45°C and from xylose at 30°C showed that acetate was possibly accumulated and some TCA metabolites might be deficient. To clarify what occur during the fermentation under the two conditions mentioned above, we tested the effect of succinate and fumarate on cell growth and ethanol fermentation. We found that addition of 20 mM succinate or fumarate into the YPD medium slightly enhanced both the specific growth rate (0.20 h⁻¹ and 0.18 h⁻¹ for fumarate and succinate, respectively, compared to that of the control, 0.10 h⁻¹) and ethanol production (0.84 % w/v and 0.55 % w/v for fumarate and succinate, respectively, compared to that of the control, 0.53% w/v) when cultivated in glucose medium at 45°C. The maximum biomass was also increased by the two metabolites. The similar effect was also found when applied the two metabolites into the xylose medium, but the effect was slightly more pronounced in case of the succinate. Other strategy to improve the ethanol production is the use of protein hydrophobin extracted from a mushroom, namely *Agrocybe cylindracea* to capture carbon dioxide molecules generated during ethanol fermentation from glucose and xylose. Our result showed that addition of 0.5µg/ml crude extract of hydrophobin significantly enhanced the specific growth rate (0.176 h⁻¹ versus 0.148 h⁻¹) in glucose medium, but not in xylose medium. Taken together, our findings might be very useful to improve ethanol fermentation from glucose and xylose at high temperature.





Survival enhancement of probiotic *Lactobacillus paracasei* subsp. tolerans JCM 1171 by encapsulation and freeze –drying

Suttipong promsawad

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand

suttipongpromsawad@gmail.com

Duenrut Chonudomkul*

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand

fscidrc@ku.ac.th

The goal of this work was to investigate preservation of *Lactobacillus paracasei* subsp. tolerans JCM 1171 culture by encapsulation in 20% skim milk with a sodium alginate. The effect of freeze drying on viability of probiotics was studied. The ability of cryo-protectants, *i.e.* maltodextrin, trehalose and whey, by pre-and post-encapsulation to protect viability of the probiotic bacteria together with encapsulation were compared. Concentrations of sodium alginate at 1.5, 2.0 and 2.5% in protection of the bacterial cells against freeze drying condition were determined by shelf-life analysis of the dried product. The results indicated that encapsulation of *Lactobacillus paracasei* subsp. tolerans JCM 1171 cultured in 20% skim milk with sodium alginate achieved a high survival rate of 97.24% which indicated that the matrix and the encapsulation technique were compatible with the bacteria. Highest survival rate was attained when the probiotic was encapsulated with 2% sodium alginate together with trehalose as the cryo-protectant. The freeze dried products were kept in polypropylene tube under vacuum and atmospheric conditions. Shelf-life test was determined by accelerated storage viability technique by incubated at 37 °C for 2 weeks. This study indicated that encapsulation of probiotic cultured in skim milk with sodium alginate and addition of trehalose before freeze-drying protected the probiotic from the adverse freeze drying environment improved the survival rate of probiotic for long term storage.





Selection of *Bacillus* sp. stains for high efficient on indole acetic acid and Study on factors affecting the production

Thanapat Ontnikul*

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
b5510404175@ku.ac.th

Vichien Kitpreechavanich

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fsciwck@ku.ac.th

Supattra phanngoan

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
sarahayo153@gmail.com

Chatsuda sakdapetsiri

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
chatsuda.sakdapetsiri@gmail.com

Bacillus spp. are reported one of bacteria that capable on promotion growth of plants by production of indole - 3-acetic acid (IAA) which is a plant hormone that inducing cell elongation and cell division with subsequent results of plant growth and cell development. Use of bacteria in the production of IAA will cause farmers reduced chemicals used, environmentally friendly and safe. The objectives in this study were to screen high efficient of IAA producing *Bacillus* and optimization of the medium to obtain high level of IAA production. A total 130 isolates from culture collection, Department of Microbiology, Kasetsart University were screened for high IAA production. The results showed that isolate 3ER39 produced the highest production $37.0 \pm 0.03 \mu\text{g/ml}$. Therefore this isolate was selected for study the optimal medium for IAA production in shaking condition of 180 rpm at room temperature after 72 hour using the basal medium contained 5 g/L peptone, 10g/L tryptophan, 10 g/L beef extract. Among various carbon sources were used to investigated the IAA production such as cassava chips powder, rice powder, rice bran, glucose, mannitol, sucrose, fructose, galactose, maltose, and lactose and various nitrogen sources such as peptone, yeast extract, casein and fermented soybean meal found that rice powder and casein were the best carbon source and nitrogen source that gave the highest IAA amount at $162.6 \pm 0.25 \mu\text{g/ml}$ and, with the cell density of 3.53×10^7 CFU/ml.

Keywords: Indole- 3 - acetic acid, *Bacillus*, optimization.





Factors Affecting Biodegradation of Polycyclic Aromatic Hydrocarbons by a white rot fungus *Trametes polyzona* RYNF13

Thanyarat Pinyo^{1,*}, Chetsada Pothiratana¹, Surachai Thachepan² and ChurapaTeerapatsakul^{1,**}

¹Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand

²Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand

*presenter: thanya_paew@hotmail.com, **contact person: fscicpt@ku.ac.th

Polycyclic aromatic hydrocarbons (PAHs) are common pollutants in soil and river sediments known to be carcinogenic and mutagenic. PAH-polluted sites require urgent decontamination. Biodegradation of three PAHs, phenanthrene, fluorene, and pyrene by *Trametes polyzona* RYNF13 was investigated. To improve the efficacy in PAH biodegradation by the fungus, factors affecting the biodegradation were studied. The fungus showed excellent removal of PAHs at high concentration of 100 mg·L⁻¹. Complete degradation of fluorene in the mineral salt glucose medium was observed within 25 days, whereas 48% of phenanthrene and 24% of pyrene were degraded under the same conditions. PAH biodegradation by the fungus was found to be influenced by culture conditions such as concentration of nitrogen source, initial pH and the presence of inducer and surfactant. A four-level Box–Behnken factorial design was employed to optimize the culture medium composition. A mathematical model was developed to show the effect of each medium component and their interactions on the PAH biodegradation in submerged culture. The model estimated the optimal concentrations. These predicted conditions were verified by validation experiments. Under the optimized conditions, efficacy in PAH biodegradation by the fungus was higher than that obtained in non-optimized conditions.

Keywords: Biodegradation, Box–Behnken Design, Fluorene, Phenanthrene, PAHs, Pyrene, *Trametes*





Identification and characterization of thermotolerant acetic acid bacteria isolated from Huai Kha Khaeng Wildlife Sanctuary, Thailand

Theerisara Phathanathavorn

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
theerisara.ph@gmail.com

Gunjana Theeragool*

Kasetsart University, Bangkok, Thailand
fscignt@ku.ac.th

Acetic acid bacteria, especially *Acetobacter* and *Komagataeibacter* (formerly *Gluconacetobacter*, *Ga.*), play important role both in food and beverage industries. These bacteria are well known for commercial vinegar fermentation due to their abilities to oxidize ethanol and tolerate against high acetic acid concentration accumulated in culture medium. They normally grow well at 25-30°C so it needs cooling system to maintain its optimum growth temperature during fermentation process especially in Thailand or other tropical countries. To overcome this problem under global warming era, thermotolerant acetic acid bacteria especially the strains isolated in tropical area are of interested to be characterized. These bacteria are isolated from various natural sources such as fruits, flowers, vinegar, alcoholic beverages and rarely found in soils and insect guts. In this study, we obtained 78 isolates of thermotolerant acetic acid bacteria from Huai Kha Khaeng Wildlife Sanctuary. All of the 78 isolates were designed as HKKU isolates and were characterized for molecular taxonomy, plasmid profile analysis and acetic acid production at high temperature. Among 78 isolates, 19 isolates (HKKU 1, 5, 6, 7, 8, 9, 10, 11, 12, 14/2, 15, 16, 25, 28, 34, 45/2, 66, 87 and 148) could grow and produce high amount of acetic acid compared with *Acetobacter pasteurianus* SKU1108 (a promising strain for high temperature acetic acid production) by ratio of clear zone/colony (cm/cm) more than 2 on YPGD agar containing 0.5%CaCO₃ and 4%ethanol at 30 and 37°C for 48 hours. Based on plasmid profile analysis, 6 isolates (HKKU 11, 12, 14/2, 15, 16 and 25) showed the different pattern of plasmid profile so they were selected for further 16S rRNA gene sequence analysis. The result showed that HKKU11, 12, 14-2, 16 and 25 were identified as *A. pasteurianus* LMG 1262^T in the range of 99.93-100% 16S rRNA gene sequence identity. In addition, HKKU15 was identified as *A. lambici* LMG 27439^T with 99.27% 16S rRNA gene sequence identity. These results indicate that *Acetobacter pasteurianus* are dominant species for acetic acid production at high temperature.





Study on phytase production of molds isolated from soils.

Tidarut Pratumtuang

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
b5510403993@ku.ac.th

Saeree Jareonkitmongkol*

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
saereej@gmail.com

The aim of this study is to investigate enzymatic properties of phytase from molds isolated from soil. Thirty-four molds isolated from soils of various regions in Thailand which are able to degrade phytase were assayed for their enzyme activity. All mold isolates were cultivated in a modified phytase screening medium and phytase activity was measured. The mold labeled “35B” was selected to investigate for its enzymatic properties since it was found to have the highest phytase activity among the thirty-four isolates when cultured for 7 days (0.548 units/mL). Effects of temperature and pH on enzyme activity were studied at a temperature range of 30-70 °C and a pH range of 2.0-10.0. The optimum temperature was 60 °C and the enzyme is stable on incubation at 30-50 °C for 30 minutes. The optimum pH of the phytase was 2.5, and it is stable on incubation in buffers with pH 2.0-10.0 for 24 hours. The mold labeled “35B” was identified to be *Aspergillus* sp. by the morphological characterization.





Identification and characterization of acetic acid bacteria newly isolated from fruits in Thailand

Wannasiri Klinchan

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
b5510400498@ku.ac.th

Gunjana Theeragool*

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscignt@ku.ac.th

Acetic acid bacteria (AAB) are widespread microorganisms in nature. They are isolated from a various natural sources such as fruits, flowers, vinegar, alcoholic beverages and rarely found in soils and insect guts. These bacteria, especially *Acetobacter* and *Komagataeibacter*, are generally used for vinegar production due to their higher ethanol oxidizing and acetic acid resistant abilities. Moreover, the latter genus also produces cellulose which has a several unique properties and wide range of applications. In this work, we obtained 27 isolates of AAB newly isolated from various kinds of fruits in Thailand. All isolates (MSKU300-MSKU326) were characterized for acetic acid and BC production, plasmid profile and molecular taxonomy. All isolates were tested for acetic acid production compared with *Acetobacter pasteurianus* SKU1108 (a promising strain for high temperature acetic acid production) by ratio of clear zone/colony (cm/cm) on YPGD agar containing 0.5% CaCO₃ and 4% ethanol at 30 and 37°C for 48 hours. The result showed that 15 isolates (MSKU300,301,302,303,305,307,308,309,310,313,314,316,318,319 and 320) could grow and produce high amount of acetic acid at 30°C. Only MSKU305 could grow and produce high amount of acetic acid both at 30 and 37°C. All of them were further determined for acetic acid production in YPGD medium containing 4% ethanol at 30°C for 7 days. The obtained result corresponded well with the previous result showing that MSKU305 produces the highest amount of acetic acid in liquid medium both at 30 and 37°C. In addition, bacterial cellulose production was performed in HS medium compared to HS medium containing 1% acetic acid and 2% ethanol. Among 15 isolates, MSKU304 produced higher yield of bacterial cellulose in HS medium containing 1% acetic acid and 2% ethanol than HS medium at 30C. Analysis of plasmid profiles were performed in 15 isolates and 16S rRNA gene sequencing of the selected 7 isolates will be carried out.





Improvement of acetic acid production by adapted *Acetobacter pasteurianus* SKU1108 (7E-13) from rice wine

Watcharakiat Kuekoon

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
b5510404183@ku.ac.th

Gunjana Theeragool*

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscignt@ku.ac.th

Acetic acid bacteria, especially *Acetobacter* species, have been used in vinegar fermentation for more than 1,000 years due to their higher ethanol oxidizing and acetic acid resistant abilities. Industrial vinegar production by *Acetobacter* sp. is usually carried out at 30°C so a cooling system is required to maintain its optimum growth temperature during fermentation process. Thermotolerant acetic acid bacteria are of interest for oxidative fermentation at high temperature especially in the era of global warming due to their abilities to reduce the cooling cost. From our previous report, *Acetobacter pasteurianus* 7E-13 was obtained from *A. pasteurianus* SKU1108 strain by sequential adaptation to higher ethanol concentration and higher temperature. The selected adapted strain, 7E-13, could produce high yield of acetic acid in medium containing yeast extract at high temperature. However, industrial vinegar fermentation is commonly carried out by using raw material without yeast extract which is expensive and produces unfavorable smell. In this study, the adapted 7E-13 strain was improved for the efficacy of vinegar fermentation by the sequential cultivation for 17 generations in Jasmine rice wine containing 6% ethanol without yeast extract at 37°C. As a result, the 7E-13 strain could grow well and produce 5.6% of acetic acid in Jasmine rice wine containing 6% ethanol at 37°C for 4 days. This adapted strain shows high potential for high temperature vinegar fermentation in Jasmine rice wine without yeast extract supplementation.





Study on phytase production of molds isolated from soil

Wiriya Sriwichai

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
b5510404191@ku.ac.th

Saeree Jareonkitmongkol*

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
saereej@gmail.com

Thirty-three phytase-producing molds which were isolated from soil were cultured in a modified phytase-screening medium at pH 7. The culture broth was used to study the enzyme activity and the properties of the phytase from the molds that produced the highest quantity of enzyme. The activity of phytase enzyme was measured by using 0.4% sodium phytate as the substrate and evaluated the quantity of inorganic phosphate released during the reaction. The molds labeled 6A, 2B and 4C were found to produce the highest amount of enzyme. After time course study of the 6A, 2B and 4C phytase production in the modified phytase screening medium, it was found that the molds labeled 6A produced the highest quantity of phytase enzyme at 7th day of cultivation. The mold 6A was studied for the optimum temperature, heat stability at a temperature range of 30-60 °C and the optimum pH, pH stability at a pH range of 2-10. The result showed that the optimum temperature of phytase enzyme from culture broth was 60°C and the phytase enzyme was stable against a temperature range of 30-50°C for 30 minutes. The phytase enzyme showed optimum pH at 2.0 and was relatively stable at the pH range tested with more than 50% of residual activity. The mold 6A was identified to be *Aspergillus* sp.





The use of herb extracts for control *Trichoderma hazianum* and *Pseudomonas fluorescens* in Bhutan oyster mushroom

Yadpiroon Boonsue

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
funny-fon@hotmail.co.th

Kooranee Tuitemwong*

Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscikrt@ku.ac.th

The objective of this study was to use 10 medical plant extract such as Pueraria mirifica, Garlic, Galangal, Lemon grass, Shallots, clove, Cumin, Turmeric, Ginger and Star anise to control the green mold disease and bacterial blotch disease in Bhutan oyster mushroom caused by *Trichoderma hazianum* and *Pseudomonas fluorescens*. There are 4 solvent Methanol, Acetone, 95%ethanol and Hexane use to extract the medical plant by rotary evaporation. The test of bacteria was used disc diffusion method and in fungi was used dual culture method which followed by Fokkema (1978). Antimicrobial index followed by Villasenor *et al.* (2004) of Pueraria mirifica, Galangal, Lemon grass, Shallot, Star anise and Cumin crude extract with methanol were 3.6667, 3.5000, 2.3333, 1.8333, 2.6667 and 2.3333, respectively. Antimicrobial index of clove and Star anise crude extract with acetone were 1.000 and 0.8333

Star anise crude extract with methanol was the most effective inhibited the growth of *Pseudomonas fluorescens*. The second and the third efficient are Henna crude extract with methanol and Star anise crude extract with acetone. The minimal inhibitory concentration followed by Basri *et al* (2005) of three crude extract are 0.00209 g/ml, 0.00253 g/ml and 0.00224 g/ml, respectively. The minimal bactericidal concentration of three crude extracts are 0.00417 g/ml, 0.00506 g/ml and 0.00448 g/ml, respectively.

Galangal crude extract with hexane was the most effective inhibited the growth of *Trichoderma hazianum* 74.44% and the second one was Galangal crude extract with 95% ethanol inhibited the growth 70% when compare with control. The minimal inhibitory concentration of Galangal crude extract with hexane and 95%ethanol were 0.00142 g/ml and 0.00708 g/ml.

The result of this study showed pH of all the crude extract was 2.5-5.5. Star anise crude extract with methanol was the most effective inhibited the growth of *Pseudomonas fluorescens* caused bacterial blotch disease. Galangal crude extract with hexane was the most effective inhibited the growth of *Trichoderma hazianum* caused green mold disease.





Development of enhanced fluorescent reporter vector

Chaiyos Sirimaneekul

Department of Biochemistry, Faculty of Science, Kasetsart University,
Bangkok, Thailand
roeygolf@hotmail.com

Nattanan T-Thienprasert*

Department of Biochemistry, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fscinnp@ku.ac.th

Fluorescent reporter vector is important for molecular biology and biotechnological-based researches. It is popular and favored over conventional reporter vectors such as luciferase and chloramphenicolacetyl transferase (CAT) genes because it is sensitive and cheap, as it is not required substrates. Moreover, it can be used for studying localization. Generally, a good reporter vector must provide a high level of gene expression. Therefore, it usually contains enhancers and strong promoter. Otherwise, the reporter gene is genetically engineered for a codon optimization. From the previous studied, a sub-element of hepatitis B virus post-transcriptional regulatory element (HBV PRE 1151-1410) was reported to stimulate gene expression of intronless luciferase and HBV transcripts. This study therefore aimed to develop an enhanced fluorescent reporter vector by inserting the HBV PRE 1151-1410 in the fluorescent reporter vector (pMGFP). By using bioinformatics analysis, the HBV PRE 1151-1410 was characterized as the highly structural conserved region. Currently, HBV PRE was successfully amplified with the specific designed primers and it is now digested and subjected for insertion into the cut pMGFP vector. The new-engineered vector will be validated using sequencing and will be investigated the level of its fluorescent activity in the future.

Keywords: reporter vector, fluorescent gene, HBV PRE, protein expression





Study of novel gene in aldo-keto reductase superfamily in Thai jasmine rice (KDML 105)

Chawanwit Imsuwan
Kasetsart University, Bangkok, Thailand
iihea54@gmail.com

Chonticha Tantitadapitak*
Kasetsart University, Bangkok, Thailand
fscicct@ku.ac.th

Aldo-keto reductase (AKR) is an enzyme superfamily found in almost all living organisms. Most AKRs use NADPH as the cofactor to metabolize steroids, sugars and other carbonyl compounds. Furthermore, AKRs are involved in detoxification process of several reactive aldehydes generated during stress. The aim of this study is to investigate novel AKR genes in rice. *OsI_02879* and *OsI_12597* are putative AKR gene; the sequences of which are distinct from the other AKRs that have been reported previously. Previous study in our laboratory, the coding sequence of *OsI_12597* was successfully cloned and the nucleotide sequence of which was successfully sequenced. In this study, the recombinant protein of *OsI_12597* was produced and visualized on SDS-PAGE. In addition, this study would like to examine mRNA expression pattern of *OsI_02879* in different tissues of rice using RT-PCR technique. These may lead to better understanding of aldehyde metabolism in rice.

