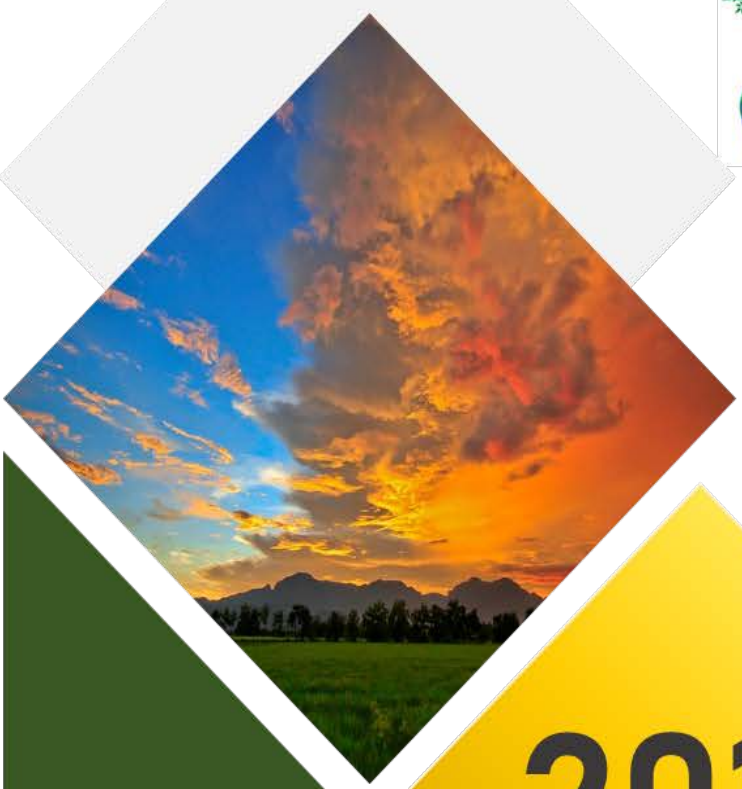

2019

I-KUSTARS

The International Kasetsart University Science and Technology Annual Research Symposium

29 - 30 May 2019

Faculty of Science, Kasetsart University, Bangkok, Thailand

Dear Colleagues,

On behalf of the organizing committee, it is my privilege to welcome all of the participants in the International Kasetsart University Science and Technology Annual Research Symposium 2019 (I-KUSTARS 2019), from 29th – 31st May 2019 at the Faculty of Science, Kasetsart University. The symposium aims to provide a platform for the exchange of interdisciplinary scientific information, as well as offering an open forum for the discussion among senior students in the Asian country who participate inI-KUSTRAS 2019. The scientific program comprises session that illustrate the relevance and value of modern science and technology.

I am looking forward to giving a warm welcome to you, and your colleagues at I-KUSTARS 2019. We hope that you will find the symposium both interesting and enjoyable. I also look forward to have a constructive discussion about all aspects of Science and Technology from all participants. I thank you for participating and contributing to the symposium.

With best wishes,

Apisit Songsasen

ApisitSongsasen
Dean of Faculty of Science

TABLE OF CONTENTS

ONFERENCE COMMETTEE

Advisory Chair	Apisit Songsasen	Dean of the Faculty of Science
	Thiraporn Anuntasethakul	Department of Zoology
	Suriya Na Nhongkai	Department of Mathematics
	Sutharat Chotikaprakhan	Department of Physics
	Jarin Kanchanawarin	Department of Physics
	Krit Won-in	Department of Earth Sciences
	Churapa Teerapatsakul	Department of Micrology
Program Chair	Arinthip Thamchaipenet	Department of Genetics
Committee	Saijai Charnsethikul	Department of Chemistry
	Nantana Srisuk	Department of Micrology
	Boontana Wannalerse	Department of Chemistry
	Angkana Sripayap	Department of Mathematics
	Thitinun Karpkird	Department of Chemistry
	Savitr Trakulnaleamsai	Department of Micrology
	Chotika Yokthongwattana	Department of Biochemistry
	Ekaphan Kraichak	Department of Botany
	Wunrada Surat	Department of Genetics
	Apichart Pattanaporkratana	Department of Physics
	Kiadtisak Saenboonruang	Department of Applied Radiation and Isotope
	Sirikorn Channual	Department of Computer Science
	Kannaree Chuangcham	Department of Earth Science
	Saree Phongphanphanee	Department of Meterials Science
	Wandee Wanishsakpong	Department of Statistics
	Chantha Wongoutong	Department of Statistics
	Pramote Chumnanpuen	Department of Zoology
	Wanwipa Vongsangnak	Department of Zoology
	Witcha Imaram	Department of Chemistry
	Puntip Toghaw	Department of Mathematics
	Paiboon Ngernmeesri	Department of Chemistry

Ingorn Kimkong	Department of Micrology
Pichamon Kiatwuthinon	Department of Biochemistry
Sutsawat Duangsrisai	Department of Botany
Kornsorn Srikulnath	Department of Genetics
Sirikanjana Thongmee	Department of Physics
Ridthee Meesat	Department of Applied Radiation and Isotope
Soontharee Koompairojn	Department of Computer Science
Prayath Nantasin	Department of Earth Science
Sudarat Nidsunkid	Department of Statistics
Vasakorn Bullangpoti	Department of Zoology
Pongthep Prajongtat	Department of Meterials Science
Bongkot Watmaung	Office of Secretaty
Nawarat Samart	Office of Secretaty
Pornpattra Songrak	Office of Secretaty
Rattapan Trongwiwat	Office of Secretaty
Pornthip Boonmahamongkol	Office of Secretaty
Satit Prasertmanakit	Office of Secretaty
Praewpilin Kangvansura	Office of Secretaty
Suchira Rotejanakusol	Office of Secretaty
Jiraprapa Khansuk	Office of Secretaty

PROGRAM SCHEDULE AT A GLANCE

May 29, 2019 Room 341 Floor 3 Building 45th Anniversary

Time	Program
8.30 - 8.45	Registration
8.45 - 9.00	Opening Ceremony (Room 341)
9.00 - 9.30	Plenary Lecture 1 Alteration of enzyme localization improves the biotransformation efficiency in Gluconobacter, a member of acetic acid bacteria *by Prof. Toshiharu Yakushi*
9.30 - 10.00	Invited Lecture 1 Proteins of unknown function from prophage loci of 'Candidatus Liberibacter asiaticus' an underlying cause of Huanglongbing disease in citrus plants *by Assoc. Prof. Dr. Pitak Chuawong*
10.00 - 10.30	Invited Lecture 2 Molecular dynamics simulation of biological membrane *by Assoc. Prof. Dr. Jirasak Wong-ekkabut*
10.30 - 10.45	Coffee Break
10.45 -11.15	Invited Lecture 3 Microbiome a wonderful word with many opportunities *by Prof. Hemant K. Gautam*
11.15 -11.45	Invited Lecture 4 Surface plasmon resonance: driving better and faster detection of metal ions *by Prof. Yap Wing Fen*
11.45 -12.15	Invited Lecture 5 Synthesis and applications of biogenic silver nanoparticles *by Prof. Shailendra Singh Gaurav*
12.15 -13.15	Lunch
13.15 - 15.00	Poster Presentation Session 1 (Ground Fl., DaviYannasugondha Bldg.)
15.00 – 15.15	Coffee Break
15.15 - 17.00	Poster Presentation Session 1 (Ground Fl., DaviYannasugondha Bldg.)

PROGRAM SCHEDULE

May 30, 2019 Floor 3 Building 45th Anniversary

Time	Program		
	Room 352	**Room 308**	**Room 307**
9.00 -10.15 (75 Mins)	Biological Science Session I-1 OB001, OB002, OB003, OB004, OB005	Biological Science Session II-1 OB016, OB017, OB018, OB019, OB020	Physical Science Session I-1 OP001, OP002, OP003, OP004, OP005
10.15 - 10.30	Coffee Break		
10.30 - 11.45 (75 Mins)	Biological Science Session I-2 OB006, OB007, OB008, OB009, OB010	Biological Science Session II-2 OB021, OB022, OB023, OB024, OB025	Physical Science Session I-2 OP006, OP007, OP008, OP009, OP010
11.45 - 13.00	Lunch		
13.00 - 14.15 (75 Mins)	Biological Science Session I-3 OB011, OB012, OB013, OB014, OB015	Biological Science Session II-3 OB026, OB027, OB028, OB029	Biological Science Session III-1 OB030, OB031 OB032, OB033
14.15 -14.30	Coffee Break		
14.30 - 15.00	Closing Ceremony, Room 341		