Keywords: Aldo-keto reductase, IPTG, Thai jasmine rice (KDML 105)





Effects of the Y286F and Y286W mutations in beta-glucosidase from *Aspergillus niger*

Duangdow Saechou
Kasetsart University, Bangkok, Thailand,
duangdao.se@ku.th

Asst.Prof. Prachumporn Kongsaree, Ph.D.*
Kasetsart University, Bangkok, Thailand,
fscippt@ku.ac.th

Bio-ethanol is ethanol produced from biomass materials. Biomass is degraded into sugars and then fermented into ethanol. Currently, food crops are used as starting materials for ethanol production, resulting in increasing food price. Hence, they are not an appropriate source of raw materials. Cellulose is an alternative starting material for bio-ethanol production, because it can be degraded into glucose by synergistic actions of many cellulases and β -glucosidase. β -Glucosidase catalyzes the hydrolysis of the beta-1,4-glucosidic bonds between the glucose residues in cellulose. Previously, we found that a β -glucosidases from *Aspergillus niger* showed a high hydrolytic activity. Nevertheless this enzyme has some disadvantages, such as the narrow specificity for glucoside substrates and the high transglucosylation activity. So, we would like to identify the important residues for substrate specificity and transglucosylation activity. The crucial amino acid residues located in active site are predicted to be W49, W262, Y286 and Y492. To investigate the role of Y286, it was mutated to Y286F and Y286W by using site-directed mutagenesis. These mutants were expressed in *Pichia pastoris*, and purified by using a phenyl sepharose column. Purity and identity was determined by sodium dodecyl sulfate-polyacrylamide gel electrophoresis (SDS-PAGE). The properties of the wild-type and mutant forms of β -glucosidase were compared with regards to kinetic parameters, hydrolysis of cellulose and xylan, and transglucosylation activities. It is hoped that the knowledge gained from this study will lead to the design and production of novel β -glucosidases with a broad substrate specificity and reduced transglucosylation activity.

Keywords: *Aspergillus niger*, Biomass, β -glucosidases, Cellulose, Transglucosylation





Effect of protein extracts from silkworm pupae in incubation with breast cancer cell line

Duanghatai Sangnoi
Kasetsart University, Bangkok, Thailand
duanghatai.sa@ku.th

Suttida Chukiatsiri*
Kasetsart University, Bangkok, Thailand
fscistd@ku.ac.th

Silkworm pupae is a source of high-quality proteins. From previous studies, proteins from silkworm pupae are involved in reducing risk of Alzheimer's disease, and further contain α -glucosidase inhibitor that reduce the inflammatory responses in type 2 diabetic patients. Therefore, in this research we are interested in study of the effect of protein extracts from silkworm pupae on responses of breast cancer cell. Two species of silkworm pupae were used in this study; Thai native silkworm; Nanglai (Mulberry silk, Bombyxmori) and Eri silkworm (non-mulberry silk; Eri silk, Philosamiaricini). To optimise conditions for protein extraction, two different buffers were used. The first buffer contained Tris-HCl pH 7.4, NaCl, EDTA, TritonX-100 and Sodium dodecyl sulfate (SDS). The second buffer contained Tris-HCl pH 7.4, DTT, glycerol, SDS and (Phenylmethanesulfonyl fluoride) PMSF. After centrifugation, supernatants were divided into two parts. One was collected at -20°C and another part was precipitated by 80% ammonium sulfate, and then was dialysed. Crude protein concentrations were measured using Bradford protein assay. The results revealed that the first buffer yielded more crude proteins than the second buffer for both species. Additionally, protein patterns detected by sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-PAGE) method showed that the protein patterns of two species were obviously different. Nanglai had large protein bands at 30 kDa and 40 kDa, on the other hand, Eri had a large protein band at 70 kDa. Then, protein extracts from the first buffer was chosen to determine the viability of breast cancer cell line from human (MCF-7) and normal kidney cell line from monkey (Vero) at different protein concentration, namely 5, 10, 15, 20, 25, 30, 45 and 50 μg for 24 hour using MTT assay. The results showed that the viability of MCF7 decreased while the concentration of protein was increased. At the same concentration, the protein extracts from Nanglai inhibited cell viability rather than from Eri. In conclusion, protein extracts from Nanglai and Eri had different protein patterns. These could inhibit growth of breast cancer cells offering a possibility of treatment of breast cancer in the future.

Keywords: Protein extraction, Silkworm pupae, Breast cancer cell line, Cell viability.





Characterisation of protein profiles of aortic and ventricular valve endothelial cells to identify potential markers.

Jirawan Waichata
Kasetsart University, Bangkok, Thailand
jirawan.w@ku.ac.th

Napachanok Mongkoldhumrongkul*
Kasetsart University, Bangkok, Thailand
fscinm@ku.ac.th

The aortic valve in the heart has an important role to regulate blood flow from the left ventricle into the main vessel aorta. The integrity and function of the aortic valve has been revealed to be regulated by valve endothelial cells (VECs) which populate on the surface of the valve. Previous evidences have shown that aortic valve calcification have dysfunction VECs, only the side that connect to the aorta, called aortic VECs (aVECs). Although ventricular VECs (vVECs), continuous layer of cells connected to the left ventricle exhibit normal phenotypes in the patients. Furthermore, the earlier research have also demonstrated that aVECs and vVECs have different phenotypes, independent from the different hemodynamic that they are encountered. Therefore, this study aims to investigate protein profiles of aVECs and vVECs by proteomic technique in order to identify potential makers which may be associated with aortic valve disease.

Firstly, frozen plate isolation, the method of side-specific isolation of VECs, was developed. Subsequently, protein from aVECs and vVECs was extracted and quantitated by Bradford assay. Proteins were then separated according to size by polyacrylamide gel electrophoresis (SDS-PAGE). They will be In-Gel *Tryptic* digested out of the SDS-PAGE and prepared *for* liquid chromatography-mass spectrometer (LC - MS) analysis. The data will be analyzed by DeCyder MS Differential Analysis software using database of MASCOT software version 2.2 and identified proteins by comparing the sequences with published data on NCBI.

Protein concentration of aVECs and vVECs from 20 porcine aortic valves were $23.59 \pm 4.23 \mu\text{g}$ and $26.57 \pm 2.65 \mu\text{g}$, respectively. The closed value suggested the similar level of metabolic rates among the two types of cells. Similar patterns of proteins separated by size was revealed by SDS-PAGE. The thorough characterization of protein profiles by LC-MS is under investigation. In conclusion, this study has revealed the practical and efficient method to isolate side-specific VEC proteins. Further information of differential protein profiles will be beneficial to the identification a specific VEC type for *in vitro* work and to the understanding of valve disease at the protein level.

Keywords: Aortic valve endothelial cells (aVECs), ventricular valve endothelial cells (vVECs), Protein marker.





Characterization of a *SAL1* Homologue from Thai Aromatic Rice KDML 105

Krittapat Chua-yam

Department of Biochemistry, Science, Kasetsart University, Bangkok, Thailand
b5510405155@ku.ac.th

Wannarat Pornsiriwong*

Department of Biochemistry, Science, Kasetsart University, Bangkok, Thailand
fsciwrp@ku.ac.th

Rice (*Oryza Sativa* L.) is a major food crop, a source of carbohydrate, and requires abundant water to grow. Khao Dawk Mali 105 (KDML105) is a Thai aromatic rice, popularly planted in northeastern region of Thailand, a region which frequently experiences drought conditions. Previous studies of plant drought tolerance mechanisms report that *SAL1*, encoding an enzyme with 3'(2'), 5'-bisphosphate nucleotidase and inositol polyphosphate 1-phosphatase activities, is a significant gene in the drought response pathway. However, the action of *SAL1* is largely unknown in rice. From NCBI database, there are two *SAL1* homologues in rice, *Os12g0183200* and *Os12g0183300*. Therefore, the objective of this research is to study the effect of drought stress on KDML105 and investigate the level of *Os12g0183200* expression. The plants were grown in a greenhouse with natural sunlight and drought stress treatments were performed by withholding water for 10 days. The leaf samples were then harvested for drought tolerance assessment, including relative water content (RWC) measurement and chlorophyll determination. After plants exposed to controlled water stress, the results show that pot weight and leaf RWC have a significant downward trend, which relates to the time of drought stress. Total chlorophyll content was measured by spectrophotometry and a change in chlorophyll content is observed in the drought-stressed plants, compared to the well-watered controls. Furthermore, the level *Os12g0183200* expression over a period of drought was determined by RT-PCR. Taken together, the results from this work could demonstrate the *SAL1* response to drought stress and provide a basis for further study of this gene, which possibly involves in drought tolerance mechanisms in rice.

Keywords: Rice, *SAL1*, Drought stress, KDML105, *Oryza Sativa*





***In silico* prediction of molecular docking between tripeptide against tyrosine kinase function of Epidermal Growth Factor Receptor for cancer therapy.**

Nonnarit Sriporatana

Department of Biochemistry, Faculty of science, Kasetsart University,
Bangkok, Thailand
nonnarit.s@ku.th

Kiattawee Choowongkomon*

Department of Biochemistry, Faculty of science, Kasetsart University,
Bangkok, Thailand
kiattawee.c@ku.th

The epidermal growth factor receptor (EGFR) is a member of the tyrosine kinase receptor family. This trans-membrane proteins are activated following binding with epidermal growth factors. The EGFR plays important roles in the growth, proliferation, differentiation and apoptosis of numerous cell types. Overstimulation of EGFR-mediated signalling can contribute to an uncontrolled cell division causing cancer cells. The EFGR involves many types of carcinogenesis such as prostate cancer, lung cancer and breast cancer. So the EGFR is important target for development of anticancer drugs. Currently, an erlotinib is an inhibiting tyrosine kinase drug, but it is expensive. In previous research the peptide that inhibits a regulatory site of EGFR, called MIG6, was discovered. It plays an important role on feedback inhibition. Hence, in this research, we tried to discover new substances that can inhibit function of tyrosine kinase by generating of all possibility of 8,000 tripeptides *in silico*. These peptides was docked into the active site on tyrosine kinase domain of EGFR as the competitive inhibitor by GOLD docking program. Five top-scored peptides were synthesized by F-moc solid phase and purified by high performance liquid chromatography (HPLC). Both antibeacon kinase assay against tyrosine kinase and overexpressed EGFR non small cell lung cancer cellline, A549, were used to investigate the effect of these peptide.

Keywords: EGFR, tyrosine kinase, anticancer, non small cell lung cancer, tripeptide inhibitor, GOLD program.





HSP22A* and *HSP22B* promoter analysis for recombinant protein production in *Chlamydomonas reinhardtii

Nutpapha Charoensuk
Kasetsart University, Bangkok, Thailand
waranya.cha@ku.th

Chotika Yokthongwattana*
Kasetsart University, Bangkok, Thailand
fscicks@ku.ac.th

Currently the production of recombinant proteins in bacterial cells is widely used for production of commercially important substances such as human immune stimulants and vaccine. However, some proteins require post-translational modifications in order for them to function properly. Therefore, alternative choices of hosts like eukaryotic system are required. Alga is one of the organism that presently being used as protein factory. Additionally the successful production of proteins required a strong promoter to drive gene to be expressed. In some case, inducible promoter is also used for the production of some toxic recombinant protein. Previous study has reported that the promoters of heat shock protein (*HSP*) can induce gene expression under high temperature. Expression of *HSP22A* was increased up to 3,500 times compared to the non-induce state. Interestingly the region of putative *HSP22A* promoter is overlapped with the promoter of *HSP22B*. Thus, this research aimed to study the *HSP22A* and *HSP22B* promoters that regulate gene expression under high temperature. The inducibility of both promoters were assessed by induction at 37 degrees Celsius for 5, 10, 15, 20 and 30 minutes. The expression of *HSP22A* gene was induced as fast as 5 minutes while the induction of *HSP22B* promoter was slower as since 15 minutes. It was expected that the *HSP22A* and *HSP22B* promoters are differentially regulated through transcription factors (TFs). In *silico* analysis showed that the *HSP22A* promoter contained TFs 90 binding sites, but the *HSP22B* promoter had about 102 TFs-binding positions. In addition, dissimilar group of TFs were predicted to regulate on the promoters which may indicate diverse roles of *HSP22A* and *HSP22B* in the regulation of expression under high temperature.

Keywords: Recombinant proteins, Heat shock protein, *HSP22A*, *HSP22B*, *Chlamydomonas reinhardtii*





Study of three dimensional structure of rice aldo-keto reductase, AKR4C15 in Thai jasmine

Nuttida Boonkor
Kasetsart University, Bangkok, Thailand
b5510405198@ku.ac.th

Chonticha Tantitadapitak*
Kasetsart University, Bangkok, Thailand
fscicct@ku.ac.th

Aldo-keto Reductase (AKR) is an enzyme superfamily metabolizing aldehydes and ketones to primary and secondary alcohols by using NADPH or NADP as the cofactor. AKRs are usually 37 kDa monomers and have an $(\alpha/\beta)_8$ -barrel motif. The AKR proteins have also been found in a wide range of organisms, from bacteria to plants and man. AKR4C15 is a novel member of AKR4 family which can metabolize several toxic aldehydes, such as malondialdehyde generated by lipid peroxidation. Recent study in our laboratory, AKR4C15 was transformed into *Arabidopsis* by Agrobacterium-mediated gene transfer method. It was shown that AKR4C15 can significantly decrease the level of malondialdehyde and methyglyoxal in the transgenic plants. This study aims to investigate the three dimensional structure of AKR4C15 by crystallization method. The recombinant protein of AKR4C15 was purified by Ni-TED column chromatography and , subsequently, by gel-filtration chromatography. Crystallization using the condition 0.8 M ammonium sulfate and 0.1 M citric buffer, pH4, resulted in crystal formation. The shape of the crystal was different from the crystals found in its negative condition and is likely to be a protein crystal. However, the size of the crystal is too small to be used in the X-ray diffraction, and thus this condition will be further optimized. In addition to AKR4 family, there are other putative AKRs which have not been reported. *OsI_15387* is a putative rice AKR gene and was studied in our laboratory. Previously, *OsI_15387* gene was transformed into *Arabidopsis* by Agrobacterium-mediated gene transfer method. In this study, the homozygous lines of the *Arabidopsis* ectopically-expressing *OsI_15387* were developed for further study.

Keywords: aldo-keto reductase, transgenic plants, protein crystallization





Purification and Characterization of Adenine deaminase (ADE)

Pantada Nilkhong
Kasetsart University, Bangkok, Thailand
b5510405333@ku.ac.th

Somchai Pornbanlualap*
Kasetsart University, Bangkok, Thailand
fsciscpl@ku.ac.th

Adenine deaminase (ADE) is a member of the amidohydrolase superfamily of enzymes that catalyzes deamination of adenine to hypoxanthine and plays an important role in purine salvage pathway. The enzyme has optimum pH of 6.5-7.0 and optimum temperature of 60 °C. Although no crystal structure of ADE is currently available, ADE is assumed to adopt a structure similar to that of Adenosine deaminase (ADA) because of the high amino acid sequence homology between the two enzymes. In addition, unlike ADA that had been intensively studied over the last decade, ADE is biochemically, genetically and structurally unexplored. Therefore, the aim of this research is to (i) express and purify the recombinant ADE in *E. coli*, (ii) characterize its substrate specificity (iii) analyze cofactor requirement of adenine deaminase (ADE), and (iv) determine stability of the recombinant enzyme. First, overnight grown culture (five milliliters) of *E. coli* BL21 carrying pET26-ADE in LB medium plus 60 µg/ml kanamycin was transferred to one liter of LB medium plus kanamycin. The culture was allowed to grow to an OD₆₀₀ nm of 0.5 and induced by addition of lactose. Cells were harvested by centrifugation at 10,000 rpm and lysed by sonication for 30 min. Proteins in the inclusion bodies were unfolded in 8 M urea at pH 9. Second, the unfolded ADE was purified from other contaminated proteins on a nickel-affinity column (Ni²⁺-NTA). Fractions containing ADE were pooled and dialyzed to remove urea. Finally, the purity and molecular weight of the purified ADE were determined on 10% SDS-PAGE. The activity of ADE was assay spectrophotometrically to determine its kinetic properties. Analysis of the stability, cofactor requirement and substrate specificity of ADE purified by nickel-affinity column is currently underway.

Keywords: Adenine deaminase (ADE), pET26-ADE and Adenine.





Establishment and characterization of drug-resistant breast cancer cell lines for in vitro multidrug resistance mechanisms

Panyarat laurchan

Department of Biochemistry, Science, Kasetsart University, Bangkok, Thailand
b5510405261@ku.ac.th

Pichamon Kiatwuthinon, Ph.D.

Department of Biochemistry, Science, Kasetsart University, Bangkok, Thailand
fscipmk@ku.ac.th

Breast cancer is the most common cancer in Thai women. The most common age range of women diagnosed with breast cancer is between 50-55 years. However, the cancer registration investigated by National Cancer Institute showed that the incident rate of Thai young women diagnosed with breast cancer has dramatically increased. This might due to the fact that the symptoms of breast cancer are latent during an early stage. As a result, patients are normally diagnosed with an advanced stage and develop multidrug resistance effect. One of the main factors causing the multidrug resistance in cancer involves in the high expression level of the membrane transport proteins called ABC-binding cassette transporters (ABC transporter). Thus, this study aims at establishing and characterizing a multidrug-resistant MCF-7 breast cancer cell line. The multidrug-resistant MCF-7 breast cancer cells were established by treating the cells with cisplatin and lapatinib chemotherapeutic drugs at increasing concentration. The characterization included a morphological study by using microscopic techniques, a cell proliferation study by reporting a period of time that the cells require to have a double in population (doubling time). Lastly, the gene expression of ABC transporter families including ABCC1, ABCG2 and ABCB1 were quantified by using quantitative polymerase chain reaction. From the microscopic technique, drug-sensitive MCF-7 cells showed a polygonal morphology with a discrete patch pattern on a culture ware surface. The doubling time of the MCF-7 cells was 40 hours. The expression of ABC transporter proteins are under investigation. The establishment of multidrug-resistant MCF-7 cell lines will provide a tool for studying multidrug resistant mechanisms in breast cancers.

Keywords: multidrug-resistant, MCF-7, cisplatin, lapatinib, ABC transporter.





Expression of recombinant RIP protein from *Jatropha curcas* in *E. coli*

Pattarapong Polwiseth
Kasetsart University, Bangkok, Thailand
b5510405241@nontri.ku.ac.th

Chotika Yokthongwattana*
Kasetsart University, Bangkok, Thailand
fscicks@ku.ac.th

Ribosome-inactivating proteins (RIPs) are present in a number of plants and some bacteria. The proteins can inhibit protein synthesis in both eukaryote and prokaryote. In plants, RIPs have been linked to defense against viral, fungi, and insect. The RIP proteins in type 1 are single-chain polypeptide with N-glycosidase activity. Type 1 RIPs have pI value ranging between 5.5-9.1 and molecular weight of approximately 26-50 kDa. The type 2 RIP contain two polypeptide chains, A chain and B chain, linked by disulfide bonds. The type 2 RIP has pI value of about 6.18 and molecular weight of approximately 62 kDa. The proteins in type 3 RIP have molecular weight of approximately 56-63 kDa. This current work aimed to generate recombinant protein of RIP type 1, Jcr4U30724.10. This gene is expressed in seed kernel of *Jatropha curcas*. The gene was cloned into pET28a vector and the sequence was analyzed. The plasmid with the correct sequence was then used to transform into *E. coli* cells. Induction conditions were varied by changing concentration of inducer and induction temperatures. The inducer, Isopropyl β -D-1-thiogalactopyranoside (IPTG), concentration of 0.1 mM – 1.0 mM were optimized. Induction were carried out at 15°C, 25°C, 30°C, and 37°C for 4 hr. The expressed proteins was determined by SDS-PAGE. Successful induction condition will provide a better way for RIP recombinant protein in bacterial cells.

Keywords: Ribosome-inactivating protein, N-glycosidase activity, recombinant protein





Overexpression of the black tiger shrimp transglutaminase II

Peradet Katanyuwongjalern
Kasetsart University, Bangkok, Thailand
b5510405325@ku.ac.th

Ratree Wongpanya*
Kasetsart University, Bangkok, Thailand
fscirtw@ku.ac.th

Innate immunity plays a key role in shrimp defense system. Blood clotting system is the one of this that participates in immune response. Shrimp transglutaminase II (STGII) is an important enzyme involved in the clottings system.

STGII catalyzes intermolecular or intramolecular ϵ -(γ -glutamyl) lysine bond formation of clottable protein, resulting in protein polymerization. The enzyme activity is a calcium ion (Ca^{2+}) dependent. Previously, our result from pull-down assay showed that calmodulin (CaM) can bind STGII. The CaM, a ubiquitous intracellular Ca^{2+} sensor, is one of the well-known signaling proteins. Thus, it is possible that STGII may interact with CaM for the enzyme function. Therefore, the objective of this study is to produce a recombinant STGII for further characterization.

To do so, STGII was cloned into pGEM-T easy vector. After characterization, the STGII consists of a coding region of 2,274 bp that encodes 757 amino acid residues with a calculated mass of 85 kDa and an isoelectric point of 5.48. The gene was then subcloned into pET32a to produce pET32a-STGII for protein expression. The STGII insert was confirmed by colony PCR and NcoI/NotI double digestion using pET32a-STGII as a template. The expected band of STGII was found in agarose gel electrophoresis. However, the recombinant protein expression is under investigated. After getting the rSTGII, protein-protein interaction between the rSTGII and rCaM will be carried out. Knowledge from this study could provide an insight into shrimp immune signaling system in response to pathogen infection.





Effects of naphthoquinone and indole derivatives on human Topoisomerase II ATPase

Pichayanan Suwannabun
Kasetsart University, Bangkok, Thailand
pichayanan.s@ku.ac.th

Nonlawat Boonyalai*
Kasetsart University, Bangkok, Thailand
nonlawat.b@ku.ac.th

Cancer is a global public health problem and the cause of early death of people around the world. Liver cancer, bile duct cancer, lung cancer, breast cancer, colon cancer and cervical cancer are major cancers in Thailand. DNA Topoisomerase is one of the necessary enzymes involved in regulating DNA under- and over-winding, transcription, replication, recombination, and DNA repair. It is also responsible for the relaxation of DNA torsional strain and the separation of chromosome. With these important functions, DNA topoisomerase has become one of the targets for anticancer drugs. Naphthoquinones, derived from naphthalene, have been used for the treatment of several diseases including cancer. Some naphthoquinones were reported to inhibit DNA topoisomerase II activity. In addition, indole derivatives are interesting compounds as promising agents against cancer. They also target at topoisomerase I and II. Therefore, this research aimed to determine the effects of naphthoquinone and indole derivatives on the ATPase domain of human topoisomerase II (hTopoII-ATPase). In this study, recombinant hTopoII-ATPase was successfully obtained with high purity. The ATPase activities of both hTopoII α and β were determined using Malachite green assay. hTopoII α -ATPase exhibited higher ATPase activity than hTopoII β -ATPase. For the inhibition study, hTopoII α -ATPase activity was moderately inhibited by some naphthoquinone derivatives but not by the indole compound (NP13). The binding affinity (K_d) value of the indole NP13) determined by Trp fluorescence spectroscopy was 44.79 μ M for hTopoII α -ATPase. This binding result was confirmed using molecular docking approach which revealed that NP13 binds at the ATP binding pocket of hTopoII α -ATPase with the docking scores of binding free energy of -9.42 kcal/mol. However, further studies on the inhibition of other indole compounds against both hTopoII α -ATPase and hTopoII β -ATPase are being under investigations.

Keywords: Topoisomerase, Naphthoquinone derivatives, Indole derivatives, Anti-cancer





Cloning and expression of factors controlling fatty acid metabolism in *Yarrowia lipolytica*

Pornsuda Piluk

Kasetsart University, Bangkok, Thailand
b5510405287@ku.ac.th

Napapol Poopanitpan*

Kasetsart University, Bangkok, Thailand
fscinpp@ku.ac.th

Yarrowia lipolytica is one of the oleaginous yeast which most extensively studied “nonconventional” yeasts. This yeast is able to accumulate large amounts lipids in form of lipid body to levels exceeding 50% of cell dry weight. Thus, it is an excellent model of a microorganism for studying in biofuel application. However, the control of lipid metabolism in *Y. lipolytica* has not been completely understood. From previous studies, the transcription factors, Por1p and Cfu1p, are involved in the regulation of the fatty metabolism in *Y. lipolytica*. In addition, the characteristic of Cfu1p has not been studied. Hence, this research will be focused on *CFU1* gene. From analysis of structural features by Motif scan on Myhits server, there are three structural features, Zinc finger C₂H₂ type, glutamine-rich region, and arterivirus GL envelop glycoprotein. Moreover, Cfu1p was predicted as nuclear protein by PSORTII program. To investigate the localization of Cfu1p, Enhanced Green Fluorescent Protein (EGFP) will be used as a protein tag at C-terminus of Cfu1p for fluorescence microscope analysis. To express *CFU1-EGFP* gene under the control of its own promoter, the two DNA fragments were amplified by polymerase chain reaction (PCR) with specific primers. The first is 4.5 kb-fragment containing the promoter, 5' UTR and core gene of *CFU1* gene. Another is 1 kb-fragment containing 3'-UTR and terminator of this gene. After that the former fragment will be cut by *EcoRI*, and *NsiI*. The latter fragment will be cut by *NsiI* and *XbaI*. Then, DNA fragments will be cloned into pSUT5 and *EGFP* gene will be inserted between *NsiI* and *StuI* in C-terminus of this gene. Finally, the protein localization will be analyzed by fluorescence microscope.

Keywords: CFU1 gene, *Y. lipolytica*, control of fatty acid metabolism, oleaginous yeast.





Biological effects of *Amomum xanthioides* Wall. extracts

Tanawan Sattanun

Department of Biochemistry, faculty of science, Kasetsart University,
Bangkok, Thailand
b5510405228@ku.ac.th

Chomdao Sinthuvanich*

Department of Biochemistry, faculty of science, Kasetsart University,
Bangkok, Thailand
fscicds@ku.ac.th

Cancer is a disease involving abnormal cell growth with the potential to invade to other parts of the body. Currently, more than 100 type of cancer have been reported in human body. The diagnosis and treatment of each type of cancer depend on several factors including age and gender of the patients as well as phase of cancer and a source organ. Current treatment rely on a surgery and chemotherapy which often has high side effect. Recently, medicinal plants have gained wide attention for use in cancer treatments to improve treatment efficacy and lower side effect. This work is interested in studying a potential use of *Amomum xanthioides* Wall. in cancer therapy. *A. xanthioides* Wall. is in a *Zingiberaceae* family. It is an annual crops with underground stem. Its organelles have been used in traditional medicine to treat diseases such as hemorrhoids, antidote, carminative. The aims of this research are to extract the *A. xanthioides* Wall. using organic solvents and to study their biological activities. The biological effects of *A. xanthioides* Wall. extracts are currently being examined for their ability to inhibit cancer cell growth *in vitro*. The initial result found that root and stem of *A. xanthioides* Wall. extracted with dichloromethane are able to reduce the cells viability of A549 (lung carcinoma) to 9.77% and 4.29% respectively. The stem extracted with ethyl acetate is able to reduce the cells viability of A549 to 16% when treated for 24 hours at 1mg/ml. Viability of HepG2 (liver carcinoma cells), Cal27 (squamous carcinoma cells) and Vero (normal kidney cells) are under investigate as well as antioxidant activity.

Keywords: *A. xanthioides* Wall, anticancer, antioxidant.





Molecular Biotyping of *Vibrio vulnificus* Isolated from Diseases Brown-marbled grouper (*Epinephelus fuscoguttatus*)

Thararat Phurahong *
Kasetsart University, Bangkok, Thailand
jane.thararat@gmail.com

Sasimanas Unajak
Kasetsart University, Bangkok, Thailand
fscissmn@ku.ac.th

Vibriosis disease is one of a serious infectious disease in animals and human being caused by *Vibrio* spp. infection. This bacterium is a part of the natural flora of coastal marine environments worldwide. In Thailand, Vibriosis disease is major causes of death in fish in several areas of coastal fisheries area including brown-marbled grouper. The major bacterial species that caused disease is *Vibrio vulnificus* which is a Gram-negative, halophilic estuarine, rod shape bacterium that causes acute cell death and fatal septicemia. *V. vulnificus* are classified into 3 biotypes including biotype 1, which are majority of human infections, biotype 2, which are primarily eel pathogens, and biotype 3, which cause human wound infection. The objectives of this research are characterization of *V. vulnificus* isolated from diseases grouper, biotyping subtyping of *V. vulnificus* based on virulence genes and identify surface protein, and secreted protein of *V. vulnificus* by surfome and secretome analysis. First, 30 samples from 36 samples were identified as *V. Vulnificus* based on 16s rRNA and classified as biotype 1 using BLASTN and phylogenetic tree analysis. Bacterial subtyping was identified by multiplex PCR of virulence genes demonstrated that those *V. vulnificus* can be divided into 8 groups. Candidate bacterial strain, VV106, VV218, VV303, VV423, VV513, VV619, VV720 and VV805, were used to study surface proteins and secreted proteins by proteomics analysis. The resulted from these studies will be importance in understanding the function of surface proteins and secreted proteins which are required for bacterial pathogenesis. Those proteins of *V. vulnificus* can be used to develop a vaccine for Vibriosis disease in fish.

Keywords: Vibriosis, *Vibrio vulnificus*, biotyping, virulence genes, multiplex PCR, proteomics analysis





Immobilization of beta-glucosidase from *Aspergillus niger* to magnetic nanoparticles

Tidatip Bunasuwan
Kasetsart University, Bangkok, Thailand,
tidatip.b@ku.th

Asst.Prof. Prachumporn Kongsaree, Ph.D.*
Kasetsart University, Bangkok, Thailand,
fscippt@ku.ac.th

beta-Glucosidase (EC 3.2.1.21), which hydrolyzes cellobiose to glucose, is an important component of the cellulase enzyme system for cellulose degradation. The deficiency of beta-glucosidase results in the accumulation of cellobiose. This is the rate-limiting factor during enzymatic cellulose hydrolysis because both endo-glucanase and exo-glucanase activities are often inhibited by cellobiose, the intermediate product. Thus the function of beta-glucosidase is not only to hydrolyze cellobiose to glucose, but also to reduce the cellobiose inhibition. Enzyme immobilization offers a potential solution through enzyme recycling and easy recovery. The objective of this study is to develop a system for immobilization of beta-glucosidase on magnetic nanoparticles for further applications. In the present work, the coding sequence of beta-glucosidase from *Aspergillus niger* in the plasmid pPICZ α B-His8-ANBG was mutated by PCR-based site-directed mutagenesis such that the amino acid sequence after the Kex2 cleavage site was changed from EAEA to CAAA. The mutated plasmid was transformed into *Escherichia coli* DH5 α and sequenced, before it was transformed into *Pichia pastoris* for protein expression. The mutant enzyme should be expressed with an N-terminal alpha-factor, which was subsequently cleaved by Kex2 to produce a mature protein with Cys as the first amino acid. The enzyme was purified by a single-step hydrophobic column chromatography. Fractions of beta-glucosidase recovered by this procedure, yielded a single protein band on a SDS-PAGE gel with an apparent molecular mass of 135 kDa. The first Cys residue of the enzyme can then react with the thioester group on the magnetic nanoparticles, via a native chemical ligation, to form a peptide bond that covalently links the enzyme and the magnetic nanoparticles. The properties of the immobilized enzyme will be characterized.

Keywords: beta-Glucosidase, Immobilization, Magnetic nanoparticles.





Purification and cloning of β -glucanase from *Bacillus* sp. C4 SS-2013

Wunchaloem Sakuntasri
Kasetsart University, Bangkok, Thailand
wunchaloem.s@ku.ac.th

The β -1,3-1,4-Glucan, a homo-polysaccharide of glucose molecule linked by the glycoside bond forms, is the major constituents of the cell wall of plants and fungi and cereals. This group of carbohydrates is made up of approximately 1,200 glucose units, linked through β -1,3-1,4-glycosidic bonds and β -1,3 linkage account for 25-30%. In the nature created specific enzyme for degradation, the β -1,3-1,4-glucan was the endo- β -1,3-1,4-glucanase. This enzyme was classified by three different endogenous glycosyl hydrolases: endo-1,4- β -D-glucanase, endo-1,3- β -D-glucanase and endo-1,3-1,4- β -D-glucanase. The β -1,3-1,4-glucanases have potential in several industrial applications e.g. in the brewing industry, animal feed industry, as well as other industries.

The preparation of enzyme was performed in a 500 ml baffled shake flask containing 100 ml of basal medium with skim milk BMSM medium according to protocol of Skerman pH 7.5 by inoculation of a diluted starter of *Bacillus* sp. C4 SS-2013 to 0.3 unit at 600 rpm and incubation at room temperature at 200 rpm for 24 h. After centrifugation, cell free supernatant was used for enzyme purification and endo-1,3-1,4- β -D-glucanase activity assay by using azo-barleyglucan (Megazyme, USA) as substrate. The C4 crude enzyme showed specific activity of 4,182 U/mg. This enzyme was successfully purified by ultrafiltration, 1st HiTrap DEAD FF column, HiTrap Phenyl FF column, 2nd HiTrap DEAD FF column and HiPrep 16/60 Sephacryl S-100 HR column. The purified enzyme showed the molecular weight of 28 kDa with specific activity of 15,200 U/mg, 0.8% yield and 3.6-fold purification. Its N-terminal amino acid sequence was QTGGSFDPFNGYN and showed 100% identity with endo-1,3-1,4- β -D-glucanase (accession number EHA32023.1).

The full-length of the glucanase gene was amplified by polymerase chain reaction (PCR). Three pairs of primer were designed to amplify the glucanase gene, the complete nucleotide sequences of endo-1,3-1,4- β -D-glucanase gene from five *Bacillus* sp. numbers (GenBank accession numbers X00754.1, Z46862.1, AF490978.1, KM009051.1 and U60830.1) were aligned manually using ClustalW2. The glucanase genes were then amplified by PCR using genomic DNA from C4 strain as the template. The expected sizes of the PCR products using BGlucF1/R1, BGlucF2/R2 and BGlucF3/R3 primers were approximately of 895, 792 and 162 bps, respectively. The purified PCR products will be further cloned and sequenced.

Keywords: endo-1,3-1,4- β -D-glucanase, *Bacillus* sp. C4 SS-2013, purification, cloning





Morphology and Pollen Morphology of the Genus *Macroptilium* (Benth.) Urb. (Family Fabaceae, Subfamily Papilionoideae) in Thailand

Jamikorn Wongjio
Kasetsart University, Bangkok, Thailand
b5510404680@ku.ac.th

Chatchai Ngernsaengsaruy*
Kasetsart University, Bangkok, Thailand
fsciccn@ku.ac.th

Morphological and pollen morphological studies of the genus *Macroptilium* (Benth.) Urb. (Family Fabaceae, Subfamily Papilionoideae) in Thailand were conducted from January 2015 to March 2016. Two species are found, Siratro (*M. atropurpureum* (DC.) Urb.) and Phasy bean (*M. lathyroides* (L.) Urb.). Morphological descriptions, distribution, and some ecological aspects are provided. The differences based on morphological characters are habit, petiole length, rachis length, lateral leaflet base, hairs on the leaflet lower surface, calyx length, wing petals color, and hilum shape. Both species are distributed throughout the country. The pollen morphological data do not provided characters for identification within the genus.





Comparative Phytochemistry of *Hapalosiphon* sp. and It's Effect on Growth of *Chlorella* sp.

Kongkidakorn Thaweepanyaporn
Kasetsart University, Bangkok, Thailand,
b5510400609@ku.ac.th

Dr. Nattha Sanevas
Kasetsart University, Bangkok, Thailand,
fscintsv@ku.ac.th

Associate Professor Srunya Vajarodaya*
Kasetsart University, Bangkok, Thailand,
fscisyv@ku.ac.th

Phytochemical analyses of lipophilic extract (dichloromethane) from the cyanobacteria *Hapalosiphon* sp. had done by using chromatographic technique i.e. TLC (thin layer chromatography) and CC (column chromatography). The alkaloid was screened by using dragendorff's reagent. Inhibitory growth activity of *Hapalosiphon* sp. lipophilic extract was treated on the green algae *Chlorella* sp., cultured in Bold's Basal medium. The different concentrations of the lipophilic extract are 0, 10, and 100 ppm and *Chlorella* sp. were collected and measured for chlorophyll content every 48 hours, for 12 days. It was found that alkaloids may be secondary metabolites in the lipophilic extract. The biomass and carotenoid content of *Chlorella* sp. didn't significantly show statistical difference after treated with all concentrations of the lipophilic extract. In contrast, the chlorophyll content trends to be decreased when the concentration increased.





Effect of Water Deficit on Relative Water Content and Anthocyanin Accumulation in Leaf of *Calathea* x 'Medallion'

Sirikarn Petsiri
Kasetsart University, Bangkok, Thailand
ppraew001@gmail.com

Kanapol Jutamanee*
Kasetsart University, Bangkok, Thailand
faaskpj@ku.ac.th

Calathea x 'Medallion' is a cultivar of *Calathea* with a purple abaxial leaf due to the accumulation of anthocyanin. The objective of this experiment was to analysis the level of anthocyanin and relative water content in *Calathea* leaf after subjected to water deficit. *Calathea* plant was water withholding until the water field capacity (FC) equal to 75% FC within 8 days. The results showed that at 75% FC, relative water content in leaf increased to 2.4%, osmolality value increased to 17.65%, and anthocyanin increased to 24.21% compared to 100%FC. The results indicated that when *Calathea* x 'Medallion' was subjected to short moderate water deficit, the plant was accumulated anthocyanin in order to decrease osmotic potential and maintain water status in cell. This is the strategy for resistant to drought.





Evaluation of DNA markers in bryophytes genus *Cololejeunea* for DNA barcoding

Sorrasak Yodphaka
Kasetsart University, Bangkok, Thailand
sorrasak.y@ku.th

Ekaphan Kraichak*
Kasetsart University, Bangkok, Thailand
fsciepk@ku.ac.th

The objective of this study was to evaluate the effectiveness of four markers for DNA barcoding of bryophytes genus *Cololejeunea*, which is found mostly on the surface of plant's leaves. We studied their morphological characters under light microscope and stereo microscope. Then we extracted and amplified DNA of 4 DNA markers; *matK*, *rbcL*, *trnL-F*, and ITS with the PCR technique. Nucleotide sequence data from the GenBank database were analyzed with MEGA 6 program. The results showed various ambiguous morphological characters in genus *Cololejeunea*. The highest successes of amplifications were found in two DNA markers: *trnL-F* and ITS. The nucleotide sequence data analysis showed that ITS had the highest number of monophyletic groups and can tell different species apart. Therefore, the ITS marker should be used for DNA barcoding in bryophytes genus *Cololejeunea*.