PROGRAM SCHEDULE: ORAL PRESENTATION

30 May 2019, Room 352, Floor 3, 45th Anniversary Building

Time	Biological Science	Code
Session I-1	**Chairman: Asst. Prof. Dr. Kornsorn Srikulnath**	
9.00 - 9.15	Phylogenetic position of *Biswamoyopterus laoensis* (Rodentia, Sciuridae, Pteromyini) inferred from molecular and morphological characters analyses Daosavanh Sanamxay *National University of Laos, Dongdok Campus, Laos*	OB001
9.15 - 9.30	Time activity comparison of some wild mammal species around constructing wildlife corridor area on highway road no. 304 between Khao Yai and Tap Lan National Parks Tanavi Prasopsuk *Kasetsart University, Thailand*	OB002
9.30 - 9.45	Population and habitat use of wild elephant in Khao Yai National Park, Thailand Mananya Pala-ard *Kasetsart University, Thailand*	OB003
9.45 - 10.00	Molecular phylogeographic study of Asian leptophlebiid mayflies (Insecta, Ephemeroptera) Ryota Tomizawa *Shinshu University, Japan*	OB004
10.00 - 10.15	Molecular identification, abundance and distribution of coral-killing sponge *Terpios hoshinota* at small islands in Indonesia Risnita Tri Utami *Bogor Agricultural University, Indonesia*	OB005
10.15 - 10.30	**Coffee break**	
Session I-2	**Chairman: Asst. Prof. Dr. Anchanee Kubera**	
10.30 - 10.45	Estimating population size of bulbuls in hill evergreen forest at Mae Sa-Kog Ma biosphere reserve, Chiang Mai province Yuwadee Ponpithuk *Kasetsart University, Thailand*	OB006
10.45 - 11.00	Community ecological and genetic structure analysis of aquatic insects in alpine and sub-alpine ponds of the Northern Japan Alps Keisuke Inoue *Shinshu University, Japan*	OB007
11.00 - 11.15	Initial study of single polymorphism genotyping of *rpms1* from Vietnamese nasopharyngeal biopsy samples Minh Trong Quang *Ho Chi Minh City Open University, HCMC, Vietnam*	OB008

30 May 2019, Room 352, Floor 3, 45th Anniversary Building

Time	Biological Science	Code
11.15 - 11.30	Genetic study of *Propionibacterium acnes* isolates in Thailand using multi-locus sequence typing (MLST) method Khemrutai Sripath *Kasetsart University, Thailand*	OB009
11.30 - 11.45	Stress regulated gene expression database of mungbean (*Vigna radiata*) seedlings Suthida boonyuen *Kasetsart University, Thailand*	OB010
11.45 - 13.00	**Lunch**	
Session I-3	**Chairman: Dr. Pichamon Kiatwuthinon**	
13.00 - 13.15	Molecular docking of catechin and its derivatives, kaempferol, and quercetin towards inhibition activity of protein tyrosine phosphatase (PTP1B) Salma Dienta Salsabila *Bogor Agricultural University, Indonesia*	OB011
13.15 - 13.30	Inhibitory effect of hydrolyzed riceberry rice bran extract on colon cancer cell line Vichugorn Wattayagorn *Kasetsart University, Thailand*	OB012
13.30 - 13.45	Association study of latent membrane protein-1 (LMP-1) gene expression and the methylation status of Ras-asociation domain family 1A (RASSF1A) genes in Vietnamese nasopharyngeal carcinoma patients Hue Hong Thieu *Ho Chi Minh City University of Science, Vietnam*	OB013
13.45 - 14.00	An Indian traditional fermented beverage based on pearl millet: synbiotic potential food extemporizing for quality life when mixed with prosopis cineraria's fruit. Poornima Saraswat *Mody University of Science and Technology, India*	OB014
14.00 - 14.15	Influence of flushing diet contains fat source differing in fatty acid profile on blood metabolites and number of embryo in Etawah crossbred goats Prasetyo Nugroho *IPB University, Indonesia*	OB015
14.15 - 14.30	**Coffee Break**	
14.30 - 15.00	**Closing Ceremony, Room 341**	

30 May 2019, Room 308, Floor 3, 45th Anniversary Building

Time	Biological Science	Code
Session II-1	**Chairman: Dr. Prissana Wiriyajitsomboon**	
9.00 - 9.15	Isolation and characterization of mercury-resistant bacteria from gold mine area in Pongkor Village, Bogor, Indonesia Wilhelmus Terang Arga Sanjaya *Bogor Agricultural University, Indonesia*	OB016
9.15 - 9.30	Fungal endophytes on asymptomatic leaves of sugarcane and bio-efficacy test against *Colletotrichum falcatum* Went and *Fusarium* sp., causal organisms of red rot of sugarcane (*Saccharum officinarum* L.) Steffanie A. Castillo *University of the Philippines Los Baños, Philippines*	OB017
9.30 - 9.45	Identification and diversity of gray leaf spot of mango in the Philippines Joanne A. Langres *University of the Philippines Los Baños, Philippines*	OB018
9.45 - 10.00	Screening of marine sponges-associated bacteria producing lignocellulolytic enzymes Wenang Maharsiwi *Bogor Agricultural University, Indonesia*	OB019
10.00 - 10.15	Exploring bioprotectant properties of *Streptomyces* spp isolated from rhizosphere soils Jepri Agung Priyanto *Bogor Agricultural University, Indonesia*	OB020
10.15 - 10.30	**Coffee Break**	
Session II-2	**Chairman: Dr. Chanita Boonmak**	
10.30 - 10.45	Selection and investigation the antagonistic ability of some pathogen fungal species in plants of the actinomycete strains belonging to genus *Streptomyces* Le Phuoc Tho *Nong Lam University, Viet Nam*	OB021
10.45 - 11.00	Comparative efficiency of pSRG plasmid transformation into *Pasteurella multocida* serotypes A and D using different methods Chanawee Somjit *Kasetsart University, Thailand*	OB022
11.00 - 11.15	Molecular evolutionary analysis of haemoglobin-binding protein A (*hgbA*) gene in *Pasteurella multocida* Jiraya Pongpikul *Kasetsart University, Thailand*	OB023

30 May 2019, Room 308, Floor 3, 45th Anniversary Building

Time	Biological Science	Code
11.15 - 11.30	Exploration of surface plasmon resonance for detection of dengue virus based on cadmium sulfide quantum dots-polyamidoamine composite thin film Nur Alia Sheh Omar *Universiti Putra Malaysia, Malaysia*	OB024
11.30 - 11.45	Biosynthetic pathway of mycobacterial glycopeptidolipids reveals chemical structure of the acyl chain Archana Vats *CSIR-Institute of Genomics and Integrative Biology, India*	OB025
11.45 - 13.00	**Lunch**	
Session II-3	**Chairman: Asst. Prof. Dr. Nattanan T. Thienprasert**	
13.00 - 13.15	Gene annotation for reconstructing pathways-associated lipid metabolism of oleaginous filamentous fungus *Aspergillus oryzae* strain BCC7051 Pathomchai Dindaeng *Kasetsart University, Thailand*	OB026
13.15 - 13.30	Identification of *Backhousia citriodora* (F. Muell) metabolites responsible for antimicrobial activity against pathogens of hospital acquired infections by using ^{1}H-NMR metabolomics approach Fadzil Sulaiman *Universiti Putra Malaysia, Malaysia*	OB027
13.30 - 13.45	Portable *Pasteurella multocida* detection device using LAMP assay Yanawat Pattharapisitthorn *Kasetsart University, Thailand*	OB028
13.45 - 14.00	Determination of phenolic compounds and mulberroside F accumulation in mulberry Nattaya Pattarapipatkul *Kasetsart University, Thailand*	OB029
14.00 - 14.30	**Coffee Break**	
14.30 - 15.00	**Closing Ceremony, Room 341**	

30 May 2019, Room 307, Floor 3, 45th Anniversary Building

Time	Biological Science	Code
Session I-1	**Chairman: Dr. Wasinee Aswasereelert**	
9.00 - 9.15	Spatial pattern and temporal variability of sea level anomaly and geostrophic current in the Eastern Indian ocean from satellite altimetry Julian Saputra *IPB University, Indonesia*	OP001
9.15 - 9.30	Identification and retracking waveform identification based on sea depth and waveform retracking of altimetry satellite data in Halmahera sea Maya Eria Br Sinurat *IPB University, Indonesia*	OP002
9.30 - 9.45	Stratigraphy and depositional environments of permian limestone at Thawa Phitak cave, Khao Erawan, Lopburi province, Thailand Kanistagan Sreesuriyapong *Kasetsart University, Thailand*	OP003
9.45 - 10.00	Speleothems of Thawa Phitak cave at Khao Erawan, Lopburi province, Thailand. Yutthaphichai Srisuk *Kasetsart University, Thailand*	OP004
10.00 - 10.15	The hyperoctahedral group Sota Shigemori *Shinshu University, Japan*	OP005
10.15 - 10.30	**Coffee Break**	
Session I-2	**Chairman: Asst. Prof. Dr. Paiboon Ngernmeesri**	
10.30 - 10.45	The potential use of carbon rods of battery wastes for processing waste of batik industries using electrodecolorization Ananda Aulia Parahita *Bogor Agricultural University, Indonesia*	OP006
10.45 - 11.00	Differential pulse polarography at dropping carbon fluid electrodes Takuya Okada* *Shinshu University, Japan*	OP007
11.00 - 11.15	Measurement of the real potential of chloride ion in mixed solvent by using a streaming carbon powder electrode Mariko Sakamaki *Shinshu University, Japan*	OP008
11.15 - 11.30	Determination of carbon isotope ratios in honey by isotope ratio mass spectrometry (IRMS) Nipon Saiwong *Kasetsart University, Thailand*	OP009

30 May 2019, Room 307, Floor 3, 45th Anniversary Building

Time	Biological Science	Code
11.30 - 11.45	Chirality effects on an electron transport in single-walled carbon nanotube coupling to a quantum dot Jakkapong Charoenpakdee *Kasetsart University, Thailand*	OP010
11.45 - 13.00	**Lunch**	
	Biological Science	
Session III-1	**Chairman: Asst. Prof. Dr. Teerasak E-kobon**	
13.00 - 13.15	Bioinformatics analysis to study the relationship between allergen from difference species in patient with allergies history Natawon Hattha *Kasetsart University, Thailand*	OB030
13.15 - 13.30	Bioinformatics-based metabolic gene cluster annotation of Cordyceps militaris and related entomopathogenic fungi Ananporn Supataragul *Kasetsart University, Thailand*	OB031
13.30 - 13.45	Comparative analysis of variants identified from human whole exome data using different variant calling and annotation tools Oratai Thakom* *Kasetsart University, Thailand*	OB032
13.45 - 14.00	Development of mushroom database platform Kornkanok Boonthum *Kasetsart University, Thailand*	OB033
14.00 - 14.30	**Coffee Break**	
14.30 - 15.00	**Closing Ceremony, Room 341**	

PLENARY SESSION

Alteration of enzyme localization improves the biotransformation efficiency in *Gluconobacter*, a member of acetic acid bacteria

Toshiharu
Yakushi RCTMR,
Yamaguchi University,
Graduate School of Science and Technology for Innovation, Yamaguchi University Yamaguchi, Japan
juji@yamaguchi-u.ac.jp

Shikimate or dehydroshikimate is a useful chemical intermediate for the synthesis of various compounds, especially the antiviral drug oseltamivir. Quinate is oxidized in the periplasm by the membrane-bound quinate dehydrogenase of *Gluconobacter* sp., a member of acetic acid bacteria, to yield dehydroquinate. Dehydroquinate dehydratase (DHQase) produces dehydroshikimate, but this process seems a rate-limiting step (Nishikura-Imamura et al., 2014). Here, it was attempted to express type-I DHQase in the *Gluconobacter* strain with the *aroD* gene from *Gluconacetobacter diazotorophics* strain Pal5. The DHQase activity of the AroD protein showed optimum pH preferable for biotransformation with acetic acid bacteria. A *TAT-aroD* derivative was constructed by artificially connecting the gene for TAT-dependent signal peptide for secretion to the periplasm. The DHQase activity in the cell-free extract of the TAT-AroD strain was approx. 30% of that of the AroD strain. A DHQase activity in whole cell suspension of the TAT-AroD strain was similar to that of the cell-free extract. On the other hand, only negligible DHQase activity was detected in whole cell suspension of the AroD strain. These results suggest that the AroD protein was relocated to the periplasm. The TAT-AroD strain produced dehydroshikimate in a nearly quantitative manner within 24 h without significant accumulation of dehydroquinate, while the AroD strain produced dehydroshikimate much slowly. It is suggested that dehydroshikimate was efficiently produced in the periplasmic space by the relocated AroD protein.

Keywords: Acetic acid bacteria, *Gluconobacter*, dehydroshikimate, protein localization

References

Nishikura-Imamura et al. (2014), Appl. Microbiol. Biotechnol. 98: 2955.

INVITED LECTURE

Proteins of unknown function from prophage loci of '*Candidatus* Liberibacter asiaticus,' an underlying cause of Huanglongbing disease in citrus plants

Duangtip Sudhan[a], Nonnanat Yooyuen[a], Amata Taweesablamlert[a], Thamrongjet Puttamuk[b], Supachai Vuttipongchaikij[c,d], Pitak Chuawong[a,*]

[a] Department of Chemistry and Center of Excellence for Innovation in Chemistry, Faculty of Science, Kasetsart University, Bangkok 10900, Thailand
[b] School of Agriculture and Cooperatives, Sukhothai Thammathirat Open University, Nonthaburi 11120, Thailand
[c] Department of Genetics, Faculty of Science, Kasetsart University, 50 Ngarm Wong Wan Road, Chatuchak, Bangkok 10900, Thailand
[d] Center of Advanced studies for Tropical Natural Resources, Kasetsart University, Ngam Wong Wan Road, Chatuchak, Bangkok 10900, Thailand

Abstract

Citrus Huanglongbing (HLB) or citrus greening is currently the most damaging disease distressing the citrus industry worldwide. The underlying agent in Asia is a phloem-limited, Gram-negative bacterium, '*Candidatus* Liberibacter asiaticus' (CLas). The current and widely practiced treatment is an antibiotic injection into the trunk of infected citrus trees, raising numerous concerns regarding antibiotic residues left in fruits, soils, and natural water. Moreover, the pathogenicity of the disease is still elusive since the bacterium is unculturable in the laboratory. The genome of CLas contains prophage regions, classified as Type-A, B, C, and D. Especially, Type-D has been indicated to correlate with the blotchy-mottle symptoms of citrus trees. Cloning, overexpression, and purification of the ORF1, an open reading frame from the partial Type-D region of CLas obtained from an infected lime tree (*Citrus aurantifolia* Swingle) were reported. Overexpression of the ORF1 was toxic to the *E. coli* host cells, and the transient expression of ORF1 in *Arabidopsis* seedlings via *Agrobacterium*-mediated transformation exhibited rapid and total chlorosis of the seedlings within two days post-transformation. The native-PAGE of the purified protein showed multiple bands, indicative of various conformations in solution. The ESI-TOF mass spectrum confirmed the molecular weight of the purified ORF1 to be 15,364.3150 Da, corresponding to the $[M+1]^+$ of the ORF1 without an N-terminal methionine. The protein predominantly consisted of □-helix as evidenced by circular dichroism (CD), and the transition toward random coil structure upon heating was reversible. The template-based modeling (I-TASSER) of the ORF1 indicated eight □-helices connected through variable loops. The simulated CD spectrum, generated from the atomic coordinates of the I-TASSER model, was remarkably similar to the experimental spectrum. Overproduction and purification of other ORFs from the Type-D region are in progress.

Keywords: '*Candidatus* Liberibacter asiaticus'; Huanglongbing disease; Blotchy mottle; Lime; Type-D; Prophage

Molecular Dynamics Simulations of Oxidized Biological Membrane

Jirasak Wong-ekkabut[1,2]*

[1]*Department of Physics, Faculty of Science, Kasetsart University, Bangkok 10900, Thailand.*
[2]*Computational Biomodelling Laboratory for Agricultural Science and Technology (CBLAST), Faculty of Science, Kasetsart University, Bangkok 10900, Thailand*
[3]*Thailand Center of Excellence in Physics (ThEP Center), Commission on Higher Education, Bangkok 10400, Thailand*
** E-mail: jirasak.w@ku.ac.th*

Abstract: Biological membrane is one of the most fundamental structures in biology. It mainly consist of lipid molecules, self-assembly forming the bilayer. Lipid bilayer protects cells and organelles and selectively controls nutrient and waste permeation in and out of cells. The structure and permeation properties of lipid bilayers such as thickness, membrane fluidity, and permeability to different substances can be altered by lipid peroxidation. Lipid peroxidation is readily oxidative attack on the unsaturated acyl chains of lipid by free radicals. Two major oxidized species are generally produced: hydroxyl- or hydroperoxy-dieonyl and truncated chains with an aldehyde or carboxylic group. Polar moieties at oxidized lipid terminals can strongly modify membrane structures and biological functions. The disturbances induced by oxidized lipids on bilayers were studied by MD simulations. The results show that, the oxidized lipid chain reversal is considered as the main cause of membrane property changes. Moreover, oxidized lipids have been observed to cause an increase in water permeability and to lead to membrane deformation. Our findings suggest that one of the key mechanisms for passive pore formation is the distribution of polar groups inside the bilayer. Interestingly, micelle formation was observed in the systems of aldehyde lipids at high concentrations. Analysis of the lipid geometry suggests that the lipid shape plays an essential role in the self-assembly of lipid structures.

Keywords: Molecular Dynamics Simulations; Biological Membrane; Oxidized Lipids; Drug Delivery; Lipid Peroxidation

Microbiome a Wonderful Word With Many Opportunities

Hemant K. Gautam
Institute of Genomics and Integrative Biology
Mall Road, University Campus Delhi-110007 India
hemant@igib.res.in

The microbiome are those microorganisms that reside in the tissues of living plants and are relatively unstudied and it may be the potential sources of novel natural products for exploitation in medicine, agriculture, and other industries. It is noteworthy that, of the nearly 300,000 plant species that exist on the earth, each individual plant is host to hundred to thousand or more microbiome while in human harbors the trillion of microbes living on the human body. Microbiome inhabitants are plentiful and diverse, varying from place to place and even from person to person. They are also dynamic, changing in response to factors such as diet or climate. Finally, they are interconnected with their host, engaged in a give-and-take relationship that is often beneficial, even essential, to both the host and their resident microorganisms. Life style disease (Non communicable diseases) like diabetes, heart attack, arthritis and even cancer are associated with choice of food and human body microbes. This is further strengthen by the Human microbiome project which proved that number of diseases are associated with microbial population of human body and their interaction of microbes present in the food. Plant and human body contains a large number of microbes and are a major source of disease fighting chemicals. These microbial communities, however, remain largely unstudied, leaving almost entirely unknown their influence upon disease. In recent years there has been an explosion in the understanding of the microbiome (the genome of all our microbes) due to development in genome sequencing technologies and metagenomic analysis. Skin is the largest part of body and have first line of defense against foreign invaders either in humans and plants and is also home to a diverse population of microbes. So it is interesting to study the skin microbiome either in humanor plant. We have found many mutidrug resistance strains from skin microbiome. In this report we will discuss the country specific MDR skin pathogens, P.acne and microbiome their prevalence and strategies to control the disease.