Comparative Phytochemistry of Indigenous Vegetables and Their Acetylcholinesterase (AChE) Inhibitory Activity

Thanwarat Woraratkul
Kasetsart University, Bangkok, Thailand
thanwarat_99@hotmail.co.th

Srunya Vajrodaya*
Kasetsart University, Bangkok, Thailand
fscisyv@ku.ac.th

The objective of this study was to compare chemical characters of the lipophilic extracts from 10 indigenous vegetable using chromatographic technique i.e. Thin Layer Chromatography (TLC) and High Performance Liquid Chromatography (HPLC). It was shown that terpenoids, steroids and anthraquinones are the components in lipophilic extracts of *Limnophila aromatica* (Lam.) Merr., *Glinus oppositifolius* (L.) A. DC., *Ocimum tenuiflorum* L., *O. basilicum* L., *O. bacilicum* L.f. var. *citratum* Back, *Toddalia asiatica* (L.) Lam., *Bergera koenigii* L., *Persicaria odorata* (Lour.) Sojak., *Morinda citrifolia* L. and *Momordica charantia* L.. These lipophilic extracts were tested for acetylcholinesterase (AChE) inhibitory activity using Ellman's colorimetric method the lipophilic extracts from *Limnophila aromatica* (Lam.) Merr., *Glinus oppositifolius* (L.) A. DC., *Ocimum tenuiflorum* L., *O. basilicum* L., *O. bacilicum* L.f. var. *citratum* Back, *Toddalia asiatica* (L.) Lam. and *Persicaria odorata* (Lour.) Sojak showed 16.98%, 10.81%, 7.01%, 12.36%, 18.04%, 17.41% and 12.69% inhibitory activity on AChE respectively, but the results more than 50% should be in consideration.





Diversity of Weeds on Two Ancient Ruins in Thailand

Thewarit Iamarrom
Kasetsart University, Bangkok, Thailand
gun.tianchan@gmail.com

Srunya Vajrodaya*
Kasetsart University, Bangkok, Thailand
fscisyv@ku.ac.th

The present work is a study of diversity of weeds, both flowering plants and bryophytes on two ancient ruins: Panomwan stone castle in Nakhonratchasima province, constructed from sandstone and laterite, and Prasrirattanamahatit temple in Lopburi province constructed from bricks. By field surveys and specimen collection, weeds on these two ancient ruins consisted of 18 families 25 genera and 25 species. Seven species, included *Streptocaulon juvenas* (Lour.) Merr., *Gomphrena celosioides* Mart., *Oldenlandia corymbosa* L., *Zygostelma benthami* Baill., *Cyperus rotundus* L., *Ruellia tuberosa* L. and *Phyllanthus amarus* Schumacher & Thonn.) are unique at Panomwan stone castle. Nine species, included *Typhonium trilobatum* (L.) Schott., *Broussonetia papyrifera* (L.) L'Hér. ex Vent., *Lindenbergia philippensis* (Cham. & Schltdl.) Benth., *Dactyloctenium aegyptium* (L.) Willd., *Cenchrus echinatus* L., *Coccinia grandis* (L.) Voigt., *Ipomoea aquatica* Forssk., *Amaranthus viridis* L. and *Bryum argenteum* Hedw. are unique at Prasrirattanamahatit temple. Nine species included *Euphorbia hirta* L., *Ficus religiosa* L., *Tridax procumbens* (L.) L., *Cyanthillium cinereum* (L.) H. Rob., *Trianthema portulacastrum* L., *Boerhavia diffusa* L., *Chloris barbata* Sw., *Eragrostis amabilis* (L.) Wight & Arn. and *Hyophila rosea* R.S. Williams. are growing on both places. Even though these two ancient ruins are in different parts of Thailand, but the average temperature within 30 years are nearly the same. Nevertheless, their main materials together with the average rainfall within 30 years are different. These later two factors may cause the unique species on both ancient ruins.





Mapping of QTLs Conferring Downy Mildew Resistance in F2 Population of Cucumber (*Cucumis sativus* L.)

Angsana Nitcharoen
Kasetsart University, Bangkok, Thailand
angsana.n@ku.th

Chatchawan Jantasuriyarat*
Kasetsart University, Bangkok, Thailand
fscicwj@ku.ac.th

Cucumber (*Cucumis sativus* L.) is a creeping vine that bears cylindrical fruits and people use it as culinary vegetables, cosmetic products and medicines. In Thailand, cucumber is one of vegetable crop productions, which can grow throughout the year in all regions. There are many factors affected on the yield of cucumber, for example, pest, bacterial and fungal diseases. Downy mildew is one of the most important fungal diseases causing yield losses in cucumber field and production. The objective of this study was the comparison between different phenotypic data used in QTL mapping that involving downy mildew resistance in F2 population. In this study we used two phenotypic data including cotyledon and first true leaf. Two hundred and seventy-two lines in F2 population which obtained from the cross between downy mildew resistant (accession number CSL0067) and susceptible (accession number CSL0139) parental lines were selected from field at Rajamangala University of Technology Lanna Lampang, Thailand. DNA was extracted from cotyledon samples. The extracted DNA was investigated for DNA polymorphism by four SSR primer pairs that were previously identified to be involved in downy mildew resistance in cucumber. The detection of the polymorphism visualized with *silver stained* polyacrylamide gel electrophoresis. In addition, cotyledons and first true leaf at 7 and 10 day after inoculation (DAI) as referring to cot7, first7, cot10 and first10 were rated for level of downy mildew infection, assessed by the appearance of leaf lesions and scored into nine categories based on symptomatic leaf area: 0 = absence of symptoms; 1 = 1-3%; 2 = 3-6%; 3 = 6-12%; 4 = 12-25%; 5 = 25-50%; 6 = 50-75%; 7 = 75-87%; 8 = 87-99%; and 9 = 100%. After that, the individual F2 plants were classified into five types based on disease scoring. Plants had scored less than 3.0 were classified highly resistant, from 3.1 to 4.0 moderately resistant, from 4.1 to 6.0 intermediate, from 6.1 to 7.0 moderately susceptible, and from 7.1 to 9.0 highly susceptible. Both of genotypic data and phenotypic data from this study will be analyzed for QTL mapping by using the composite interval mapping (CIM) method by Zeng (1994), as implement in Qgene 4.3.10 Software. The results will be shown in the presentation.





DNA fingerprinting technique reveal number of queens in a colony of the fire ant, *Solenopsis geminate*

Issarawan Keadkraichaiwat
Kasetsart University, Bangkok, Thailand
aisarawan.k@ku.th

Fire ants are major pest for human and agriculture. They destroy the root of seedlings, rearing aphids, and steal seeds of farmers. Their bites cause burns and severe itching. However, fire ants are also one of the pollinators. Fire ants in Thailand are belonged to the only species *Solenopsis geminate*. Like other ants, fire ant colonies are composed of either a single queen or multiple queens and workers, but the variation of queen number in a colony in Thailand is not yet known. To reveal the colony queen's number for the effectiveness of future pest management, we used microsattellite markers for fingerprinting at least 24 workers in a colony, and genotyped a total 12 colonies from different parts of Thailand. At the beginning, we tested the successfulness of PCR amplification of 19 primers from a few individuals from different colonies. We removed 1 locus that were difficult to amplify or yielded multiple bands and estimated the size of PCR products in 3% agarose gel for fluorescent tagging and multiplexing the PCR products in the fragment analysis. We then tested the successfulness of the PCR amplification with the rest 18 primer pairs tagging with M13 sequences and fluorescent colors. Of these 18 primer pairs, 15 of which were successfully amplified in most samples. We performed fragment analysis from these primers on 2 individuals of the 24 selected colonies and removed additional 3 primer pairs that were monomorphic. We thus genotyped a total of 12 loci on these 24 individuals from 12 colonies. In some parts of the data we currently analyzed, we found that individuals from the same colony often shared one or two alleles suggesting most colony are headed by a single queens. Our additional results will be present.





Cytotoxic effects of the giant African snail mucus on the leukemia cell line U937

Kornsuang Jangtarwan

Department of Genetics, Faculty of Science, Kasetsart University, Bangkok, Thailand
Kornsuang.j@ku.th

Pramote Chumnanpuen*

Department of Zoology, Faculty of Science, Kasetsart University, Bangkok, Thailand
pramote.c@ku.ac.th

Teerasak E-kobon

Department of Genetics, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscitse@ku.ac.th

Ratana Banjerdpongchai

Department of Biochemistry, Faculty of Medicine, Chiang Mai University,
Chiang Mai, Thailand
ratana.b@cmu.ac.th

Leukemia is a heterogenic group of diseases characterized by permeation of the hematopoietic system into the blood, bone marrow and other organs. This type of cancer is more common in children leading to the cause of child deaths worldwide. Research on natural products has aimed to provide an alternative cancer therapy with reduced side effects. Previous study from our research group has revealed the anticancer properties of mucus extracted from the giant African land snail (*Achatina fulica*) against the breast cancer cell line MCF-7. This study aimed to examine the effects of *A. fulica* mucus on the growth of human leukemia cells U937 compared to the human normal blood cells (PMBC) by conducting cytotoxicity assay using 3-(4,5-Dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) test and detections of apoptosis by propidium iodide staining. Alterations of cell morphology and genetic materials were detected by a fluorescent microscopy and agarose gel electrophoresis. Our results revealed dramatic effects of the snail mucus on cell growth at the 50% inhibitory concentration of 7 $\mu\text{g/ml}$, apoptosis, and induction of cell morphological change in the human leukemia cells U937. These effects were subtle when compared to the normal blood cells. Thus, this natural product from the pest snails could be an alternative agent for the anti-cancer drug development.





Distribution and genetic diversity of *Pteroptyx* spp. (Coleoptera: Lampyridae) in Thailand

Lalita Tonuch

Department of Genetics, Kasetsart University, Bangkok, Thailand

lalita_0037@hotmail.com

Ajaraporn Sriboonlert*

Department of Genetics, Kasetsart University, Bangkok, Thailand

fsciapsl@ku.ac.th

Fireflies are coleopteran insects in the family Lampyridae. Their names are acquired from their unique abilities to produce light in their abdomens. There are over 2000 species of the fireflies discovered worldwide. In Thailand, over 100 species were believed to be present; however, only 20 species were officially reported in the publications. *Pteroptyx* firefly is one of the most abundant genera in Thailand. They are often aggregated on the trees along the mangrove area. These fireflies are one of the most important tourist attractions in the ecotourism industry. Three *Pteroptyx* firefly species were discovered in Thailand, *Pteroptyx malaccae* Gorham, *P. valida* Olivier and *P. tener* Olivier. In this research, we aim to study the distribution and genetic diversity of *Pteroptyx* fireflies in Thailand. We studied 52 *Pteroptyx* samples from four provinces including Chanthaburi, Trat, Samut Songkhram and Surat Thani. Mitochondrial *COI* and *CytB* genes were amplified and analyzed. Phylogenetic tree revealed that these three *Pteroptyx* firefly species were grouped according to their genera. *P. malaccae*, the most abundant species was grouped into the east and the south populations. Due to some difficulties in DNA amplification, we were unable to amplify some of the samples from different localities. In the future, the DNA from all *P. malaccae* samples collected from all localities will be amplified and analyzed to elucidate the genetic diversity of this species across Thailand.





Expression of AGAMOUS in Arabidopsis and expression of *Jatropha curcas* AGAMOUS Gene in Arabidopsis that have been transformed

Natnaree Sirirat
Kasetsart University, Bangkok, Thailand
bonus_nari@hotmail.com

Sompid Samipak*
Kasetsart University, Bangkok, Thailand
fscispsp@ku.ac.th

Future oil shortage is an inevitable problem that needed to be address immediately by finding alternative energy in various forms. Production of biodiesel is a new energy alternative that is friendly to the environment. *Jatropha curcas* L. is a plant that can make oil in the seeds and has long been studied but the limitation lies in low productivity because there are too few female flowers. AGAMOUS genes are found in many species of flowering plants including *J. curcas* and function in early female flower part development.

In this study leaf and flower tissues were collected from *Arabidopsis thaliana* plants that have been confirmed by Polymerase Chain Reaction to contain a *Jatropha curcas* AG overexpression construct. RNA samples were extracted from the collected tissues. In addition, RNA samples were also obtained from different tissues (root, stem, leaf, and flower) of *A. thaliana* wildtype plants. Real-time Polymerase Chain Reaction technique was used to analyze the levels of *JcAG* expression from all RNA samples. This work is still in progress.





Modelling a Fusion Core Structure of the Porcine Epidemic Diarrhea Virus (PEDV)

Nattaya Chutikamoltham

Department of Genetics, Faculty of Science, Kasetsart University, Bangkok, Thailand
nattaya.chuti@gmail.com

Thanyada Rungrotmongkol

Department of Biochemistry, Faculty of Science, Chulalongkorn University,
Bangkok, Thailand

Puey Ounjai

Department of Biology, Faculty of Science, Mahidol University, Bangkok, Thailand

Anchanee Kubera*

Department of Genetics, Faculty of Science, Kasetsart University, Bangkok, Thailand
fsciacs@ku.ac.th

Porcine epidemic diarrhea virus (PEDV) is a coronavirus that causes lethal diarrhea in suckling piglets, leading to catastrophic loss in livestock industry. Due to lack of effective treatment and prevention, PEDV is currently of grave concern. Interestingly, an infection of some coronaviruses can be blocked by inhibiting conformational changes of the viral fusion core. Unfortunately, to date, no structure of PEDV fusion core has been elucidated. Here, we used homology based approach to predict the 3D structure of the PEDV fusion core using the fusion core structures of the Middle East respiratory associated coronavirus (MERS-CoV), severe acute respiratory syndrome associated coronavirus (SARS-CoV), murine hepatitis virus (MHV), and human coronavirus NL63 (hCoV-NL63) as templates. The result demonstrated that, similar to other coronavirus, the fusion core of PEDV contains three identical coiled-coil subunits that together form a six-helix bundle structure. The inner core, which contains three hydrophobic grooves, is formed by parallel organization of the three helical heptad repeat domain, HR1 (residues THR807 to SER916). While the outer coiled-coil structure is formed by HR2 peptides (residues GLU925 to ASN939) that aligned antiparalelly to stabilize the three inner grooves. The global structural arrangement of PEDV fusion core revealed remarkable homology between MERS-CoV and PEDV fusion proteins and suggested that the PEDV fusion core are a class I fusion protein similar to other coronaviruses. Moreover, molecular dynamic (MD) simulations were exploited to analyze a soluble conformation of PEDV fusion core and its stability in water. Our work offers insightful structural information that will be fruitful for the discovery of the novel PEDV fusion inhibitors.





Effect of glyphosate to detoxifying gene, Phytochelatin synthase (*PCs*), in Thai rice

Associate Professor Pattana Srifah Hunhne, Ph.D. *
Kasetsart university, Bangkok, Thailand
fscipns@ku.ac.th

Nicha Daengphai
Kasetsart University, Bangkok, Thailand
nicha.d@ku.th

Kisana Bhinija, and Jutamaad Satayavivad
Chulabhorn Research Institute, Bangkok, Thailand

Phytochelatin synthase (*PCs*) is a known protein involving in detoxification mechanism in plant cells. In our previous study revealed that the *PCs* gene isolated from *Oryza sativa* var. *indica Khao Dawk Mali 105* (Jasmine rice) contained the consensus motif which serves as a sensor for heavy metal ions and arsenic residues. In this study, the glyphosate, a broad-spectrum systemic herbicide commonly used to kill weeds in paddy fields, was applied to soil contaminated with arsenic substance and its effect to *PCs* gene expression in two rice varieties were then evaluated by the quantitative real-time PCR. The results showed the expression levels of *PCs* gene in two different rice cultivars, *O. sativa* var. *indica* Pathumthani and Riceberry was down-regulated when they exposed to glyphosate applied in soil from North-Eastern part. In contradictory, the *PCs* gene in *O. sativa* var. *indica* Riceberry was up-regulated when the rice exposed to glyphosate in soil from Southern part of Thailand.





DNA fingerprinting technique reveal number of queens in a colony of the weaver ant, *Oecophylla smaragdina*

Pitchapa Yampairoh
Kasetsart University, Bangkok, Thailand
pitchapa.y@ku.th

Ants are member of social insects that a colony contains a number of individuals with different castes, e.g. queens, males and workers. All caste have specific roles especially the queen who can reproduce and head the colony. Number of queens in a colony may be varied depending on the populations and other ecological factors. This also affects size of the ant nest and number of ant larvae and thus might be one of the important factors for rearing ants. Due to waver ants in Thailand are agricultural and economically important because their larvae are popular food. To explore if there is variation of colony's queen number in the weaver ants in Thailand that might affect the brood yield, we used microsatellite markers to genotype 24 worker ants collected from 12 different colonies in all parts of Thailand. We first tested 13 primers from previous study to test the successfulness of amplification in a few individuals from different colonies and removed one of them because of no amplification. We estimated the size of the PCR products of 12 microsatellite loci in polyacrylamide gel and planned for fluorescent tagging. The PCR products of different sizes that were non-overlapped could be tagged with the same fluorescent color and the same or overlapped size could be tagged with different colors. Thus, the PCR products of these 12 loci will be able mixed into two reactions for the fragment analysis. We used four types of M13 sequences, M13A, M13B, M13C, and M13D, to tagged at the 5' end of the forward primer and used the other four types of forward M13 primers labeled with four fluorescent dyes to reduced costs of primer labeling. We first tested the amplification results of this method and obtained successful results. We currently amplified these 12 primers with indirectly fluorescent tags of all 288 individuals (24 individual from each colony x 12 colonies). We will soon present the final results.





Genetic variation of *copia*-retrotransposons in biofuel crops, *Jatropha* spp.

Piyanont Tangbutr

Department of Genetics, Faculty of Science, Kasetsart University, Bangkok, Thailand
nonlanie@gmail.com

Vipa Hongtrakul *

Department of Genetics, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscivph@ku.ac.th

Jatropha curcas L. has received a great attention worldwide for its potential as a source of biodiesel. It is a diploid plant with 22 chromosomes and a genome size of approximately 370 Mb. It has been reported to have narrow genetic base, leading to its breeding program has recently concentrated on interspecific hybridization. Crossing between *J. curcas* and *J. integerrima* Jacq. is the most successful and a lot of the derived hybrid progenies with a tendency of high yield and disease resistance were produced. Understanding genetic information of *J. curcas* will be useful to produce commercial lines. Retrotransposon is one of two major groups of eukaryotic transposable elements that copy themselves via RNA intermediates, leading to various gene regulation, speciation and variation among populations. The objective of this study was to evaluate genetic variation of *copia*-retrotransposons in *J. curcas* (KUBP78-9), *J. integerrima* (JI, red flower), F₁137 and a backcross hybrid (VH1). *Copia*-retrotransposons sequences were amplified using the degenerate primers for the reverse transcriptase (RT) domain of *copia*-type retroelements and then cloned into vectors. Ten cloned of each sample were selected and sent for sequencing. After sequence analysis, 7, 8, 10 and 8 variants were obtained from KUBP78-9, JI, F₁137 and VH1 respectively. Altogether 33 sequence variants from 4 samples were found with genetic distance from 0.06 to 0.571. The neighbor-joining tree was constructed and could separate all 33 variants into 11 groups. The tree was also constructed based on all RT variants and known plant RT sequences from database to identify lineages of *copia*-type families. Three different RT specific primer pairs could amplify different *copia*-variants. This will increase the possibility of obtaining different retrotransposon families of plant species.