Keywords: Antibiotics, 16S rRNA, MDR, Microbiome, P.acne

Surface Plasmon Resonance: Driving Better and Faster Detection of Metal Ions

Yap Wing Fen*
Department of Physics, Faculty of Sciences, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia
yapwingfen@gmail.com

Nur Alia Sheh Omar
Functional Device Laboratory, Institute of Advanced Technology, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia
nuralia.upm@gmail.com

Wan MohdEbtisyamMustaqimMohdDaniyal
Functional Device Laboratory, Institute of Advanced Technology, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia
wanmdsyam@gmail.com

SilvanSaleviter
Functional Device Laboratory, Institute of Advanced Technology, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia
silvansaleviter94@gmail.com

Surface plasmon resonance (SPR) is a powerful optical technique with the ability to monitorbiomolecular interactions in real time.SPR is very sensitive to perturbations of refractive index near the metal film, and such phenomenon alters the position of SPR angle.However, low concentration of metal ions have similar refractive index. Therefore, it is highly desirable to integrate the SPR sensor surface with novel material to detect the metal ion at low concentrations.Inspired by the advantages of SPR sensors, i.e., fast, high sensitivity, and label-free detection,various kinds of biorecognition elements/active layers have been employed to detect metal ions sensitively and selectively.The binding between analyte and its ligand-anchored to the surface of the sensor chip is known to offer exquisite specificity, sensitivity, and selectivity of the proposed SPR sensor, and subsequently produce the lowest detectionlimit of metal ions. Towards the end of the 21th century, many researchers have worked on lowering the detection limit and improving the sensitivity of thesensor, which was an important factor in the development of SPR sensors.The recent advances in the development and the applications of SPR optical sensor for better and rapid detection of metal ions willbe discussed in this study.

Keywords: Surface plasmon resonance, Metal ions, Optical sensor.

SYNTHESIS AND APPLICATIONS OF BIOGENIC SILVER NANOPARTICLES

Shailendra Singh Gaurav[1], Amardeep Singh[2] and Gyanika Shukla[3]
Professor & Head, Department of Genetics and Plant Breeding, Ch. Charan Singh University, Meerut-250004 (UP), India.
PhD Scholars, Department of Genetics and Plant Breeding, Chaudhary Charan Singh University, Meerut-250004 (UP), India.

Silver nanoparticles (AgNPs) have gained significant interest due to their unique optical, antimicrobial, electrical, physical properties and their possible application. The AgNPs may be synthesized by various chemical and physical methods; however, most of these methods are energy consuming, costly and environment harming. Hence, researchers are much interested in preparing NPs by biological methods, also called as Green-Approach of NP synthesis. In past decades, the researchers have developed methodologies that incorporate the use of biological entities such as algae, bacteria, fungi, yeasts, and plants in a number of biochemical and biophysical processes for the synthesis of NPs. These methods are cost effective, eco-friendly and faster than most of the physical and chemical methods of NP synthesis. In this review, the green synthesis, properties, applications of silver nanoparticles and their recent advances are described.

Keywords: Silver nanoparticles, biogenic synthesis, antimicrobial property, mycogenic synthesis.

TABLE OF CONTENT: ORAL SESSION

Biological Science Orals

TABLE OF CONTENT: ORAL SESSION

Physical Science Orals

TABLE OF CONTENT: POSTER SESSION

Biological Science Posters

TABLE OF CONTENT: POSTER SESSION

Physical Science Posters

Phylogenetic position of *Biswamoyopterus laoensis* (Rodentia, Sciuridae, Pteromyini) inferred from molecular and morphological characters analyses

Daosavanh Sanamxay[1], Masaharu Motokawa[2], and Tatsuo Oshida[3]
[1] Faculty of Environmental Sciences, National University of Laos, Dongdok Campus, P.O.Box 7322, Xaythany District, Vientiane Capital, Lao PDR. Email: daosavanhsnx@gmail.com
[2] The Kyoto University Museum, Kyoto University, Kyoto 606-8501, Japan. Email: motokawa.mssdaharu.6m@kyoto-u.ac.jp
[3] Laboratory of Wildlife Biology, Obihiro University of Agriculture and Veterinary Medicine, Obihiro 080-8555, Japan. Email: oshidata@obihiro.ac.jp

Abstract

The tribe Pteromyini (flying squirrels) are monophyly with a sister group, tree squirrels (tribe Sciurini). This tribe comprises of 52 species of 15 genera in the world, of which 10 species of 5 genera are distributed in Lao PDR. Since 2013 to date, three flying squirrel species have been reported from Lao PDR, including *Petaurista petaurista* and *Petinomys setosus* recorded recently, and *Biswamoyopterus laoensis* as a new species. *Biswamoyopterus* has been omitted heretofore from all phylogenetic studies of flying squirrels, and its phylogenetic position is still remained uncertain. In the present study, Mitochondrial cytochrome *b* sequence and 76 morphological characters are subjected to resolve the phylogenetic position of *Biswamoyopterus*. In molecular aspect, within 12 taxa *B. laoensis* is most closely related to *Belomys pearsonii*. Congruently with molecular data, the result of morphological characters showed that *B. laoensis* is closely related to genus *Belomys* with 100% supported of bootstrap values in strict consensus tree. We will discuss about the evolution and biogeography of *Biswamoyopterus* with focusing on body size change.

Keywords: Flying squirrels, Molecular and morphological phylogenies, Taxonomy.

Time Activity Comparison of Some Wild Mammal Species Around Constructing Wildlife Corridor Area on Highway Road No. 304 Between Khao Yai and Tap Lan National Parks

Tanavi Prasopsuk, Ronglarp Sukmasuang, Khwanrutai Charaspet, Tarapone Panganta, Mananya Plara-ard, and Noraset Khioewsree

Abtract

Comparative study of some wild mammal activity time around the area of the construction site of the World Heritage Forest Corridor Project that located on the Highway No. 304, during 26 – 29 th kilometer, that plan to conjugate the area of Khao Yai National Park (KYNP) and Tap Lan National Park (TLNP) together, this study was conducted during October 2017 and August 2018, 11 months totally that covered an area in the both side of the 3 km along corridor of 6 km^2 approximately. Based on camera trap data that gained from 22 camera trap stations locates systematically, 2,580 trap night totally, 11 stations were located in TLNP, 1,477 trap night totally, 11 stations were located in KYNP, 1,103 trap night totally, were used to analyze for time activity comparison between the same species of the both site. The results showed that 22 wild mammal species were photographically recorded both in TLNP and KYNP with the total % RA of 22.29% . There was 20 wild mammal species were recorded in KYNP with % RA of 33.27% . Twenty wild mammal species were recorded in TLNP with the % RA of 14.01% . The results showed that Malayan porcupine, pig-tailed macaques, red muntjac, rat, large Indian civet of the both side of the corridor has time synchronize in each species of 65.0% 62.8% 46.9% 41.4% and 32.2% respectively. May be due to the different of habitat conditions and probability of the species photo of the both side and also degree of disturbance that different between the both side. The wild mammal species of the both site of the corridor had little synchronized in active time were variable squirrel, grey-bellied Squirrel, Asiatic black bear, common palm civet, Asiatic jackal, small Indian mongoose, and leopard cat that ranged the active between 13.40 - 27.90% . Most of the wild mammal, 11 species, were nocturnal. Six species out of them were diurnal and 4 species were cathemeral. The results from comparing the pattern of nighttime activities with other conservation areas that do not interfere with the same species. It was found that mammals around the wildlife corridor area trend to change their activity patterns to night time. The results showed a change in behavior from interference for a long time in both of transportation and human activities in the forest corridor area. Recommendation for the proposed management are important, including reducing activity in the connecting area, reducing the use of light and sound on transportation routes and creating awareness about the effect of using the highway to a part of the natural world heritage area.

Keywords: Wild mammal species, Activity pattern, Wildlife corridor, Khao Yai National Park, Tap Lan National Park

Population and Habitat Use of Wild elephant in Khao Yai National Park, Thailand

Mananya Pala-ard [1] and Ronglarp Sukmasuang [1*]

Abstract

Population and habitat use of wild elephant in Khao Yai National Park was procedured during January 2016 and February 2017. The objectives were to investigate the dung and the population densities using line transect method. The decay rate of the dung for the population calculation was studies. The population structure and age class was also studied by directed observation to estimate the population trend. The dung diameter was also used to estimate the population structure. The results based on 116 systematic transect lines, 2 km length each line, 500 m interval, 213.20 km totally found 1,209 elephant dung piles. The result reflected that the dung density was 531.49 dung piles/ km^2 analyzed by data combined. During the dry season the dung density was 841.85 dung piles/km^2 whereas that of the wet season was 468.56 dung piles/km^2. The decay rate based on 52 dung piles, every 7 days checked was 0.0039 dung piles/day. The population density was 0.15 individuals/km^2. The density during the dry season was 0.23 individuals/ km2 whereas the density during the wet season was 0.13 individuals/km^2 the population structure comprised of calve: juvenile: sub adult: adult was 1:1.09:1.14: 2.10 respectively that showed decreasing population trend. The sex ratio between adult male: adult female was 1 : 1.095. The environmental factors affecting the appearance of the animal when determined by data combined were saltlick sites, tourist recreation area and altitude classes. During the dry season the important environmental factors were salt lick, altitude classes and distance from permanent stream. During the wet season the important environmental factors were road and tourist recreation area. Based on fulltime basic data showed 421 times of the elephant appearance on road and tourist recreational area that obtained by directed observation. The most of the elephant appearance were area around the road number 3077. Most of the period that elephant was recorded were 18.00 – 20.00 hour and the period of 16.00-18.00 hour. Recommendations for further elephant management in the area was increasing caution elephant of the park ranger for tourist especially in the area that the animal appearance resulted by this study. Moreover, saltlick sites should be created in the area far from the road and the recreation area of the park.

Keyword: Wild elephant, Population, Habitat use, Khao Yai National Park

Molecular phylogeographic study of Asian leptophlebiid mayflies (Insecta, Ephemeroptera)

Ryota Tomizawa
Biology Department, Faculty of Science, Shinshu University,
Matsumoto, Nagano, Japan, 19ss502k@shinshu-u.ac.jp

Abstract

The Asian region, including the Japanese Islands and Thailand, considered to be a hotspot region of biodiversity. As such, it is also an important area from the viewpoint of evolutionary biology on a global scale. However, as for the aquatic insects in this region, there are many unresolved tasks, such as their classification, accurate distribution, phylogenetic relationships, genetic diversity, and so on. The family Leptophlebiidae, which we focus in this study, is a pan-globally distributed mayfly group, which have differentiated into many species by adapting to various habitats. That is, leptophlebiid mayflies are typically exemplary models of "adaptive radiation" and "diversification". However, there have been few studies into their genetic phylogenetic relationships and the genetic diversity between species distributed in Asia. Under such circumstances, we have conducted phylogenetic analyses on leptophlebiid mayflies collected in the Asian region (mainly in the Japanese Islands, Thailand, Philippines, and other placess), using certain molecular markers. For molecular analyses, the markers of the mitochondrial DNA COI region and the nuclear DNA histone H3 region were used. So far as a result, it has become clear that some cryptic lineages. Furthermore, it was also revealed that the specimens consisting of these cryptic lineages were collected from environments somewhat different to their conventionally known habitats. Therefore, it has been suggested that there may be greater potential for subtle niche differentiation and diversification than previously expected.

Keywords: Biogeography, Phylogeny, Genetic diversity, Leptophlebiidae,

Molecular Identification, Abundance and Distribution of Coral-Killing Sponge *Terpios hoshinota* at Small Islands in Indonesia

Risnita Tri Utami
Department of Marine Science and Technology, Faculty of Fisheries and Marine Sciences, Bogor Agricultural University
Bogor, Indonesia
risnita.triutami@gmail.com

Neviaty Putri Zamani
Department of Marine Science and Technology, Faculty of Fisheries and Marine Sciences, Bogor Agricultural University
Bogor, Indonesia
np_zamani@yahoo.com

Hawis Madduppa*
Department of Marine Science and Technology, Faculty of Fisheries and Marine Sciences, Bogor Agricultural University
Bogor, Indonesia
hawis@apps.ipb.ac.id

Coral-killing sponge *Terpios hoshinota* is one of threats to coral reefs. The outbreaks of *T. hoshinota* has been reported in the Indo-Pacific region. However, the current distribution of this species in Western of Sumatera Island is unknown, compared to Seribu Islands. This study aimed to identify coral-killing sponge molecularly and to compare the distribution and abundance of *T. hoshinota* in Bengkulu (Western of Sumatera) and in Seribu Islands (Northern of Java Island) and to record the preferences of coral substrate of *T. hoshinota*. Coral reefs and *T. hoshinota* data were collected using underwater photo transect method with (0.5x0.5) m^2 quadrate transect. Coral reefs covered by *T. hoshinota* was analyzed by using Correspondence Analysis, while the determination of biophysical and chemical environment was analyzed by Principal Component Analysis. The identity of the sponge was *T. hoshinota*. *T. hoshinota* has been expanding in many reefs across Indonesia especially in Tikus Island and Belanda Island. The most prevalent coral genera in the Seribu Islands infected by *T. hoshinota* was *Acropora* while those in Bengkulu were *Porites* and *Pocillopora*. Pearson correlation between the live coral cover and T. *hoshinota* cover was revealed not significant, while *T. hoshinota* cover and orthophosphate was significant. This study suggests that orthophosphate may play a role invasion of *T. hoshinota* outbreaks.

Keywords: invasive sponge, urban reefs, DNA barcoding

Estimating Population Size of Bulbuls in Hill Evergreen Forest at Mae Sa - Kog Ma Biosphere Reserve, Chiang Mai Province

Yuwadee Ponpithuk[1], Supalak Siri[1], Dokrak Marod[1] Mongkol Safoowong[2], Wimonmart Nuipakdee[3] and Prateep Duengkae[1,*]
[1]Department of Forest Biology, Faculty of Forestry, Kasetsart University. 50 Ngamwongwan Rd., Chatuchak, Bangkok 10900, Thailand. Tel. +66-2-579-0176, Fax +66-2942-8107 *email: prateep.du@ku.ac.th
[2]Deparment of National Park, Wildlife and Plant Conservation, Doi Chiang Dao Wildlife Research Station, Wildlife Research Research Division, Wildlife Conservation Bureau, Chiang Mai, Thailand.
[3]Mae Sa-Kog Ma Biosphere Reserve, Chiang Mai Province

Abstract

The bulbul bird group (Family Pycnonotidae) plays a crucial role in seed dispersal and insect control in tropical forest ecosystems but there remains a lack of knowledge of their population size in the forests of Thailand. This study's objective is to estimate the bulbul population in a hill evergreen forest. A long-term monitoring study in a permanent plot at the Mae Sa - Kog Ma Biosphere Reserve, Chiang Mai Province was conducted monthly from October 2014 through December 2018. Data were collected using mist netting method for capture-recapture protocol with individual bird banding. The results showed 5 species were detected of resident bulbuls, consisting of Puff-throated Bulbul (*Alophoixus pallodus*), Mountain Bulbul (*Ixos mcclellandii*), Black-crested Bulbul (*Pycnonotus flaviventris*), Ashy Bulbul (*Hemixos flavala*) and Flavescent Bulbul (*Iole virescens*). The estimated population of bulbuls was 412 ± 52.04 (mean±SE) with a calculated density of 3.35 ± 0.422 individuals/ha. This result is the first reported in Thailand, and we recommend using this protocol for studying overall forest types in Thailand.

Key words: Estimates, Population, Pycnonotidae, mist netting, capture-recapture

Community ecological and genetic structure analysis of aquatic insects in alpine and sub-alpine ponds of the Northern Japan Alps

Keisuke Inoue*
Biology Unit, Faculty of Science, Shinshu University Graduate School,
Matsumoto, Nagano, Japan, 19ss501a@shinshu-u.ac.jp

Abstract

Alpine and sub-alpine ponds are considered that they pay some roles as important habitats and /or environments in mountain ecosystem. For example, they have functions as water resources for terrestrial organisms, and habitats for aquatic animals. Alpine and sub-alpine ponds have various origins, and their environments differ greatly for each origin. For aquatic animals inhabiting these ponds, differences in their environments are thought to directly effect in biota, so their environments' diversity may contribute to the creation of mountainous biodiversity. However, despite the importance of alpine and sub-alpine ponds, studies focusing on the relationship between the ponds' environments and their biodiversity have only a few cases even in high mountainous areas of Europe. Especially in the Northern Japan Alps ponds, there are no yet study cases. Under these circumstances, In the present study, we focused on the Kamikochi area and the Yari-Hotaka Mountain Ranges in the Northern Japan Alps, and we have conducted analyses for the relationship between their aquatic insect fauna and the pond's environments in alpine and sub-alpine ponds. In addition to comparing and examining the obtained community, population structure data and environmental data as habitats, the cluster analysis, the NMDS analysis, and the CCA analysis were also performed. As the result of conducting our studies of 23 ponds in total, community structures were categorized into 4 groups largely in all of our analyses. Also it was suggested that the alpine and sub-alpine aquatic insects' fauna is influenced by altitude, abundance of herbaceous plants around the shore, amount of gravels, sands and soil at the bottom of ponds. Thus, alpine ponds with divergent environments may have important roles in the creation of mountainous biodiversity. In addition, we would like to try to investigate the direction and frequency of movement and dispersion of aquatic insects between these ponds using molecular markers. As the first step, genetic analysis of the mtDNA COI region (DNA barcoding region) was performed on a small diving beetle *Agabus japonicus*. As a result, *A. japonicus*, in addition to that we observed individuals of the same lineage as widely distributed (i.e., from Hokkaido to Nagano), we revealed that individuals of largely genetically different lineage inhabit some alpine ponds.