Phenotypic study on *Jatropha curcas* AGAMOUS overexpressed Arabidopsis

Preeyanuch Srinilta
Kasetsart University, Bangkok, Thailand
preeyanuch.sri80@gmail.com

Sompid Samipak*
Kasetsart University, Bangkok, Thailand
fscispsp@ku.ac.th

Usage of fossil oil has increased significantly in the present time while there is a limited of available fossil reserve. Finding alternative energy sources has become one necessity task. *Jatropha curcas* is one plant that produces oil and is one leading biodiesel source that has now been widely used due to its low fruit yield. The low number of female flowers is the main problem limiting the yield.

In the experiment, Arabidopsis transformed with AGAMOUS from *J. curcas* gene was confirmed for the presence of the overexpression construct by Polymerase Chain Reaction. Three primer pairs were designed to be specific for CaMV35S, *JcAG* and Hygromycin resistance gene. Total of three separate lines were identified that contained all of the 3 portions of the DNA construct. The plants showed very thin stem causing them to bend and the flower phenotypes vary from normal to short stamen.





Molecular identification and genetic variation of the malaria mosquito (*Anopheles maculatus*) from Thailand and Indonesia

Rachawalan Suriyasaengsri

Department of Genetics, Faculty of Science, Kasetsart University, Bangkok, Thailand
rachawalan.s@ku.th

Uraiwan Arunyawat*

Department of Genetics, Faculty of Science, Kasetsart University, Bangkok, Thailand
fsciuwa@ku.ac.th

Anopheles maculatus complex is a major malaria vectors in Thailand, Indonesia and other country in Southeast Asia. The important problem in vector control program of species complex is a mistake of morphological identification because of their similar morphology. In this study, *An. maculatus* complex mosquitoes (based on morphological identification) were collected from Central Java, Indonesia, showing some different characters from *An. maculatus* in Thailand, which may be a related species in the Maculatus complex group. Thus, the objective of this research is to identify *An. maculatus* complex from Indonesia using molecular markers and to analyse genetic variation comparing between two *An. maculatus* populations based on *COI* and *ITS2* sequences. The results of molecular identification presented that mosquito specimens from Indonesia are most likely *An. maculatus*, however the BLAST result of *ITS2* gene suggested more similar to *An. dispar* than *An. maculatus* (percent identities = 95-97% and 93-94%, respectively). The genetic variation and haplotype diversity were low in both Indonesia and Thai mosquito populations. High level of genetic differentiation was observed between these two populations in both *COI* and *ITS2* genes ($F_{ST} = 0.97066$ and 0.99157, respectively). The genetic structure and phylogenetic analyses clearly divided the pooled populations into two clusters including Indonesia and Thailand clusters. Furthermore, the results suggesting the mosquito from Indonesia is most likely different from *An. maculatus* mosquito in Thailand. Hence, additional efficient marker is required to clarify this mosquito vector from Indonesia.





Characterization of *ngr1* mutant of the green alga *Chlamydomonas reinhardtii* with altered sensitivity to oxidative stress

Saran Wai

Kasetsart University, Bangkok, Thailand

darwinm13sg37@hotmail.com

Chlamydomonas reinhardtii is a model organism for various biological processes. Nowadays, this green alga is also used to study lipid synthesis/accumulation for biofuel production. The discovery of mutant strains and relevant genes may lead to strain improvement that will effectively increase the production of biofuel. The *ngr-1* mutant was isolated by its resistance to MNNG (Methylnitrosoguanidine) in the hope to find glutathione-deficient mutants. Previous studies have found that this mutant accumulated normal glutathione level. However, *ngr-1* is sensitive to oxidative stress such as high intensity of light and other drug-induced oxidative stress. The analysis of whole genome sequencing indicated that there are 5 candidate genes, which are g1260, g1237, g1243, g1146, and g1145. We hypothesized that one of these genes is responsible for the phenotype of this mutant. The objective of this research is to further characterize the *ngr-1* mutant and identify the gene that led to the phenotypes. The candidate genes expression under several stress conditions such as 1.5mM Rose Bengal, 0.5mM Methyl Vilogen, and high intensity light is currently under studied by semi-quantitative RT-PCR. The sensitivity and tolerance of *ngr-1* mutant to various stresses is being tested. We expect that the result of this research will be useful for strain improvement for stress tolerance.





Cloning and expression of *Anopheles* proteins as target for blocking malaria transmission

Sirinun Kimcharoensuk

Department of Genetics, Faculty of Science, Kasetsart University, Bangkok, Thailand
sirinun.k@ku.th

Anchanee Kubera*

Department of Genetics, Faculty of Science, Kasetsart University, Bangkok, Thailand
fsciacs@ku.ac.th

The objective of this study is to investigate the transmission-blocking compounds that could inhibit the function of *Anopheles* proteins which are important for *Plasmodium* development. Carboxypeptidase B (CPB) is expressed in the midgut of *Anopheles*. This enzyme is essential for the sexual development of *Plasmodium* in the mosquito. Saglin is a protein of the salivary gland that interacts with the domain-A protein-TRAP (Thrombospondin-Related Anonymous Protein), TRAP is a protein expressed in sporozoites. TRAP binds to saglin with high specificity. Thus, this interaction is essential for the invasion of salivary gland and the transmission of malaria. Therefore, CPB and saglin are the protein targets for blocking the malaria transmission. The amino acid sequences of CPB and saglin were obtained from the National Center for Biotechnology Information (NCBI) database. The three-dimensional structure homology modeling of CPB and saglin proteins were predicted from the amino acid sequences by SWISS-MODEL program. The virtual screening of compounds from National Cancer Institute (NCI) diversity set IV and FDA-approved drugs was performed against CPB and saglin proteins. The results showed that the compounds from the NCI diversity dataset number 123527 and 53275 are the top-scoring compounds which bind specifically to the binding site of CPB and saglin. The cDNA fragments of *cpb* and *saglin* genes from *Anopheles* were amplified and sequenced. Genes were cloned into pET vector and transformed into *E.coli* by heat shock method.





Study of Repetitive DNA Sequences in Vertebrate Chromosomes

Tanawut Chiangklang

Department of Genetics, Kasetsart University, Bangkok, Thailand
n_tenor_@hotmail.com

Worapong Singchat

Department of Genetics, Kasetsart University, Bangkok, Thailand

Surin Peyachoknagul,

Department of Genetics, Kasetsart University, Bangkok, Thailand

Kornsorn Srikulnath*

Department of Genetics, Kasetsart University, Bangkok, Thailand
kornsorn.s@ku.ac.th

Repetitive DNA sequences are widely distributed throughout the vertebrate genomes which suggest an important role for genomic organization. These sequences can also be classified into two type including interspersed type and site-specific type. The satellite DNA are the site-specific type of repeated sequences consisting highly repetitive sequences which are clustered in the heterochromatic regions of chromosomes such as centromeres, pericentromeric regions and telomeres. These elements are a good chromosomal marker for investigating the karyotype evolution and sex chromosome identification in vertebrates. In this study, to characterize the chromosome constitution of two house geckos, flat-tailed house gecko (*Hemidactylus Platyurus*) and spiny-tailed house gecko (*Hemidactylus frenatus*), both of which showed different karyotype features, we performed the molecular cytogenetic techniques to localize satellite DNA, microsatellite motifs, and telomeric sequences (TTAGGG)_n on chromosomes, and discussed organization of repetitive elements in *Hemidactylus* lineage.





Genetic Variation of Immune System Genes in Malaria Vector (*Anopheles minimus*) in Thailand

Thamonwan Lertvareerat

Department of genetics, Faculty of Science, Kasetsart University, Bangkok, Thailand
thamonwan.l@ku.th

Uraiwan Arunyawat*

Department of genetics, Faculty of Science, Kasetsart University, Bangkok, Thailand
fsciuwa@ku.ac.th

Anopheles minimus is one of the main malaria vectors in Thailand. Malaria is an important public health problem in border area of Thailand caused by *Plasmodium sp.* parasites in *Anopheles* mosquitoes. The immune response of the host is the vital part indicating the survival of the parasite and vector interaction. Therefore, understanding genetic variation of immune system genes in *An. minimus* is important to improve the malaria control program in Thailand. In this study, two partial innate immune system genes (*STAT1* and *Imd*) were sequenced to analyze pattern of genetic variation in three *An. minimus* populations, collected from Surat, Chanthaburi, and Tak provinces. In each population, 10 sequences were used to analyze the levels of nucleotide variation and population differentiation. The analyzed fragment length of *STAT1* and *Imd* are 507 and 684 nucleotides, respectively. The preliminary results showed that level of nucleotide diversity was relatively low in all populations, and pattern of genetic variation is most likely explained by mutation and genetic drift forces.





Expression analysis and cloning of genes involved in Luciferin biosynthetic pathway

Warinda Thongsukh

Department of Genetics, Kasetsart University, Bangkok, Thailand
pearpear_warinda@hotmail.com

Ajaraporn Sriboonlert*

Department of Genetics, Kasetsart University, Bangkok, Thailand
fsciapsl@ku.ac.th

Fireflies are bioluminescent beetles in the family Lampyridae. The firefly light organ is situated in the terminal segments of their bodies. The bioluminescence reaction is produced in the specialized photocyte cells, from a chemical reaction between luciferase enzyme and its substrate luciferin. This firefly bioluminescence has been widely used as a reporter system in various applications including medical, bioengineering, and bioimaging. Although the luciferase enzyme has been well characterized, the biosynthetic pathway of its substrate luciferin is still unknown. In previous study, we performed transcriptome analysis of an aquatic firefly *Luciola aquatilis* larva to elucidate the biosynthetic pathway of the luciferin. We identified 19 gene candidates in the transcriptome study. Therefore, in this study, we aim to validate the expression of these genes using reverse transcription PCR. Total RNA of the adult *L. aquatilis* was extracted and converted into cDNA. RT-PCR confirmed the expression of these genes in the adult *L. aquatilis*. These genes will be cloned into pGEM-T easy vector for further studies.





The use of Bitumen to improve performances of paraffin/boron oxide for neutron shielding

Donrudee Toyen

Department of Applied Radiation and Isotopes, Faculty of Science,
Kasetsart University, Bangkok, Thailand
Donrudeetoyen@gmail.com

Kiadtisak Saenboonruang*

Department of Applied Radiation and Isotopes, Faculty of Science,
Kasetsart University, Bangkok, Thailand
fscissa@ku.ac.th

Neutrons are one type of radiation that involves the spreading of electrically neutral neutrons. Since neutrons have no electric charge, they are able to pass through most materials. However, for some elements with high neutron absorption cross section such as boron-10 and lithium-6, neutrons could interact via nuclear reactions and possibly cause harmful biological damage. To prevent or reduce doses of neutron exposure, effective neutron shielding could be utilized. Generally, materials that serve as an effective neutron shielding contain high contents of hydrocarbons such as polyethylene (PE), paraffin wax, and water, with mixture of boron or lithium. Paraffin wax is a by product of light lubricating oil stocks and interesting to be used as a neutron shielding. This research used bitumen, which also contains high contents of hydrocarbons but higher melting point and flash point, to improve performances of paraffinwax as a neutron shielding. Different contents of bitumen along with variations of high-neutron-absorption-cross-section material, B_2O_3 , mixed in paraffin wax were varied and important characteristics of the composite such as flash point and neutron shielding properties were investigated.





Effects of Acute Gamma Irradiation on Morphological and Tillering Characters in Tissue Culture of Three Vetiver Ecotypes

Kamontip Ruanpang

Department of Applied Radiation and Isotopes, Faculty of Science,
Kasetsart University, Bangkok, Thailand
b5510403314@ku.ac.th

Katarut Chusreeaeom Ph.D.*

Department of Applied Radiation and Isotopes, Faculty of Science,
Kasetsart University, Bangkok, Thailand
fscikac@ku.ac.th

Vetiver has become the outstanding species for soil and water conservation especially for erosion protection and contaminated by both inorganic and organic pollutants. Nuclear technology has been successfully applied in developing new plant varieties. This project aims to investigate effects of acute gamma irradiation on morphological and tillering characters in tissue culture of three vetiver ecotypes. The sterilize tillers of native Thai vetiver were cultured on MS medium for 4 weeks. Plantlets of the Surat Thani ecotype were exposed to gamma radiation at 0 (control), 30 and 40 Gy. The Mai Huai Wai ecotype and the Prachuap Khiri Khan ecotype were exposed to gamma radiation at 0 (control) and 40 Gy. After irradiation, the irradiated tillers were planted on MS medium supplemented with BA.

The results revealed that doses of gamma radiation had effect on tillering percentage, the Surat Thani ecotype at 30 and 40 Gy were 82.29 and 6.59, respectively. The Mai Huai Wai ecotype and the Prachuap Khiri Khan ecotype at 40 Gy were 2.00 and 21.14, respectively. The $LD_{(50/60)}$ and $GR_{(50/60)}$ of the Surat Thani ecotype were estimated to 35 and 40 Gy, respectively. It was not possible to calculate the $LD_{(50/60)}$ and $GR_{(50/60)}$ of the Prachuap Khiri Khan and the Mai Huai Wai ecotypes because at the dose of 40 Gy the survival and growth rate were very limited. Some abnormalities observed in the M_1V_1 generation of the irradiated Surat Thani ecotype were undulate leaf margins and light green leaf. All the irregular characters were maintained through tissue culture. This information will be useful for developing novel vetiver mutants.

Keywords: Vetiver, Gamma Irradiation, Tissue Culture, Morphological, Tillering Characters





Development of a Single Channel Analyzer for gamma-ray spectroscopy

Kanes Amornchaimontree,
Department of Applied Radiation and Isotopes
Faculty of Science, Kasetsart University, Bangkok, Thailand
b5510403331@ku.ac.th

Manit Jitpukdee*
Department of Applied Radiation and Isotopes
Faculty of Science, Kasetsart University, Bangkok, Thailand
fscimnj@ku.ac.th

The module is analyzed by WINDOW mode. In the WINDOW mode, the upper-level becomes a window width control with a 0 to +1 V range. Front panel, 10-turn, the lower-level controls the lower limit of the window over a +20 mV to +10 V range. Front panel, 10-turn, the upper-level depend on changing of the lower-level and the window width setting. The SCA output logic pulse is generated when pulse amplitudes between the upper and lower limits. The positive logic output +5 V amplitude and 1 μ s width. This module is useful when a narrow range of pulse heights must be selected.

Single-Channel Analyzer is suitable for selecting a range of output pulse amplitudes from a spectroscopy amplifier. This module is also performing with scintillation counters, proportional counters, and ionization chambers, and compatible with NIM-standard power supply. The model is suitable for study the simple function of SCA.

Keywords: Single Channel Analyzer, Spectroscopy, Nuclear Instrument





Synthesis bismuth nanoparticles using gamma radiation

Kanokwan Saiphet

Department of Applied Radiation and Isotopes,
Faculty of Science, Kasetsart University, Bangkok, Thailand
b5510400323@ku.ac.th

Ridthee Meesat*

Department of Applied Radiation and Isotopes,
Faculty of Science, Kasetsart University, Bangkok, Thailand
fscirim@ku.ac.th

The primary goal of radiotherapy is to maximize lethal radiation dose delivered to tumors, meanwhile keeping minimum damage to surrounding healthy tissues as low as possible. Nanoparticles of high atomic number elements can be used to enhance radiation dose delivered to tumors, also called radiosensitizers. Bismuth has a high atomic number ($Z=83$) that could be potential used as a dose enhancing agent for cancer radiotherapy. In this project, we studied bismuth nanoparticles (BNPs) synthesis by gamma radiation. The BNPs were synthesized by gamma radiation in an aqueous solution, containing 1 mM $\text{Bi}(\text{NO}_3)_3 \cdot 5\text{H}_2\text{O}$, 4 % polyvinyl pyrolidone (PVP) used as a stabilizer and 0.2 M isopropanol added as a HO^\bullet and H^\bullet scavenger. Gamma radiation was carried out in a gamma chamber Mark I, provided Nuclear Technology Research Center, Faculty of Science, Kasetsart University. The dose rate of the irradiator was 0.7 kGy/h. It was measured by Fricke dosimeter. The sample solutions were irradiated at 4 kGy. The transitions of the irradiated solution were not observed in typical UV-Vis spectra (200-800 nm). The characterization of bismuth nanoparticle by transmission electron microscope (TEM) and synthesis the nanoparticles at high dose (>100 kGy) are in the process.





Enhancement of Stability of ^{68}Ga -DOTA-Bombesin by using Gentisic acid

Nushwara Junsuri

Kasetsart University, Bangkok, Thailand
b5510403411@ku.ac.th

Wanwisa Sudprasert*

Kasetsart University, Bangkok, Thailand
fsciwasu@ku.ac.th

Radiolabeled peptides are of increasing interest in imaging and targeted radiotherapy of tumors. Among these, ^{68}Ga -DOTA-Bombesin is currently being developed for clinical studies. This research aimed to study the use of gentisic acid to increase the stability of the ^{68}Ga -DOTA-Bombesin. The radiochemical purities of radiolabelled compound with and without gentisic acid were compared in different pH reactions containing ammonium acetate and sodium acetate. The concentration of gentisic acid was varied within the range of 10-30 mg/ml. The results showed that the highest radiochemical purity of ^{68}Ga -DOTA-Bombesin was found at $90.5 \pm 12.3 \%$ and $90.8 \pm 2.2 \%$ in ammonium acetate at pH 4.4 - 4.7 and 4.7-5.0, respectively. The radiochemical purity was found to be lower at $70.5 \pm 0.2 \%$ and $66.9 \pm 0.9 \%$ in sodium acetate at pH of 4.4 - 4.7 and 4.7 - 5.0, respectively. The gentisic acid with the concentration of 10 mg/ml slightly increased radiochemical purity of radiolabelled compound in ammonium acetate to $92.1 \pm 1.0 \%$, but significantly increased radiochemical purity in sodium acetate to $91.5 \pm 0.7 \%$.





Development of a spectroscopy amplifier for radiation detector

Nutthanon Amkrang
Department of Applied Radiation and Isotopes,
Faculty of Science, Kasetsart University, Bangkok, Thailand
b5110403357@ku.ac.th

Purit Junhom,
Department of Applied Radiation and Isotopes,
Faculty of Science, Kasetsart University, Bangkok, Thailand

Manit Jitpukdee*
Department of Applied Radiation and Isotopes,
Faculty of Science, Kasetsart University, Bangkok, Thailand
fscimnj@ku.ac.th

This present research aims to design and development of Gaussian shaping amplifier module. This module accompany with CR-200-4 μ s Gaussian shaping amplifier and NIM power supply. It has been applied to amplifier module for gas filled detector and scintillation detector. Coarse gain was adjusted to 10, 20, 50 and 100 while fine gain was adjusted by 10 turn's potentiometer (variable resistant). Performance with NIM power supply to check shaping time, gain, noise and Integral nonlinearity. The measurement were equal to 4 μ s and 100 μ V RMS for shaping time and noise. Integral nonlinearity $< \pm 1.0\%$ using 4 μ s shaping. This article describes underlying design principles and indigenous development of this amplifier.