Keywords: alpine zone, mountain ponds, biodiversity, benthic invertebrates

INITIAL STUDY OF SINGLE POLYMORPHISM GENOTYPING OF *RPMS1* FROM VIETNAMESE NASOPHARYNGEAL BIOPSY SAMPLES

Minh Trong Quang

Department of Pharmaceutical and Medical Biotechnology,
Faculty of Biotechnology, Ho Chi Minh City Open University, HCMC, Vietnam
tmquang99@gmail.com

Danh Hoang Nguyen
Department of Pharmaceutical and Medical Biotechnology,
Faculty of Biotechnology, Ho Chi Minh City Open University, HCMC, Vietnam
danhhoang1804@gmail.com

Nam Hoang Dang Phan
Department of Pharmaceutical and Medical Biotechnology,
Faculty of Biotechnology, Ho Chi Minh City Open University, HCMC, Vietnam
1753010148Nam@ou.edu.vn

Hue Hong Thieu
Department of Pharmaceutical and Medical Biotechnology,
Faculty of Biotechnology, Ho Chi Minh City Open University, HCMC, Vietnam
honghue0205@gmail.com

Thuan Duc Lao
Faculty of Biotechnology, Ho Chi Minh City Open University, HCMC, Vietnam
Faculty of Biology and Biotechnology, Ho Chi Minh City University of Science, Vietnam
thuan.ld@ou.edu.vn

Thuy Ai Huyen Le
Faculty of Biotechnology, Ho Chi Minh City Open University, HCMC, Vietnam
thuy.lha@ou.edu.vn

Single nucleotide polymorphism of *RPMS1* has been reported to associate with the cell proliferation, apoptosis, metastasis and invasion of nasopharyngeal carcinoma (NPC). However, especially in Vietnam, the country with high endemic NPC, the number of studies has not been conducted yet. The current study is initially performed to identify the variations of *RPMS1* in Vietnamese NPC patients, for early diagnosis and as a potential biomarker for its value further applied in NPC patients. A total of 30 NPC biopsy samples and 10 non-cancerous samples, were collected from NPC patients and healthy volunteers in Cho Ray Hospital, Ho Chi Minh City, Vietnam. The polymerase chain reaction (PCR) and sequencing were performed to identify *RPMS1* variations in nasopharyngeal biopsy samples from Vietnamese NPC patients and non-cancer controls, compared to the wild-type sequence (NC_007605). As the results, the frequency of positive *RPMS1* counting for 66.67% (20 of 30 cases) in biopsy samples and no sample was detected non-cancerous samples, (p = 0.013). The results of odds ratio and relative risk values, were 41.00 (95% CI = 2.18 to 770.11), 1.95 (95% CI = 1.27 to 3.01), respectively, indicated the strongly association between the detection of *RPSM1* gene and NPC incidence in Vietnamese NPC patients. Additionally, we revealed main *RMPS1* gene variants, including wild-type, RMPS1-B, RMPS1-C, RMPS1-C*, were identified. The frequency of wild type, RPMS1-C (A155391G), RPSM1-C* (A155391G, T155384C) and RPMS1-B (C155389T) variations are counting for 40% (8 of 20 cases), 50% (10 of 20 cases), 5% (1 of 20 cases) and 5% (1 of 20 cases), respectively. Among them, RMPS1-C/C* was preferential in Vietnamese nasopharyngeal carcinoma. In conclusion, these findings demonstrated that *RPMS1* gene was significantly associated for NPC. Among variants in *RPMS1* gene, RMPS1-C/C* was preferential in Vietnamese NPC patients. These data is the first dataset on the polymorphism in the *RPMS1* gene in Vietnamese NPC patients, and could be utilized as a promising biomarker for prognosis, diagnosis and therapy for NPC based on the EBV gene variations.

Keywords: nasopharyngeal carcinoma, polymorphism, *RPMS1*, variations.

Genetic study of *Propionibacterium acnes* isolates in Thailand using multi-locus sequence typing (MLST) method

Khemrutai Sripath
Department of Genetics, Faculty of science, Kasetsart University, Bangkok, Thailand khemrutai.s@ku.th

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 fsciptch@ku.ac.th

Abstract

Propionibacterium acnes is an acne-associated Gram-positive bacterium that metabolizes sebum and oil within skin pores and relies on numerous virulence-associated factors for the acne pathogenesis such as host tissue-degrading lipases, esterases, and hyaluronate lyases. Many studies reported genetic diversity of *P. acnes* from different pathogenic symptoms and skin conditions. This study aimed to examine genetic diversity of *P. acnes* isolates in Thailand using multi-locus sequence typing (MLST) method. Genomic DNAs were prepared from 15 isolates of *P. acnes* obtained from facial swap. Primers specific to eight house-keeping genes were used for PCR amplification according to the MLST scheme of *P. acnes*, which included *aroE*, *aptD*, *camp*2 , *gmk*, *sodA*, *lepA*, *guaA*, and *tly*. Expected sizes of the amplified products were successfully obtained in all samples. The amplified fragments were sequenced and compared with the pubMLST database for assignment of allelic types, sequence types, and clonal groups before visualization of their genetic relatedness using the eBRUST program. New allelic types and sequence types (STs) were identified from these *P. acnes* isolates in Thailand, indicating different patterns of genetic variation compared to those reported in the pubMLST data. Therefore, this finding helps understanding the genetic diversity of *P. acnes* in Thailand which will be useful for targeting the virulent strains and developing appropriate medical treatment of acnes.

KEYWORDS: Pathogenesis, *Propionibacterium acnes*, acne, multi-locus sequence typing, genetic diversity

Stress regulated gene expression database of mungbean (Vigna radiata) seedlings

Suthida boonyuen

Department of bioscience and technology , faculty of science, Kasetsart University, Bangkok, thailand
suthida.bo@ku.ac.th

Abstract

Mungbean(Vigna radiata) is a type of small green legume in the same plant family as peas and lentils. It is a higher source of protein, fiber, and phytonutrients consumed as sprouts or dry beans. Mungbean seeds are the good source with a good benefit of dietary protein and it contains higher levels of folate and iron than other bean species. Furthermore, mungbean can fix atmospheric nitrogen via root rhizobial symbiosis leading to improved soil fertility with a good texture. The aims to study the response of mungbean (Vigna radiata) seedlings to multiple stress conditions and using a python program to collect the data and create a program also allow users to input query genes and choose an option to find in co-expression under multiple stress condition. For the first result after users input their query genes which mean sequences or gene name it will show a bar chart with different colors and show small description with a name of a gene in other conditions that their input relates to. For a second result will show co-gene in order such as users setting to show between first 50 to 100 genes. The last result will show the family of a mystery either gene or sequence from the input. It will show all of the family name and members (find from orthomcl_ATA_vradi). Form all of these data will expose on the website.

Molecular Docking of Catechin and Its Derivatives, Kaempferol, and Quercetin Towards Inhibition Activity of Protein Tyrosine Phosphatase (PTP1B)

Salma Dienta Salsabila
Department of Biochemistry, Faculty of Mathematics and Natural Sciences,
Bogor Agricultural University, Bogor, Indonesia
salmadientasalsabila@gmail.com

Laksmi Ambarsari*
Department of Biochemistry, Faculty of Mathematics and Natural Sciences,
Bogor Agricultural University, Bogor, Indonesia
laksmi@apps.ipb.ac.id

Tony Ibnu Sumaryada*
Department of Physics, Faculty of Mathematics and Natural Sciences,
Bogor Agricultural University, Bogor, Indonesia
tsumaryada@apps.ipb.ac.id

Type II Diabetes mellitus (T2DM) is dominating the population of DM around 95%. It is caused by the resistance of insulin in the body cell, which related to the aberrant signaling of insulin receptor. One of molecular proteins that plays a pivotal role is Protein tyrosine phosphatase 1B (PTP1B). It's widely expressed by T2DM and acted as a negative regulator, which dephosphorylate insulin receptor (IR) and insulin receptor substrate (IRS) on tyrosine-phosphate residues. Hence, PTP1B has emerged as an attractive drug target for new selective treatment of T2DM. Little is known about PTP1B inhibitors since almost its active site region is highly charged, not much inhibitor compounds have membrane permeability, and its synthetic inhibitors have negative effects. Due to the challenges, catechin, kaempferol, and quercetin which have been used as bioactive flavonoid in herbal medication can be the potential PTP1B inhibitors. Catechin has been shown in vitro to inhibit PTP1B activity on its catalytic domain. Meanwhile, kaempferol and quercetin have been tested as antidiabetic through in vivo study. This research is aimed to determine the interaction and inhibition potency of catechin and its derivatives, kaempferol, and quercetin against PTP1B (ID:1WAX) in silico using docking simulation. The methods include ligand and receptor's preparation, analysis of ligands bioactivity and toxicity, validation of molecular docking, molecular docking simulation, and energy and chemical bond analysis. Phosphotyrosine is used as control and thiazolidinedione (TDZ) as comparator. This research also considers the catechins optical isomers. The following potential inhibitors (Ki highest→lowest) are (-)-Epicatechin (Ki: 2.2366µM), (+)-Catechin (Ki: 3.1359µM), (+)-Gallocatechin (Ki: 16.9894µM), (-)-Epigallocatechin (Ki: 20.1169µM), (+)-Epigallocatechin (Ki: 20.1169µM), Quercetin (Ki: 20.1169µM), (-)-Catechin (Ki: 28.2053µM), (-)-Gallocatechin (Ki: 28.2053µM), Kaempferol (Ki: 28.2053µM), and (+)-Epicatechin (Ki: 33.3969µM). The (-)-Epicatechin has the highest inhibition potency which even exceeds PTP1B's substrate, phosphotyrosine (Km: 23.82µM) and synthetic inhibitor, TDZ (Ki: 6.1643µM). It shows 91.67% binding site similarity and -7.7 kcal/mol affinity energy that indicates it can bind PTP1B binding and catalytic sites spontaneously. The optical isomers of catechins affect binding interactions on PTP1B surface. Each of them has different interactions to inhibit PTP1B. Therefore, all test ligands can be alternative inhibitors for T2DM treatment.