Keywords: Amplifier, Shaping time, Nuclear Instrument





Effects of Iron Oxide Nanoparticles Synthesized by Gamma Radiation on Selected Seed Germination and Chromosome Aberrations

Palita Lertjarad

Department of Applied Radiation and Isotopes,
Faculty of Science, Kasetsart University, Bangkok, Thailand
b5510403471@ku.ac.th

Ridthee Meesat*

Department of Applied Radiation and Isotopes,
Faculty of Science, Kasetsart University, Bangkok, Thailand
fscirim@ku.ac.th

Iron oxide nanoparticles are exhibited remarkable magnetic properties, also called super-paramagnetic, has extensively been used for biomedical applications. The impacts of iron oxide nanoparticles on the environment and biological species are not well understood, especially plant biology. In this project, we focus on the plant biological effects of iron oxide nanoparticles (IONs) on seed germination, plant growth and chromosome aberration. The IONs were synthesized using gamma radiation in an aqueous solution, containing 2 mM $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$ in presence of a stabilizer (4% PVA and 4% PVP) and 0.2 M 2-isopropanol as a scavenger of oxidizing agents. Gamma irradiation was carried out in a gamma chamber 5000 (^{60}Co source) at 100 kGy. The dose rate for the gamma irradiator was 4.0 kGy/h, measured by Fricke dosimeter. For plant biological experiments, the selected corn seeds, Insee2 sweet corn hybrid, were used to study effects of IONs on plant biological system. The sweet corn seeds were incubated 2 h in 5 solutions: de-ionized water (DI-water) as a control, 4% PVA, 4% PVP, IONs in 4 % PVA, IONs in 4 %PVP, in DI-water with the ratio of 1:20. The results of seed germination and shoot growth as percentage of control were not significantly ($p < 0.05$), but root growth was significantly decreased ($p < 0.05$). Root lengths of IONs in 4% PVA and 4% PVP solutions relative to controls (100%) were 96.44% and 91.73%, respectively. In addition, *Allium cepa* root chromosomal aberration assay was used to evaluate the toxicity of iron oxide nanoparticles that contaminated in the environment. Different abnormal mitotic figures were observed in all mitotic phases. Among these abnormalities were micronuclei, fragment and anaphase bridges.

Keywords: Iron oxide nanoparticles, Gamma radiation, Seed germination, Chromosome aberrations





Factors Influencing the Accumulation of Radionuclides in Marine Sediment

Panchalee Chuttimaphorn
Kasetsart University, Bangkok, Thailand
b5510403454@ku.ac.th

Wanwisa Sudprasert*
Kasetsart University, Bangkok, Thailand
fsciwasu@ku.ac.th

The measurements of environmental samples to identify and quantify natural and artificial radionuclides are important for supporting the environmental radiation surveillance program of the country. This research aimed to study factors influencing the accumulation of radionuclides in marine sediment. Sediment samples were collected from 10 sites along the seashore of Sriracha, Chonburi province in three seasons (rainy: October 2015, winter: January, 2016 and summer: March, 2016). Radionuclides were determined using gamma spectrometry with a high purity germanium detector (HPGe) using a certified multinuclide standard source as a reference material. The effects of season and additional factors influencing radionuclides accumulation, i.e. particle size, organic matter and heavy metals were evaluated. The results showed that the accumulation of radionuclides varied with the particle size and the organic matter content in sediment. The accumulation of heavy metals showed similar results to that of the radionuclides in sediment.





Radioactivity Level in Marine Sediment after Fukushima Nuclear Power Plant Accident

Parot Supangyut
Kasetsart University, Bangkok, Thailand
b5510403501@ku.ac.th

Wanwisa Sudprasert*
Kasetsart University, Bangkok, Thailand
fsciwasu@ku.ac.th

The study of natural and man-made radioactivity in marine and coastal environments is of significant important to address the concern about human risk to radiation exposure. This research aimed to measure radioactivity levels in marine sediment collected in some areas of Chonburi Province after the Fukushima Daiichi nuclear disaster in 2011 compared to those collected in the pre-Fukushima period. A grab sampler was used for the sampling of surficial sediments that were collected from 10 sites along the seashore of Sriracha, Chonburi province in different periods, i.e., October 2015, January and March 2016. After collection, all the samples were dried and ground prior to radioactivity measurement. Natural and artificial radionuclides in sediment were analyzed using a well-calibrated HPGe detector. The results showed that the artificial radionuclides were not found in this study. The detected radionuclides were related to the naturally occurring isotopes U-238, Th-232 and K-40. However the mean specific activities of these radionuclides were not significantly different with those found before Fukushima accident. The present study confirmed no changes in the radioactivity levels and ensures the radiation safety of the marine environment along the sampling sites.





Development of a 2 kV high voltage power supply for scintillation detector

Pasawee Promsila,
Department of Applied Radiation and Isotope
Faculty of Science, Kasetsart University
Bangkok, Thailand
b5510403497@ku.ac.th

Anuwat Chanhom,
Department of Applied Radiation and Isotope
Faculty of Science, Kasetsart University
Bangkok, Thailand

Manit Jitpukdee
Department of Applied Radiation and Isotope
Faculty of Science, Kasetsart University
Bangkok, Thailand
fscimnj@ku.ac.th

We have developed a high-voltage power supply for scintillation detector which receives power from NIM power supply. Transformer with 3 stages voltage multiplier circuit was installed in high-voltage power supply, sine wave signal was generated by self-oscillation technique. In order to adjust the voltage, 10 turns potentiometer was installed to adjust the voltage between 0 – 2 kV and ripple 10 mV at 2 kV. The maximum voltage output was 2 kV and electric current was 500 μ A for biasing with photomultiplier tubes that conjunction with scintillator

Keywords: High Voltage, Power supply, Nuclear Instrument





Calibration of HPGe Gamma-ray Detector System for Radionuclides Measurement in Marine Sediment

Paveena Maomodee
Department of Applied Radiation and Isotopes,
Faculty of Science, Kasetsart University, Bangkok, Thailand
b5510403446@ku.ac.th

Wanwisa Sudprasert*
Department of Applied Radiation and Isotopes,
Faculty of Science, Kasetsart University, Bangkok, Thailand
fsciwasu@ku.ac.th

Determination of the activity concentrations of natural and artificial radionuclides in sediment with high accuracy is important in the assessment of radiation dose by these radionuclides, observing the behavior of radioactivity in the eco-system, and monitoring the radiation safety of the marine environment. Gamma-ray spectrometry is widely used to determine activities of a variety of radionuclides in environmental samples. Calibration of a gamma detector system is a complex multistep process which includes a number of measurements involving point sources and reference standard.

This research aimed to perform a careful calibration procedure for radionuclide measurement in marine sediment using aHPGe gamma spectrometry. The energy and efficiency calibration were carried out using a certified multinuclide standard source containing Cd-109, Co-57, Te-123m, Cr-51, Sn-113, Sr-85, Cs-137, Y-88 and Co-60. Relationship between energy of incident gamma ray and channel obtained by multichannel analyzer was observed in the energy range from 88 to 1,836 keV. The correlation between the gamma-ray energy and efficiency was obtained by fitting a second order polynomial to the measurement data. The Lower Limit of Detection (LLD) and Minimum Detectable Activity (MDA) were determined. The well-calibrated gamma spectrometry significantly supports the accurate measurement of radionuclides in marine sediment.





Gross alpha and beta measurement in selected drinking water samples by a gas proportional counter

Pracharee Korsuppharukchai,
Department of Applied Radiation and Isotopes,
Faculty of Science, Kasetsart University, Bangkok, Thailand
b5510403438@ku.ac.th

Ridthee Meesat
Department of Applied Radiation and Isotopes,
Faculty of Science, Kasetsart University, Bangkok, Thailand
fscirim@ku.ac.th

Panee Pakkong *
Department of Applied Radiation and Isotopes,
Faculty of Science, Kasetsart University, Bangkok, Thailand
fscipnp@ku.ac.th

Gross alpha and beta concentrations in drinking water are one of the important qualities for international standards. Drinking water contains radioactive substances that lead to present a risk to human health. Gross alpha/beta measurements in water samples enable radiochemical composition analysis in environmental studies, providing an efficient screening method. In Thailand, standard values for drinking water of gross alpha and beta radioactive concentration have not been setting up. For this reason, we selected the 9 drinking water samples from local commercial shops in Bangkok and a countryside to measure gross alpha and beta concentration. One liter of water samples was prepared by evaporation using hot plate at 80 °C to reduce sample volume. The sample residue was transferred to 2-inch diameter of a stainless steel counting planchet and dried under infrared lamp until constant weight. The sample planchets were measured the gross alpha and beta activities using the low background multiple detector type with 10 sample detectors (Berthold LB770) at Office of Atom for Peace (OAP). The gross alpha of the drinking water samples was 4.8 ± 3.5 mBq/L to 15.5 ± 4.1 mBq/L, and gross beta was 30.2 ± 8.8 mBq/L to 222.7 ± 14.7 mBq/L. In general, the standard limit of WHO for gross alpha and beta concentrations in drinking water are not over 500 mBq/L and 1000 mBq/L, respectively. Thus, the obtained results showed that activity concentrations of alpha and beta emitting radionuclides in selected drinking water samples are within the range recommended by WHO.

Keywords: Gross alpha and beta measurement, gas proportional counter, radioactivity in drinking water, gross alpha, gross beta





Gamma-ray Mutagenesis Studies on Stem Cuttings of Wild Petunia (*Ruellia squarrosa* (Fenzi) Cufod)

Rujira Yairam

Department of Applied Radiation and Isotopes, Faculty of Science,
Kasetsart University, Bangkok, Thailand
b5510403527@ku.ac.th

Katarut Chusree_aeom*

Department of Applied Radiation and Isotopes, Faculty of Science,
Kasetsart University, Bangkok, Thailand
fscikac@ku.ac.th

Wild Petunia (*Ruellia squarrosa* (Fenzi) Cufod) commonly use as coverage offering unique beauty to landscape areas and can be used to decontaminate pollutant both naturally and artificially into the soil. Stem cuttings of wild petunia were acutely irradiated by gamma-rays from Cobalt-60 with the dose of 0, 15 and 30 Gy at a dose rate of 224.4 Gy/hr to induce mutation. Irradiated stems (M_1V_0) were planted in plastic trays containing growing media and were placed in a shaded greenhouse, 50 stems per treatment with 3 replications. One month after irradiation, the number of survived stems, the number of stems producing lateral buds and growth performances were recorded. The calculated 50% growth reduction dose ($GR_{(50/60)}$) was 33.5 Gy. It was not possible to identify the median lethal dose ($LD_{(50/60)}$) because the survival rate was 100% in control, 96.88% in 15 Gy and 92.17% in 30 Gy. In M_1V_1 generation, some abnormalities characters were observed included narrow leaves, heart shape leaves and malformation leaves at the dose of 15 and 30 Gy. This information will be useful for gamma-ray mutagenesis in wild petunia research.

Keywords: Wild Petunia, gamma-ray mutagenesis, stem cutting





Testing Performance of CsI(Tl) Scintillator for Gamma-ray Detection

Sasiluk Thongsom,
Department of Applied Radiation and Isotopes Faculty of Science, Kasetsart University
Bangkok, Thailand
b5510400374@ku.ac.th

Damisa Bumrunghanakit ,
Department of Applied Radiation and Isotopes,
Faculty of Science, Kasetsart University, Bangkok, Thailand

Manit Jitpukdee*
Department of Applied Radiation and Isotopes
Faculty of Science, Kasetsart University, Bangkok, Thailand
fscimnj@ku.ac.th

The performance of CsI(Tl) scintillator for gamma-ray detection was studied. The CsI(Tl) scintillation crystals was grown under a simple developed process using the Bridgman-Stockbarger method. A CsI(Tl) crystal was assembled as a shielding foil and coupled with a Photomultiplier tube(PMT) from Hamamatsu model 52154-02. The assembly was associated with 276 Photomultiplier Base with Preamplifier for gamma spectrum analysis. Two different sizes of CsI(Tl) scintillation crystals (diameters 22 mm and 44 mm) were tested in radiation detection performance using gamma radiation sources of energy 662 keV from Cs-137. The results have shown the energy resolution at 662 keV for 22 mm and 44 mm diameter of scintillation crystals were 12.83% and 13.56%, respectively. The intrinsic peak efficiency at 662 keV for 22 mm and 44 mm diameter of scintillation crystals were 13.54% and 16.23%, respectively. This research presents that the grown CsI(Tl) scintillation crystals have suitable performance for gamma-ray detection and they can be used in radiation laboratory.

Keywords: CsI(Tl) , Scintillator , energy resolution, intrinsic peak efficiency





The study of ascorbic acid as a stabilizer of radiolabeled DOTA-biomolecule conjugates

Sasiwimon Naksuriyawong
Department of Applied Radiation and Isotopes,
Faculty of Science, Kasetsart University, Bangkok, Thailand
b5510403543@ku.ac.th

Wanwisa Sudprasert*
Department of Applied Radiation and Isotopes,
Faculty of Science, Kasetsart University, Bangkok, Thailand
fsciwasu@ku.ac.th

The application of ^{68}Ga -labelled DOTA-conjugated biomolecule is a new field of interest for positron emission tomography (PET). Radiolabelling at high specific activities are the most desirable for clinical application. This research aimed to study the stability of ^{68}Ga -DOTA-Bombesin using ascorbic acid as a stabilizer. As the pH of the radiolabelling reactions are extremely important for Ga, the radiochemical purity of ^{68}Ga -DOTA-Bombesin were compared in two pH adjuster systems, i.e., ammonium acetate and sodium acetate. The concentration of ascorbic acid was varied in the range of 10-30 mg/ml. The results showed that the radiochemical purity of ^{68}Ga -DOTA-Bombesin was highest at $90.8\pm 1.3\%$ in ammonium acetate compared to $70.5\pm 0.2\%$ in sodium acetate. The ascorbic acid with 10 mg/ml increased radiochemical purity of radiolabelled compound to $93.9\pm 0.7\%$ and $81.4\pm 0.4\%$ in ammonium acetate and sodium acetate, respectively.





The radioprotective effect of edible mushroom extracts inhibits gamma radiation-induced dicentric chromosome aberration in human lymphocytes

Sirirattana Thongkaew

Department of Applied Radiation and Isotopes,
Faculty of Science, Kasetsart University, Bangkok, Thailand
b5510403551@ku.ac.th

Paiboon Ruengpatthanaphong*

Department of Applied Radiation and Isotopes,
Faculty of Science, Kasetsart University, Bangkok, Thailand
fscipbr@ku.ac.th

The objective of this study aimed to investigate the antioxidant activity and the radioprotective effect of edible mushroom extracts including *Ganoderma lucidum*, *Pleurotus ostreatus culubinus*, *Pleurotus djamor*, and *Agaricus blazei*. Four species of mushroom extracts were evaluated for their antioxidant activities by DPPH, ABTS and FRAP assay. The results showed that the extracts of *Ganoderma lucidum* and *Agaricus blazei* were two higher antioxidant activities than other species. The EC₅₀ of *Ganoderma lucidum* extract was 0.056 mg/mL, 0.12 mg/mL, and 0.025 mg/mL for DPPH, ABTS, and FRAP assay, respectively. The EC₅₀ of *Agaricus blazei* extract was 0.2 mg/mL, 0.046 mg/mL, and 0.08 mg/mL for DPPH, ABTS, and FRAP assay, respectively. In addition, the radioprotective effect of these mushroom extracts was determined using dicentric chromosome aberration analysis (DCA). Peripheral blood samples from human volunteers were irradiated with ¹³⁷Cs Gamma ray at a dose of 3 Gy and then treated with the extracts of *Ganoderma lucidum* and *Agaricus blazei* at the doses of 0, 50, 100 and 200 µg/mL, respectively.

Keywords: Antioxidant activity, Edible mushroom extracts, Gamma irradiation, Dicentric chromosome aberration, Radioprotective





Radioprotective effect of *Lentinula edodes* and *Hericium erinaceus* in gamma radiation induced dicentric chromosome aberration

Sisirapatch Buasawas
Department of Applied Radiation and Isotopes,
Faculty of Science, Kasetsart University, Bangkok, Thailand
b5510403560@ku.ac.th

Paiboon Reungpatthanaphong*
Department of Applied Radiation and Isotopes,
Faculty of Science, Kasetsart University, Bangkok, Thailand
fscipbr@ku.ac.th

In this study, the antioxidant activity and radioprotective effect of mushroom extracts, including Shiitake mushroom (*Lentinula edodes*) and Yamabushitake mushroom (*Hericium erinaceus*), were investigated. Both of mushroom extracts greatly exhibited antioxidant activity by using DPPH, ABTS, and FRAP assays. The radioprotective effect of these mushroom extracts were determined by Dicentric Chromosome Analysis (DCA). Human blood samples were irradiated with gamma radiation at a dose of 3 Gy to induce dicentric chromosome aberration in human lymphocytes. The results of this study showed that the extracts of *Lentinula edodes* and *Hericium erinaceus* decreased dicentric chromosome aberration in human lymphocytes .

Our results suggested that both extracts of *Lentinula edodes* and *Hericium erinaceus* exerted their radioprotective effect to inhibit dicentric chromosome aberration in human lymphocytes.

Keywords: Mushroom extracts, Gamma irradiation, Radioprotective, Dicentric chromosome





The study of using solid neutron converters coated on a drift cathode for Gas Electron Multiplier-based Neutron Detector

Suwadee Sripraprem
Kasetsart University, Bangkok, Thailand
b5510403608@ku.ac.th

Kiadtisak Saenboonruang*
Kasetsart University, Bangkok, Thailand
fscikssa@ku.ac.th

The Gas Electron multiplier (GEM) detector is a relatively new gaseous detector but already establishes itself as one of the most promising particle detector due to its excellent properties including high rate capability, excellent position resolution, low discharged probability, and excellent radiation hardness. Generally, the GEM detector is used to detect ionizing particles, however, it could be modified by inserting suitable solid neutron converters such that it is now able to detect neutrons. Good neutron converters should have high neutron absorption cross section such that charged particles or low-energy gamma are produced during the conversion. This research aims to study effect of using different high-neutron-absorption-cross-section materials such as ^{10}B , ^{10}B , ^6Li , ^6Li , ^{113}Cd , ^{113}Cd , ^{157}Gd , and ^{157}Gd with different thickness coated on the GEM drift cathode to detect thermal neutrons. Simulations along with calculations were thoroughly considered. Results from this research could be used as a reference for future projects that aim to maximize detection efficiencies.





Synthesis of Gold-Iron Oxide Composite Nanoparticles using Gamma Radiation

Thanyabhorn Khemthong

Department of Applied Radiation and Isotopes,
Faculty of Science, Kasetsart University, Bangkok, Thailand
5510403390@ku.ac.th

Ridthee Meesat*

Department of Applied Radiation and Isotopes,
Faculty of Science, Kasetsart University, Bangkok, Thailand
fscirim@ku.ac.th

The radiation-induced formation of metal nanoparticles has been proved to be a powerful technique to synthesize nanocolloids and control their size. Bimetallic nanoparticles are class of significant materials receiving considerable attention because the diversity in structures, compositions and properties of these nanoalloys can be used in many applications such as catalysis, magnetism, and biomedicine. These applications favorably depend on physical properties of the composite metal nanoparticles such as shape, size and composition. In this study, the bimetallic nanoparticles consisting of gold and iron oxide were synthesized in aqueous solution systems using gamma-ray. The solutions were composed of 0.4 mM HAuCl_4 , 0.1 mM FeCl_3 , 4 % PVA used as a stabilizer, and 0.2 M isopropanol added as an $\cdot\text{OH}$ and H^\cdot scavenger. Gamma irradiation was carried out in a gamma chamber Mark I with dose rate 0.7 kGy/h, provide by Nuclear Technology Research Center, Faculty of Science, Kasetsart University. The dose rate was performed by Fricke dosimetry. The samples were irradiated at 4 kGy. The results showed that the color of the solutions turn to light red-violet meanwhile the solutions without FeCl_3 , the color of the solution was red-violet. The UV absorption peak showed at 520 nm which confirmed the formation of gold-nanoparticles. However, the color of the solutions without gold chloride did not change and the transitions were not observed in typical UV-Vis spectra (200-800 nm). So, the iron oxide nanoparticles were not synthesized at the absorbed dose. For the Au-Fe bimetallic nanoparticle synthesis study at high dose (>100 kGy), the experiments are in the process.

Keywords: Gold-iron oxide composite nanoparticles, Gamma-ray





The use of Soypex100 to improve performances of paraffin/boron oxide for neutron shielding

Waraporn Putthumrong
Department of Applied Radiation and Isotopes,
Faculty of Science, Kasetsart University, Bangkok, Thailand
steppraw@gmail.com

Kiadtisak Saenboonruang *
Department of Applied Radiation and Isotopes,
Faculty of Science, Kasetsart University, Bangkok, Thailand
fscikssa@ku.ac.th

Since neutrons are neutral, reducing energy of neutrons using ionizations is not effective. To effectively shield neutrons, materials with high contents of light elements or high-neutron-absorption-cross-section elements such as boron or lithium are used. Since paraffin consists of a mixture of hydrocarbon molecules, it is commonly used as a neutron shielding. However, fumes from paraffin wax is flammable, hence, it could be dangerous to facilities that involve usages of fire. This research aims to study effect of mixing Soypex-100, a renewable vegetable-based candle wax, to improve properties of a composite of paraffin/boron oxide (B_2O_3) as a neutron shielding. Important characteristics that were investigated include melting point, flash point, and linear attenuation coefficient (μ). Different contents of Soypex-100 and boron oxide were varied during the research and thorough measurement and analysis were performed.





Effect of silver nanoparticles synthesized by gamma radiation on resistant to bacteria, mung bean seed germination and chromosome aberrations

Warisa Ussawanantakarn

Department of Applied Radiation and Isotopes,
Faculty of Science, Kasetsart University, Bangkok, Thailand
b5510403535@ku.ac.th

Ridthee Meesat*

Department of Applied Radiation and Isotopes,
Faculty of Science, Kasetsart University, Bangkok, Thailand
fscirim@ku.ac.th

At the present, silver nanoparticles (SNPs) have been interesting extensively in many fields such as antimicrobial functions, waste water treatments, medical and industrial applications. Some applications have also been extended for commercial purposes for examples detergents, cosmetics and hydro-gel wound dressing which are used in daily life. So, these products will inevitably end up to the environment. The toxicity of the metallic nanoparticles is a controversial issue because they are more toxic and chemically active per unit of mass than bulk materials of the same elements. There are serious environmental and biological concerns over these invisible and tiny particles. In this project, we focus on influences of SNPs on plant biological system. The Ag-nanoparticles were synthesized by a ^{60}Co gamma chamber irradiator with a dose rate of 4 kGy/h provided by Thailand Institute of Nuclear Technology (TINT). The dose rate was measured by Fricke dosimeter. The solutions were composed of 1mM AgNO_3 , 4 % of a stabilizer and 0.2 M iso-propanol used as an oxidizing agent scavenger. Polyvinyl alcohol (PVA) average Mw 100000 da and polyvinyl pyrrolidone (PVP) average Mw 10000 da were be used as the stabilizer. These solution samples were irradiated at 100 kGy. The color of irradiated solutions in PVA and PVP were yellow- green and dark brown, respectively, while the absorption peak showed a peak at 400 – 410 nm corresponding to the surface Plasmon resonance band of silver nanoparticles. In case of the plant biological experiments, we studied effects of SNPs on seed germination, plant growth and chromosome aberration. For seed germination, the selected mung bean seeds (strain Chainat 72) were soaked 2 h in de-ionized water (DI-water) as a control and a mixed solution of SNPs in PVA with a ratio of 1:20 as well as SNPs in PVP and DI-water solutions. The treated seeds were used to test seed germination and shoot growth. For the latter case, *Allium cepa* root chromosomal aberration assay was used to evaluate the toxicity of SNPs. The result showed that the germination of soaked seeds in SNPs-PVA solutions and SNPs-PVP solutions were significantly decrease 88 % and 85 % , as compared with a control, respectively. The shoot and root lengths of the seeds in SNPs-PVA solutions and SNPs-PVP solutions were significantly decrease 98.03 % and 96.63 % , as compared with a control, respectively . For the chromosome aberration study, the experiments are in the process.





Detection of organothionphosphate using gold nanoparticles synthesized by gamma radiation

Yada Mongkhonthanaporn
Department of Applied Radiation and Isotopes,
Faculty of Science, Kasetsart University, Bangkok, Thailand
b5510400331@ku.ac.th

Ridthee Meesat*
Department of Applied Radiation and Isotopes,
Faculty of Science, Kasetsart University, Bangkok, Thailand
fscirim@ku.ac.th

Water pollution from pesticides is a serious problem in many countries, especially developing nations. Highly sensitive techniques and accurate evaluation of the pollutant contamination in water are one of the crucial tasks of environmental monitoring. In this study, we used synthesized gold nanoparticles (GNPs) by gamma radiation to detect malathion. The organophosphate pesticide is common found in the surface water. The detection mechanism is based on the fact that the sulfhydryl group (-SH) of malathion can react with GNPs, leading to change the color of the solution. The changing color depends on concentration of the pesticide in the GNPs solution and can be visually detection. The GNPs were synthesized using gamma radiation in an aqueous solution, containing 0.5 mM $\text{HAuCl}_4 \cdot 6\text{H}_2\text{O}$ in presence of a stabilizer and 0.2 M 2-isopropanol as a scavenger of oxidizing agents. In this project, we used 4 %, 6 % and 8% polyvinylpyrrolidone (PVP), 10 % polyvinyl Alcohol (PVA), and 4 % acrylamide as the stabilizer. The sample solutions were irradiated 4 kGy at room temperature in a ^{137}Cs gamma irradiator Mark I with dose rate 0.7 kGy/h provided by Nuclear Technology Research Center, Faculty of Science, Kasetsart University. The dose rate was measured by Fricke dosimeter. The color of irradiated solutions turns to red. The absorption peak showed a peak at 520-530 nm which is confirmed the formation of gold nanoparticles, corresponding to the surface Plasmon resonance band. In case of malathion measurement, the pesticide was detected by mixing the pesticide solution and the diluted GNPs solution. The total volume of the mixed solution was 1 ml. The concentrations of the pesticide were prepared 0-40 ppm. The GNPs solutions were diluted five folds. The color of GNPs solutions in presence of malathion changed from pink to purple. The color of the solution depended on the concentration of malathion. However, in case of GNPs-PVA solutions and acrylamide, the color did not change. Thus, the measurement of malathion using GNPs depends on the stabilizers

Keywords: Gold nanoparticles, Gamma ray, Pesticides, Malathion, polyvinyl alcohol, polyvinylpyrrolidone, acrylamide





Diversity of Diatoms in the Area of Bang Kachao, Samut Prakan Province

Apirak Oomgrai
Kasetsart University, Bangkok, Thailand
apirak.o@ku.th

Nittaya Somsap *
Kasetsart University, Bangkok, Thailand
fscinys@.ku.ac.th

This study was emphasizing on diversity and density of diatoms with environmental factors in the area of Bang Kachao, Samut Prakan province from dry to rainy season (April to July 2015). Sampling sites were set up at different five stations (KJ1 to KJ5). The environmental parameters showed 27.39–32.63 °C of brackish water temperature, 2.20–7.16 psu of salinity, 0.32–6.56 mg.L⁻¹ of dissolved oxygen and 6.64–7.70 of pH. Ten genera of diatoms were identified. *Cylindrotheca* was the most dominated genus of $5.38 \pm 5.75 \times 10^4$ cells.L⁻¹ (74.48% of total density) followed by *Thalassiosira* (19.34%). The station and month that had the highest densities of diatoms were KJ2 and July. Both of the most values of Shannon-Wiener diversity indices (H') and Pielou evenness indices (J') were found in KJ1 and June.





Antioxidant activity of golden apple snail extracts

Chinachote Kongraksrasakul

Department of Zoology, Faculty of Science, Kasetsart University, Bangkok, Thailand
Bariesmith21@gmail.com

Teerasak E-kobon*

Department of Genetics, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscitse@ku.ac.th

Pramote Chumnanpuen

Department of Zoology, Faculty of Science, Kasetsart University, Bangkok, Thailand
pramote.c@ku.ac.th

A golden apple snail (*Pomacea canaliculata*) is a freshwater snail originated from South America and widely distributed in Asia. It is one of the agricultural pests in Thailand causing problems on rice fields. The snail lives in diverse habitats such as pond, marsh, paddy field, canal, swamp, and survives even in dried and polluted environments. Some reports showed that *P. canaliculata* body part and egg shell extracts had antioxidant property against free radicals caused by UV radiation, heavy metal, and other toxic chemical contamination. The free radicals have central roles in metabolism, cellular stress, DNA damage and mutation. Consequently, effects of these free radicals can cause cardiovascular disease, cancer, diabetes, hypertension, Alzheimer disease, etc.

The objective of this research was to study the antioxidant activity of the golden apple snail extracts. The radical *scavenging* activities of both aqueous and ethanolic extracts were evaluated using 2,2-diphenyl-1-picrylhydrazyl (DPPH) assay compared to the standard antioxidant compound (Trolox). We found that the antioxidant compounds in the snail extracts were thermostable indicating that they were not destroyed by the cooking process. The comparison of antioxidant activity between the heated and non-heated snail extracts is currently ongoing. We hypothesized that the non-heated snail extraction might have higher antioxidant activity than the heated condition. The results of this research can be applied to pharmaceutical and cosmetic applications for protecting deterioration of the cells and preventing diseases caused by the free radicals.





Diversity of Blue Green Algae in the Area of Bang Kachao, Samut Prakan Province

Jaruwan Phantuchan
Kasetsart University, Bangkok, Thailand
popjawan@gmail.com

Nittaya Somsap*
Kasetsart University, Bangkok, Thailand
fscinys@.ku.ac.th

Diversity and density of blue green algae with physico-chemical parameters in the area of Bang Kachao, Samut Prakan province, were investigated from dry to rainy season (April to July 2015) at different five sampling sites (KJ1 to KJ5). The results showed that brackish water had ranges in values of temperature (27.39–32.63 °C), salinity (2.20–7.16 psu), dissolved oxygen (0.32–6.56 mg.L⁻¹) and pH (6.64–7.70). Phytoplankton assemblages were identified to seven genera of blue green algae. *Planktolyngbya* was a dominant genus with a mean density of $10.38 \pm 3.71 \times 10^4$ units.L⁻¹ or 95.10% of total density. The highest densities of blue green algae were found in KJ4 and July. Shannon-Wiener diversity indices (H') had maximum values in KJ4 and April. Pielou evenness indices (J') had the highest values in KJ1 and April.





Effect of *Tiliacora triandra* leaves extract on hippocampal neurogenesis.

Jurairat Rungreung

Department of Zoology, Faculty of Science, Kasetsart University, Bangkok, Thailand.
fujimakenta@gmail.com

Wachiryah Thong-asa*

Department of Zoology, Faculty of Science, Kasetsart University, Bangkok, Thailand.
fsciwyth@ku.ac.th

Mammal brain present approximately two area of neurogenesis, subventricular zone (SVZ) of lateral ventricles and subgranular zone (SGZ) of dentate gyrus. From past reports found the ischemia is a determinant of neurogenesis effect. The present study aimed to evaluate the effect of *Tiliacora triandra* leaves extract on hippocampal neurogenesis in normal and transient cerebral ischemic mice. Transient cerebral ischemia (t2VO) was induced by 3 minutes bilateral common carotid artery occlusion. Thirty male ICR mice were randomly divided into 6 groups of SHAM+VEH, SHAM+300, SHAM+600, t2VO+VEH, t2VO+300, t2VO+600. Twenty four hours after surgery, mice were orally administered with vehicle (10% Tween 80) and/or *T.triandra* extract (300 and 600 mg/kg) for 18 consecutive days. The number of neurogenesis were analyzed by using Ki-67 immunohistochemistry. The result showed that transient ischemia induced by 3 minutes bilateral common carotid artery occlusion result no effect on hippocampal neurogenesis, and similar *Tiliacora triandra* leaves extract either normal, and transient cerebral ischemic mice.





Histopathological Effects of Atrazine on the Freshwater Mussel, *Hyriopsis bialata*

Krittapas Srisamai
Kasetsart University, Bangkok, Thailand
kritaphasdeksiyung@gmail.com

Nopparat Srakaew*
Kasetsart University, Bangkok, Thailand
fscinrsr@ku.ac.th

Atrazine is one of the herbicides widely used in Thailand for controlling broad-leaf weeds that grow in the crops. High utilization of atrazine results in its contamination both in terrestrial and aquatic environments. Accumulated evidence has indicated that atrazine at 0.01-160 $\mu\text{g/l}$ is detected in the natural freshwater resources in Thailand. Bivalve molluscs are ubiquitously distributed in several aquatic environments. Their filter-feeding activity likely makes them sensitive to toxicants, and thus they are often used as sentinels to monitor the toxic levels of the water. This study aimed to evaluate the acute toxicity of atrazine to the freshwater pearl mussel, *Hyriopsis bialata*, using high concentrations of atrazine. The mussels were reared in aquaria with a controlled temperature (26 °C) and photoperiod (12 h L: 12 h D). The animals were fed *ad libitum* with the green algae, *Kirchneriella incurvata*. Four mussels each (two males and two females) were treated with atrazine at different concentrations (0, 25, 50, 100 and 200 mg/l) for 4 days. The experiments were conducted with three replicates. The viability of the mussels was determined and assessed using one way ANOVA and Turkey's multiple comparison test. Tissues (the gills, mantles, gonads and digestive organs) were dissected out, fixed in 10% neutral buffered formalin, embedded in paraplast and cut into 5- μm -thick sections. Histological sections were stained with hematoxylin and eosin and viewed under a light microscope for histopathological study. It appears that atrazine did not cause significant mortality. In addition, atrazine-treated mussels did not show histopathological changes compared with untreated mussels. Therefore, atrazine did not exert acute toxicity to *H. bialata*. However, further study is needed to determine the chronic effects of atrazine on the freshwater mussels to guarantee the potential use of the mussels as a bioindicator for the atrazine toxicity test.





Effect of *Tiliacora triandra* on spatial learning and memory in permanent left common carotid artery occlusion mice

Natsuda Mayagasa

Department of Zoology, Faculty of Science, Kasetsart University, Bangkok, Thailand
natsuda.ma@ku.th

Wachiryah Thong-asa*

Department of Zoology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fsciwyth@ku.ac.th

Chronic cerebral hypoperfusion led to a neuronal dysfunction and a neuronal dead may cause by an atherosclerosis or arteriosclerosis. The neuronal dead occurred in vulnerable areas, such as the hippocampus, which played an important role in the formation of new memories, the consolidation of information from short-term memory to long-term memory and spatial navigation. The present study investigated the effect of the *Tiliacora triandra* extract on spatial cognitions in chronic cerebral hypoperfusion mice cause by permanent left common carotid artery occlusion (LCO). Sixteen male ICR mice were randomly divided into 3 groups of Control, LCO+300 and LCO+600, respectively. Drug administration was treated for 18 days and started 8 days after the operation. At day 7 of drug administration the cognitive abilities were evaluated using the acquisition and reversal trials in the Moris water maze. The result revealed significantly enhancing effect on spatial learning of LCO+300. Both LCO+300 and LCO+600 showed significantly enhanced of learning flexibility, on the other hand, there was no significant difference in memory capacity between all groups, which imply that *T. triandra* extract enhances spatial learning and flexibility learning, but not spatial memory capacity. In conclusion, *T. triandra* extract enhances the spatial learning and learning flexibility, but not spatial memory capacity in chronic cerebral hypoperfusion mice caused by permanent left common carotid occlusion.





Effect of *Tiliacora triandra* leaves extract on oxidative status in permanent left common carotid artery occlusion mice.

Nicha Swattanakoon
Kasetsart University, Bangkok, Thailand
niichaa.toey@gmail.com

Wachiryah Thong-asa*
Kasetsart University, Bangkok, Thailand
fsciwyth@ku.ac.th

Chronic cerebral hypoperfusion is involved in neurodegenerative diseases such as vascular dementia (VaD) and Alzheimer's disease (AD). It is induced by thrombotic or embolic blockage of the cerebral blood flow and lead to oxidative stress neuronal degeneration. The present study aimed to investigate the effect of *Tiliacora triandra* leave extract on the brain oxidative stress in chronic cerebral hypoperfusion mice induced by permanent left common carotid artery occlusion. Sixteen male IRC mice were randomly divided into 3 groups of Control, UCO+300, UCO+600. Control mice were surgery for permanent left common carotid artery occlusion and orally administration of 10% Tween 80 while others were received *T.triandra* leaves extract (300 and 600 mg/kg) for 14 days. All mice were decapitation and remove brain for oxidative stress evaluation such as total protein level, calcium level and lipid peroxidation (malondialdehyde; MDA), catalase (CAT), reduced glutathione (GSH), and superoxide dismutase (SOD). The result showed that *T.triandra* leaves extract had no effect on the oxidative status in our chronic cerebral hypoperfusion mice model. The present study concluded that *T.triandra* leaves extract had no effect on oxidative status in chronic cerebral hypoperfusion mice model which is induced by permanent left common carotid artery occlusion.





The Survey of Edible Bivalve in Prachuap Khiri Khan Province

Patitta Deesanguan

Department of Zoology, Faculty of Science, Kasetsart University, Bangkok, Thailand
patita.d@ku.th

Cheewarat Printrakoon*

Department of Zoology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscicrp@ku.ac.th

This study was focused on the study of bivalve species from 18 sites along coastline in Prachub kirikhun Province. Live and dead 107 shell species from 22 families were recorded. Sandy beach was the main habitat for bivalve diversity, Bo thong lang showed the maximum bivalve species (35 species, 13 families). The second was Ao Manaow that show 32 species from 12 families following Had soun (30 species; 15 families) and Had fang dang (25 species, 14 families). Had ao noi was the last of top five, 18 species from 7 families. According to the highest number of species, Veneridae was the most important among four economic and edible bivalve families that 22 species were recorded. Following family Arcidae (13 species), Mytilidae (6 species) and Donacidae (4 species) were recorded respectively. *Meretrix meretrix* (Veneridae) was the most commonly distributed that was coved 12 sites, following *Donax faba* (Donacidae) was found in 11 sites, *Perna viridis* (Mytilidae) was found in 9 sites and *Tegillarca granosa* distributed 3 sites, respectively. Although some families were showed the high number of species such as Cardiidae (9 species), Mactridae (7 species) and Tellinidae (7 species) respectively but not prefer to eat in local or market. Not only taste factor or meat content in shell but status of distribution and abundance in field study were also the important factors to promote utilization. This study will be database information to support development of utilization, management and aquaculture in the future.