Keywords: PTP1B molecular docking, catechin compounds, kaempferol-quercetin

Inhibitory effect of hydrolyzed riceberry rice bran extract on colon cancer cell line

Vichugorn Wattayagorn
Department of Zoology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
Vichugorn.w@ku.th

Mesayamass Kongsema
Department of Zoology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fscimmk@ku.ac.th

Pramote Chumnanpue*
Department of Zoology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fsciptch@ku.ac.th

Abstract

Riceberry rice bran is the part of rice that has been scrubbed out during coloring. There are various health benefits with high protein content and antioxidant ability. The hydrolyzed rice bran consists of diverse peptide which provide various bioactive properties. This work aimed to study the effect of hydrolyzed riceberry rice bran extracted on colon cancer cell lines (non-metastatic colon cancer cell line: HT-29, metastatic colon cancer cell line: SW-620) compared to normal cell (human fibroblast cell line: PCS-291-010) The MTT assay result showed that our extract has less cytotoxicity on normal cell (PCS-291-010, IC_{50} = 6,680.00 µg/ml) compared to the colon cancer cell lines and has more effect on metastatic cancer cell line (HT-29, IC_{50} = 5,492.31 µg/ml) than non-metastatic cancer cell line (SW-620, IC_{50} = 6,040.76 µg/ml). According to the DNA fragmentation pattern analysis using gel electrophoresis technique, the ladder pattern indicated that the rice bran rice bran extract can induce apoptosis process. According to the cell senescence analysis using SA-β-gal stanning technique at 72 h after treatments, non-metastatic cancer cell (SW-620) reached maximum senescence rate at 95.45% while metastatic cancer cell (HT-29) had only 13.34% of senescence. In conclusion, the hydrolyzed riceberry rice bran extract can inhibit colon cancer cell lines with less effect on normal cell. The extracts could induce apoptosis process in metastatic cancer cell and induce senescence process in non-metastatic cancer cell. This observed information will be useful and applicable for medical research and colon cancer treatment in the future.

Keywords: riceberry rice bran, colon cancer

Association study of *Latent membrane protein-1* (*LMP-1) gene* expression and the methylation status of *Ras-asociation domain family 1A (RASSF1A) genes* in Vietnamese Nasopharyngeal carcinoma patients.

Hue Hong Thieu
Faculty of Biology and Biotechnology, Ho Chi Minh City University of Science, Vietnam
honghue0205@gmail.com

Tuan Anh Hoang Nguyen
Faculty of Biology and Biotechnology, Ho Chi Minh City University of Science, Vietnam
nhatuan1710@gmail.com

Kha Dong Ngo
Faculty of Biology and Biotechnology, Ho Chi Minh City University of Science, Vietnam
dongkha2607@gmail.com

Thuan Duc Lao
Faculty of Biotechnology, Ho Chi Minh City Open University, HCMC, Vietnam
Faculty of Biology and Biotechnology, Ho Chi Minh City University of Science, Vietnam
thuan.ld@ou.edu.vn

Thuy Ai Huyen Le
Faculty of Biotechnology, Ho Chi Minh City Open University, HCMC, Vietnam
thuy.lha@ou.edu.vn

The infection of Epstein-Barr virus (EBV) are considered as the etiological factor contributed to nasopharyngeal carcinoma (NPC). In the latent satge, *Latent membrane protein-1 (LMP-1)*, an oncoprotein, is able to interact with intracellular signal pathways that lead to the activation of DNA methyltransferase (DNMT). Consequently, hypermethylation of tumor suppressor genes (TSGs), also considered as the promoting-factor in NPC to tumorigenesis, are induced. *Ras-association domain family 1A (RASSF1A)* genes is a TSG that frequently hypermethylated in NPC. With the aims to determine the association between *RASSF1A* gene's promoter methylation and expression of *LMP-1* in Vietnamese NPC patients. A total of 30 NPC biopsy samples and 30 non-NPC brushing samples were enrolled into current study. Realtime-PCR, Nested-specific methylation PCR were applied to analyze the expresion of *LMP-1* gene, and the status methylation of *RASSF1A* gene, respectively. The Chi-square analysis was conducted to examine the association between them with 95% confidence interval. As the result, the frequencies of *LMP-1* expression were 70%, 13.33% in NPC biosy samples and non-NPC brushing samples, respectively. Additionaly, the proportion of *RASSF1A* methylation were 70% , 3.33%, respectively. Based on statitical analysis, the strong association between the expression of *LMP-1* or the methylation of *RASSF1A* and NPC were observed (both p-value < 0.05). Notably, in the group of NPC samples, concerning to 21 cases with positive for *LMP-1* expression, 13 cases (counting for 61.90%) were positive for *RASSF1A* methylation. Statistical analysis showed that there was a significant relationship between *LMP-1* expression and methylation status of *RASSF1A* ($p<0.05$). In conclusion, there was an association between expressions of *LMP-1* with *RASSF1A* methylation status in Vietnamese NPC patients. Those data suggested the profile of those characteristics could further develop promising biomarker for prognosis, diagnosis and therapy for Vietnamese NPC.

Keywords: Nasopharyngeal carcinoma, LMP1, RASSF1A, methylation.

An Indian traditional fermented beverage based on Pearl millet: synbiotic potential food extemporizing for quality life when mixed with *Prosopis cineraria's* fruit.

Poornima Saraswat and R. K Gaur*

Department of Bio-sciences, School of Science, Mody University of Science and Technology, Rajasthan, India
posarasw.cash@modyuniversity.ac.in
rkgaur.cash@modyuniversity.ac.in

Abstract

Varied Indian traditional fermented foods and beverages are produced with diverse types of fermentation. They have been used since antiquity and have inherent numerous nutritional values. One of the traditional beverages called 'Raabadi' is extensively used in Northern parts of India which is fermented with country buttermilk and its main ingredient is Pearl millet (*Pennisetum typhoideum*) flour. It is grown expansively in India as a staple food. It can grow under adverse climatic conditions such as inadequate rainfall in non-irrigated areas. Similarly, a leguminous plant species known as *Prosopis cineraria (L) Druce* also grows in extreme climatic conditions of the semi-arid and arid regions of western India. This is commonly known as 'Khejri'. Both plants have high nutritional values considering that pearl millet has high starch content whilst *Prosopis* pods have high protein content. Thus, these two plants were brought together in traditional fermented food model system that was designed on basis of 'Raabadi' recipe. The beverage developed was based on mixture of soybean and pearl millet flour with substitution of 20% of *Prosopis* pod's flour to check its in-vitro protein digestibility. Result showed significant rate of protein digestion (*in-vitro*) with pod's flour addition compared to control which in turn indicates high protein content and digestibility. These explanations may have therapeutic values on effects of protein calorie malnutrition, weight control and gut health. Sensory evaluation showed the acceptance of 73%.

Keywords: Pearl millet. Raabadi, protein digestibility, fermented foods

*Corresponding Author

Influence of flushing diet contains fat source differing in fatty acid profile on blood metabolites and number of embryo in Etawah crossbred goats

Prasetyo Nugroho
Department of Nutrition and Feed Technology, Faculty of Animal Science, IPB University, Bogor, Indonesia
pnugrohoprasetyo@gmail.com

Komang G. Wiryawan
Department of Nutrition and Feed Technology, Faculty of Animal Science, IPB University, Bogor, Indonesia
kgwiryawan61@gmail.com

Dewi Apri Astuti
Department of Nutrition and Feed Technology, Faculty of Animal Science, IPB University, Bogor, Indonesia
dewiapriastuti86@gmail.com

Wasmen Manalu
Department of Anatomy, Physiology, and Pharmacology, Faculty of Veterinary Medicine, IPB University, Bogor Indonesia
pwasmenmanalu@gmail.com

Abstract

Flushing is an effort to increase the livestock body conditions by providing a high-quality feed formulation, so that the livestock is ready to carry out the reproduction process and can be implemented in goats prior to mating to optimize the reproduction process. Supplementation of fat on feeding flushing ration, especially polyunsaturated fatty acid (PUFA) is a strategy to stimulate steroid hormone production. The objective of the present study was to evaluate and analyze Influence of flushing diet contains fat source differing in fatty acid profile on blood metabolites and number of embryo in Etawah crossbred goats. A total of 18 multiparous Etawah crossbred goats were fed isocaloric and isonitrogenous diets divided into three treatments (n = 6 per treatment) during flushing period. The treatment rations were R1 (supplementation of coconut oil as a source of saturated fatty acid), R2 (supplementation of sunflower oil as a source of linoleic acid), and R3 (supplementation of flaxseed oil as a source of α-linolenic acid). Flushing period from 3 weeks pre-mating to 2 weeks post-mating. Estrus was synchronized by injecting prostaglandin $F_{2\alpha}$ two times at 11 days interval. The experiment used a completely randomized design (CRD). The results showed that the treatments did not significantly affect ($P > 0.05$) to the consumptions of nutrient, plasma glucose and cholesterol concentrations during flushing period. Though the body condition score (BCS) was not significantly different ($P > 0.05$) among all treatments, flushing for 3 weeks increased BCS. Mean plasma progesterone and the number of embryos were higher ($P < 0.05$) in goats supplemented with flaxseed oil than those supplemented with coconut oil or sunflower oil.