Diversity of Green Algae in the Area of Bang Kachao, Samut Prakan Province

Pattarawadee Thongjam
Kasetsart University, Bangkok, Thailand
wadee_za36@hotmail.com

Nittaya Somsap*
Kasetsart University, Bangkok, Thailand
fscinys@.ku.ac.th

The study of diversity and abundance of green algae with environmental factors were conducted in the area of Bang Kachao, Samut Prakan province. Samples were collected at different five stations (KJ1 to KJ5) from dry to wet season (April to July 2015). The brackish water had minimum and maximum values of temperature (27.39–32.63 °C), salinity (2.20–7.16 psu), dissolved oxygen (0.32–6.56 mg.L⁻¹) and pH (6.64–7.70). Green algae were identified to seven genera. The most dominated were *Microspora* with a mean density of $2.70 \pm 3.52 \times 10^3$ cells.L⁻¹ (55.32% of total density) and *Scenedesmus* (30.75%). The highest densities of green algae were found in KJ3 and May. Shannon-Wiener diversity indices (H') had maximum values in KJ5 and April. Pielou evenness indices (J') had the highest values in KJ2 and April.





Diversity of Dinoflagellates in the Area of Bang Kachao, Samut Prakan Province

Piyatida Kumnuedsana
Kasetsart University, Bangkok, Thailand
babyback_magician@hotmail.com

Nittaya Somsap*
Kasetsart University, Bangkok, Thailand
fscinys@.ku.ac.th

Diversity and abundance of dinoflagellates with environmental factors in the area of Bang Kachao, Samut Prakan province, were studied at five sampling stations (KJ1 to KJ5) from dry to wet season (April to July 2015). Physico-chemical parameters of brackish water had ranges in values of temperature (27.39–32.63 °C), salinity (2.20–7.16 psu), dissolved oxygen (0.32–6.56 mg.L⁻¹) and pH (6.64–7.70). The most dominated genera from four identified dinoflagellates belonged to *Peridinium* with a mean density of $1.4 \pm 0.66 \times 10^3$ cells.L⁻¹ (69.96% of total density) and *Alexandrium* (27.18%). KJ3 and July presented the highest densities of dinoflagellates. KJ1 and April had maximum values of Shannon-Wiener diversity indices (H'). KJ1 and May had the most values of Pielou evenness indices (J').





Distribution of Bivalve Species in Kood Island, Trat Province

Ratchakorn Wetworanan

Department of Zoology, Faculty of Science, Kasetsart University, Bangkok, Thailand
ratchakorn.w@ku.th

Cheewarat Printrakoon*

Department of Zoology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscicrp@ku.ac.th

The study of the distribution of bivalves was intended to gather information of bivalves is found in the eastern of Thailand. Six sites of four microhabitats such as sandy beach, rocky beach, rocky shore with shallow reef and mangrove patchy were focused along coastline of Kood island, Trat Province. Sixty five bivalve species 21 families (8 orders) were found this study. Arcidae are the most important family which recorded the highest species (9 species; 13.85%), the second is Spondylidae that found 8 species (12.31%). Followed by Veneridae was found 7 species (10.77%), Cardiidae and Isognomonidae both were found 6 species (9.23%), respectively. Significantly, *Spondylus* spp. from family Spondylidae were commonly found in all site whereas *Barbatia foliata* from family Arcidae was found in almost site except mangrove site. Sandy beach of Khlong Hin revealed the most diverse were found 25 species, the next was sandy beach of Tha Ta Pao were found 24 species following by rocky shore with shallow reefs (22 species), rocky beach of Khlong Hin (12 species) and the mangrove of Khlong Gnam Khlo (8 species). The lowest number was found at rocky shore of Bang Bao that 6 species were recorded. This result was similar to previous report that study on bivalves in the East Coast Gulf of Thailand, microhabitat properties were related to along the gulf of Thailand on discussion. However, *Anadara rhomboidalis*, *Arca patriarchalis*, *Barbatia illota*, *Barbatia pistachia*, *Vasticardium kengaluorum*, *Vasticardium pectiniforme*, *Vasticardium seweli*, *Vasticardium vertebratum*, *Veplicardium sinense*, *Donax (Dentilatona) incarnatus*, *Semele cordiformis*, *Anodontia edentula*, *Lucina pensylvanica*, *Aulacomya atra*, *Brachidontes striatulus*, *Trichomya hirsuta*, *Isognomon (Anisoperma) perna*, *Isognomon (Parviperna) albisoror*, *Placuna quadrangular*, *Spondylus fauroti*, *Spondylus foliacens*, *Spondylus heidkeae*, *Spondylus multimuricatus*, *Spondylus occidens*, *Spondylus squamous*, *Plicatula plicata*, *Geloina bengalensis*, *Macra olorina* were firstly report as new recorded in Thailand. This finding indicates that the basic knowledge of biology diversity for conserve the bivalve population in conservation area.





Histological Structures of Digestive System in Leschenault's Rousette (*Rousettus lechenaulti*)

Ratchanon Sopapan
Kasetsart University, Bangkok, Thailand
ken_rb_121@hotmail.com

Wirasak Fungfuang*
Kasetsart University, Bangkok, Thailand
fsciwsf@ku.ac.th

The Leschenault's Rousette, *Rousettus lechenaulti*, widely inhabits Thailand except lower southern Thailand and it is important in the ecosystem as a pollinator and help for reproduction of tree. Although ubiquitously found, the biology of *R. lechenaulti* is poorly understood, including the digestive system. The aim of the present study was to investigate the microscopic structures of digestive system of *R. lechenaulti*. The adult wild bats were collected from Chuntaburi province. Animals were euthanased and the digestive tract were collected, fixed in neutral buffer formalin solution for 24 hr., embedded with paraffin technique. Tissue sections were stained with hematoxylin&eosin (H&E) for general structural histology, Alcian blue (AB) pH 1.0 for sulfated mucopolysaccharides, AB pH 2.5 PAS for carboxylated mucopolysaccharides and periodic acid-Schiff (PAS) for neutral mucopolysaccharides. The results indicated that the anterior and posterior tongue were found lingual papillae, but posterior tongue were found mucous gland in skeletal muscle layer. In addition, digestive tracts were found four layers, including Tunica mucosa consists of epithelium and lamina propria, Tunica submucosa consists of loose connective tissue with blood vessel, Tunica muscularis consists of smooth muscle, and Tunica adventitia consists of loose connective tissue. However, this study improved fundamental knowledge on the structures of the bats digestive system contributes to a better understanding of digestive system of the bats in comparison to other mammals.





Functional annotation of metabolic genes in firefly *Luciola aquatilis*

Sarintip Nguantad
Kasetsart University, Bangkok, Thailand
b5610403804@ku.ac.th

Pramote Chumnanpuen*
Kasetsart University, Bangkok, Thailand
pramote.c@ku.ac.th

Ajaraporn Sriboonlert
Kasetsart University, Bangkok, Thailand
fsciapsl@ku.ac.th

Wanwipa Vongsangnak
Kasetsart University, Bangkok, Thailand
fsciwpv@ku.ac.th

Firefly is a bioluminescence beetle belonging to the Coleoptera Order, Lampyridae Family. Due to firefly can only survive in the unpolluted environment, they are considered as bio-indicator. Moreover, the firefly larva has a favorable role in agricultural pest control as they prey on either fresh water or land snails. Nowadays, their bioluminescence is also highly beneficial in different research applications. Even though there are several studies on fireflies e.g., life cycle, flashing behaviour, and bioluminescence, the molecular control underlining these processes are still limited. In this study, we aim to perform functional annotation of metabolic genes in *Luciola aquatilis* larva. A total of 19,761 protein coding genes were decoded from 39,730 transcripts achieved from Illumina RNA Sequencing data. Using KEGG via GhostKOALA with a cut-off of 50% sequence identity, a total of 4,728 protein coding genes were identified and orderly distributed into five functional categories i.e. metabolism (1,744 genes), genetic information processing (1,236 genes), environmental information processing (915 genes), cellular processes (509 genes), and organismal systems (324 genes). As a result, the metabolism observably shows a major functional category. Interestingly, the high numbers of metabolic genes and functions associated with carbohydrate metabolism (296 genes), lipid metabolism (241 genes) and nucleotide metabolism (222 genes) are found. In contrast, a few metabolic genes and functions involved in terpenoids and polyketides metabolism (52 genes) are found. This study provides the functional annotation data which can be used to gain insight into metabolic roles of *L. aquatilis* and relevant firefly.





Antioxidant activity of Cyclophorid snail mucus

Sasi Thakan

Department of Zoology, Faculty of Science, Kasetsart University, Bangkok, Thailand
sasi.thakan.37@gmail.com

Teerasak E-kobon*

Department of Genetics, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscitse@ku.ac.th

Pramote Chumnanpuen

Department of Zoology, Faculty of Science, Kasetsart University, Bangkok, Thailand
pramote.c@ku.ac.th

At present, many people are interested in good health and they want to live long. Free radicals deteriorate human's health quickly. Antioxidants can scavenge free radicals and combat their effects. The aim of this study was to investigate antioxidant activity of the crude mucus extract from the edible snail, *Cyclophorus* sp. The radical scavenging activities of fresh and freeze-dried snail mucus were evaluated using 2,2-diphenyl-1-picrylhydrazyl (DPPH) assay compared to 6-Hydroxy-2,5,7,8-tetramethylchroman-2-carboxylic acid (Trolox) as the standard antioxidant compound. The crude mucus of *Cyclophorus* sp. (mucilage forms was dissolved by water) was tested at the concentration of 1.25 - 10 $\mu\text{g/ml}$ in 96-well plate. Thermal stability of the snail extracts was investigated to assure that the antioxidant property remained after the Cyclophorid snails/extracts were cooked. The antioxidant property was maximum in the fresh mucus (26.19%) followed by the freshly-boiled mucus (21.89%) and the freeze-dried mucus (20.02%). The percentage of inhibition of these mucus samples was dose dependent. Triplicate experiments gave highly reproducible results. Our results showed the novel antioxidant property of the Cyclophorid snail mucus for the first time and the thermal stability of the mucus has been ensured. This can be applied for the nutraceuticals, bio-pharmaceuticals and cosmetics as possible source of cost-effective natural antioxidants.





Histological Structures of the Digestive tract in Greater short-nosed Fruit Bat (*Cynopterus sphinx*)

Sippakorn Phantawongsupakorn*
Kasetsart University, Bangkok, Thailand
sippakorn.p@ku.th

Wirasak Fungfuang
Kasetsart University, Bangkok, Thailand
fsciwsf@ku.ac.th

The Greater short-nosed fruit bat, *Cynopterus sphinx*, widely inhabits all area in Thailand and it is important in ecosystem as a pollinator of fruits because they consumed the nectar as a food. Although ubiquitously found the biology of *C. sphinx* is poorly understood, including the digestive tract. The aim of the present study was to investigate the microscopic structures of the digestive tract of *C. sphinx*. Animals were anesthetized with an overdose of Anesthetic agents, fixed in Neutral buffer formalin solution for 24 h, the digestive tract of *C. sphinx* was processed by paraffin technique, stained with Hematoxylin and eosin, Alcian blue pH2.5-PAS, Alcian blue pH1.0 and PAS and examine with light microscope. According to the result, it was found that only dorsal surface of *C. sphinx*'s tongues covered with keratinized stratified squamous epithelium. The filiform papilla and fungiform papilla also found on the tongue. The esophagus is lined with non-keratinized stratified squamous epithelium, Submucosa layer of *C. sphinx*'s esophagus were clearly seen. Invagination in the stomach, causing a gastric pits. In the body part there were fewer gastric glands than other parts in stomach, and the epithelium of intestine is simple columnar epithelium, a long villi and number of goblet cells can be found throughout the intestine and also found Bruner's gland in *C. sphinx*'s intestine. Villi were not found in large intestine, but found Plica circularis and many Intestinal gland in *C. sphinx*'s large intestine. These result should contribute to improve understanding of bat morphology and comparison of the digestive tract to the other bats.





Antibacterial biofilm activity of mucous proteins from giant African snail (*Achatina fulica*) on *Escherichia coli* and *Staphylococcus aureus*

Suwapitch Chalongkulasak

Department of Zoology, Faculty of Science, Kasetsart University, Bangkok, Thailand
pojii.sn@gmail.com

Teerasak E-kobon*

Department of Genetics, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscitse@ku.ac.th

Pramote Chumnanpuen

Department of Zoology, Faculty of Science, Kasetsart University, Bangkok, Thailand
pramote.c@ku.ac.th

Giant African snail (*Achatina fulica*) is an alien species that can rapidly reproduce in Thailand and seriously causes damage to agricultural products. Even though there were several reports on the antimicrobial activity of snail mucus and their extracts, their inhibitory effect on bacterial biofilm has never been studied. Bacterial biofilms cause problems in hospital, drinking water system and food industry where high sanitation is essential. This study aimed to evaluate the efficiency of mucous protein from giant African snail against the biofilm formations of *Escherichia coli* and *Staphylococcus aureus*. The snail mucus was collected and separated as 5 HPLC-fractions by reverse phase (C18) column. Antibiofilm formation abilities of crude mucus and all fractions at the concentration of 200 µg/ml were tested with the cultured *E. coli* and *S. aureus* in 96-well plates for 72 h. Biofilm formations were evaluated by crystal violet (CV) assay, visualized under the inverted microscope, and measured the absorbance at 590 nm. The result indicated that the HPLC fraction 3 and 4 had the highest inhibitory effect on bacterial biofilms. The investigation of IC₅₀ value of the selected fraction will be an ongoing process. Our research shows the potential applications and sustainable way to solve the bacterial biofilm problem using agricultural pest snails.





Microscopic Structures of the Posterior Digestive Tract of the Butterfly Lizard, *Leiolepis ocellata* Peters, 1971 (Squamata: Agamidae)

Tanachoke Kengkarnpanich*
Kasetsart University, Bangkok, Thailand
best.tk5561@gmail.com

Nopparat Srakaew
Kasetsart University, Bangkok, Thailand
fscinrsr@ku.ac.th

The butterfly lizard, *Leiolepis ocellata*, widely inhabits northern Thailand and it is important in the ecosystem as a predator for controlling insects. Although ubiquitously found, the biology of *L. ocellata* is poorly understood, including the digestive system. The goal of the present study was to investigate the microscopic structures and carbohydrate components of the posterior digestive tract of *L. ocellata*. Ten wild lizards (five males and five females) were collected from Tak and Lampang provinces. Animals were anesthetized with an overdose of sodium pentobarbital. The abdominal incision was made to expose the internal organs. The small and large intestines were collected, fixed in Bouin's solution for 24 h, embedded in a paraplast and cut into 5- μ m-thick sections. Histological sections were stained with hematoxylin-eosin for general nuclear and cytoplasmic staining, periodic acid-Schiff (PAS) for neutral mucopolysaccharides, alcian blue (AB) pH 1.0 for sulfated mucopolysaccharides, AB pH 2.5 for carboxylated mucopolysaccharides, PAS-AB pH 2.5 for determination of co-production of neutral and carboxylated mucopolysaccharides and Masson's trichrome for differentiation of the collagenous connective tissues and the muscular tissues. The results show that three common tissue layers from the inside to the outside (mucosa, muscularis and serosa) constitute the wall of both intestinal regions. However, the large intestinal wall has an additional submucosa layer located between the mucosa and the muscularis. The mucosa consists of an epithelium and an underlying lamina propria. The small intestinal epithelium is of a simple ciliated columnar epithelium, while the large intestine is lined by a simple non-ciliated columnar epithelium. Interspersed with epithelial cells are mucous goblet cells. Carbohydrate histochemistry reveals that these mucous cells produce a mixture of neutral, carboxylated and sulfated mucopolysaccharides. The lamina propria contains loose connective tissues with numerous blood vessels. The submucosa of the large intestine is separated from the mucosa by few layers of the smooth muscles (muscularis mucosae). It consists of connective tissues that become blue upon Masson's trichrome staining. The muscularis comprises the inner circular and outer longitudinal smooth muscles, both of which become red upon Masson's trichrome staining. The outermost serosa is composed of loose connective tissues covered with a simple squamous epithelium. Our ongoing study is also to investigate the microscopic structures of the anterior digestive system and organs associated with the digestive system in this species. Improved fundamental knowledge on the structures of the lizard digestive system contributes to a better understanding of the digestive system of the lizards in comparison to other reptiles.





Effect of *Tiliacora triandra* and neuronal damage in permanent left common carotid artery occlusion mice

Thitapha Boonwattanasophon

Department of Zoology, Faculty of science, Kasetsart University, Bangkok, Thailand.

thitapha.b@ku.th

Wachiryah Thong-asa*

Department of Zoology, Faculty of science, Kasetsart University, Bangkok, Thailand.

fsciwyth@ku.ac.th

Chronic cerebral hypoperfusion was claim as one of many causes of dementia. The persistent decrease of cerebral blood flow lead to neuron dysfunction and dead. The present study aimed to investigate the effect of *Tiliacora triandra* leaves extract in delaying of neuronal damage in chronic cerebral hypoperfusion mice caused by permanent left common carotid artery occlusion (LCO). Sixteen male ICR mice were randomly divided into 3 groups of Control, LCO+300 and LCO+600, respectively. Before histopathological analysis, the Control mice were surgery for permanent left common carotid artery occlusion and orally administration of 10% Tween 80 while others were received *T.triandra* leaves extract (300 and 600 mg/kg) for 14 days. The result showed that the dead cell of the LCO+300 and LCO+600 mice in the left hippocampal hemisphere which ipsilateral to the arterial occlusion significantly lower than the Control mice ($p<0.05$) in the region of cornus ammonis (CA) 1,3 and dentate gyrus (DG). In conclusion, *Tiliacora triandra* leaves extract reveal the protective effect on neuronal degeneration in chronic cerebral hypoperfusion mice.





Species Diversity and Abundance of Freshwater Cladocera (Crustacea: Branchiopoda) at Sri Nakhon Khuean Khan Park, Samut Prakarn Province

Warawut Wongkawee
Kasetsart University, Bangkok, Thailand,
tonsudlaw17@gmail.com

Supiyanit Maiphae*
Kasetsart University, Bangkok, Thailand,
supiyanit.m@ku.ac.th

This study aims to examine the species diversity, distribution and abundance of the cladocerans in freshwater habitats at Sri Nakhon Khuean Khan Park, Samut Prakarn Province. Samplings were carried out at six stations in April, May, June and July, 2015. Samples were qualitatively collected by hauling a plankton net of 60 micrometers in mesh size, and quantitatively collected by filtering 20 liters of water through the same plankton net size. All samples were preserved with 95% alcohol. A total of 3 families 4 genera and 4 species were recorded. They comprised *Moinodaphnia macleayi* (King, 1853), *Moina micrura* Kurz, 1874, *Diaphanosoma excisum* Sars, 1885 and *Leberis diaphanous* (King, 1853). *Moinodaphnia macleayi*, *Moina micrura* and *Diaphanosoma excisum* were distributed in stations 1-5 whereas *Leberis diaphanous* could be found only in station 4 and station 5. The most diverse family was Moinidae (2 genera 2 species) followed by Sididae (1 genus and 1 species) and Chydoridae (1 genus and 1 species). In terms of species richness, station 4 and station 5 comprised all species recorded in the present study whereas they were not found at station 6 throughout the study period as this station was more saline. Moreover, all four species were found in June and July, the months when the water was deeper. In this case depth can provide different niches in terms of habitat, while cladocerans can show different patterns of distribution along the habitat depth, forced upon them by UV exposure, food resources and predators associated with these varying depths. The complementarity value showed that there is about 0-25% difference in species composition between the months but 0-100% between stations. In addition, the abundance of each species showed differences both among stations and months. It was found that June showed the highest abundance (538 individuals / liter). However, not surprisingly there was no significant correlation between abundance and physical and chemical factors ($P=0.952$) because: 1) the study needs to be carried out over at least one year in order to see the full cycle of both organisms and environmental factors, and 2) the main factors might be the biological factor such as food and predators, so these two factors need to be measured. Then the annual pattern of cladoceran distribution and abundance can be discussed.