Keywords: flushing, body condition score, progesterone, embryo

Isolation and characterization of mercury-resistant bacteria from gold mine area in Pongkor Village, Bogor, Indonesia

Wilhelmus Terang Arga Sanjaya
Department of Soil Science and Land Resources, Faculty of Agriculture, Bogor Agricultural University, Bogor, Indonesia
terangarga@gmail.com

Nur Syafira Khoirunisa
Department of Soil Science and Land Resources, Faculty of Agriculture, Bogor Agricultural University, Bogor, Indonesia
n.syafira.kh@gmail.com

Sri Ismiani
Department of Soil Science and Land Resources, Faculty of Agriculture, Bogor Agricultural University, Bogor, Indonesia
sriismiani593@yahoo.co.id

Fahrizal Hazra
Department of Soil Science and Land Resources, Faculty of Agriculture, Bogor Agricultural University, Bogor, Indonesia
fhazra2011@yahoo.com

Dwi Andreas Santosa*
Department of Soil Science and Land Resources, Faculty of Agriculture, Bogor Agricultural University, Bogor, Indonesia
dsantosa@indo.net.id

Pongkor Village is an area with the biggest artisanal and small-scale mining in Indonesia which is using mercury for gold leaching. In the previous study, two mercury resistant microbes have been discovered from Pongkor Village that can survive with Minimum Inhibitory Concentration (MIC) of 575 ppm. Mercury resistant microbes have critical role in optimizing bioremediation approach as an effective and low cost alternative to remove mercury. In this study, four new microbes are isolated with higher mercury resistance with MIC of 600-3000 ppm. The purposes of this research are to characterize and identify new mercury resistant microbes and to test their capability in accumulating mercury. Bacterial isolation and identification are conducted from nutrient broth supplement with various concentration of $HgCl_2$ (10-3000 ppm). The isolated bacteria with MIC higher than 600 ppm are tested for mercury accumulation in the nutrient broth containing 10, 100, 1000, 2000 and 3000 ppm of Hg for 2 weeks. The results show that there are four mercury-resistant bacteria can survive in nutrient broth that contain $HgCl_2$ concentration higher than 600 ppm. Based on molecular identification with 16S rRNA, they are identified as *Mycobacterium* sp., *Methylobacterium radiotolerans*, *Cladosporium halotolerans*, and *Mycolicibacterium peregrinum*. The highest resistant ability of bacteria is 3000 ppm which belongs to *C. halotolerans*, and *M. peregrinum*, while the capability in accumulating mercury test show that there is different accumulation pattern in various mercury concentration. C. *halotolerans* has stable capability to accumulate mercury (90,32-96,06%) in various concentration, meanwhile the capability of *M. peregrinum* is decrease along with the increasing of mercury concentration (97,10% in 10 ppm, 95,66% in 100 ppm, 78,60% in 1000 ppm, 34,80% in 2000 ppm, and 7,70% in 3000 ppm).

Keyword : *mercury resistant bacteria, bioremediation, accumulation,*

Fungal Endophytes on Asymptomatic Leaves of Sugarcane And Bio-Efficacy Test Against *Colletotrichum falcatum* Went and *Fusarium* sp., Causal Organisms of Red Rot of Sugarcane (*Saccharum officinarum* L.)

Steffanie A. Castillo*
Institute of Weed Science, Entomology and Plant Pathology
University of the Philippines Los Baños, College of Agriculture and Food Science, College, Los Baños, Laguna, Philippines
sclapitan@up.edu.ph

Teresita U. Dalisay
Institute of Weed Science, Entomology and Plant Pathology
University of the Philippines Los Baños, College of Agriculture and Food Science, College, Los Baños, Laguna, Philippines
tudalisay_d1760@yahoo.com

Sugarcane (*Saccharum officinarum* L.), is an important tropical perennial grass cash crop valuable for its ability to store high concentrations of sugar and its capability to produce bioethanol. These beneficial products are commonly affected by various biotic factors that are responsible for its low yield, diseases are the major cause of concern. Red rot disease of sugarcane is a major constraint for sugarcane production as it affects the economically viable parts of the sugarcane such as seeds, setts, stalk and leaves. It has been limited only to the known causal organism, C*olletotrichum falcatum,* however, isolation work from leaves revealed presence of species of *Fusarium*. It was observed that from the total processed sections, 55% showed *C. falcatum* while 45% showed *Fusarium* sp. SCL01. To test the infective capacity to cause disease of the two isolates, pathogenicity assay of both fungi were conducted and showed that isolates were able to express symptoms of red rot disease, 66.67% of inoculation points resulted to formation of lesions by *C. falcatum* while 88.89% by *Fusarium* sp. SCL01. The isolates were recovered from the disinfected inoculated tissues through re-isolation. Percent recovery for both pathogens were 87.5% for *C. falcatum* and 93.33% for *Fusarium* sp. SCL01. Plant disease management such as the use of antagonistic fungal endophytes are being studied extensively due to the adversative effects of chemical control. In this study, thirty-eight (38) endophytic fungi (EF) were collected from the asymptomatic leaves of sugarcane and were challenged against the two isolated test pathogens. Prior to *in vitro* test of efficacy, frequencies of occurrence of EF on leaf segments were accounted. Fifty percent isolation frequencies of EF were found both on the apical and basal segments of the leaves. Test of efficacy of the EF were done by *in vitro* and *in vivo* assays. Results from the bio-efficacy assays showed that out of the 38 isolated EF, only one EF coded as SCL-EF34 exhibited promising antagonistic activity against both pathogens. The promising EF was subjected to cultural and morphological characteristics by observing its growth in different media and production of fruiting bodies. It was observed that the EF do not produce fruiting bodies hence, noted as sterile mycelia (SM). Radial growth inhibition in dual culture assay against *C. falcatum* was 48.99%, while the percent radial growth inhibition of *Fusarium* sp. SCL01 was 50.94%. Further assessment and evaluation of the efficacy of SM SCL-EF34 *in vivo* were done by detached leaf assay. Results showed that SM SCL-EF34 was effective only in protecting the leaves against *C. falcatum* at spore concentrations $1x10^4$ and $1x10^6$/ml where the mean lesion lengths were not significantly different with negative control set-ups of sterile distilled water and SM SCL EF-34 alone and was observed to have reduced mean lesion length. On the other hand, SM SCL-EF34 was found ineffective in controlling *Fusarium* sp. SCL01.

Keywords: Sugarcane, Red Rot Disease, Fungal Endophytes, Biological Control

Identification and Diversity of Gray Leaf Spot of Mango in the Philippines

Joanne A. Langres*
Graduate School
University of the Philippines Los Baños, Laguna, Philippines
jalangres@up.edu.ph

Teresita U. Dalisay
Institute of Weed Science, Entomology and Plant Pathology
University of the Philippines Los Baños, Laguna, Philippines
tudalisay_d1760@yahoo.com

Fe M. Dela Cueva
Institute of Plant Breeding,
University of the Philippines Los Baños, Laguna, Philippines
fmdcueva@yahoo.com

Ireneo B. Pangga
Institute of Weed Science, Entomology and Plant Pathology
University of the Philippines Los Baños, Laguna, Philippines
ibpangga@yahoo.com

Flor A. Ceballo
Institute of Weed Science, Entomology and Plant Pathology
University of the Philippines Los Baños, Laguna, Philippines
faceballo@up.edu.ph

Mangifera indica L., commonly known as mango, is one of the most important fruits in the Philippines due to its high nutritional value and economic contribution in local and export market. The gray leaf spot disease of mango was recently observed from several major mango growing areas in the country. This study was conducted to (i) identify the pathogen causing the disease, (ii) assess the genetic diversity among isolates using molecular markers, and (iii) distinguish the morphological and cultural characteristics of the different isolates. The infected leaf samples were collected, disinfected, and the associated fungi were isolated. Pathogenicity tests of fungal isolates were performed. Identification was carried out by PCR amplification and sequencing of the Beta-tubulin gene and Internal Transcribed Spacer regions. Representative isolates were grown in synthetic Potato Dextrose Agar and characterized morpho-culturally. Total of 51 pathogenic isolates were revealed four different species causing the disease namely *Neopestalotiopsis clavispora*, *N. chrysea*, *Pseudopestalotiopsis* sp. and *Pseudopestalotiopsis theae*. The *N. clavispora* isolates were diverse while other isolates were of none to very slightly diversity. The four species had almost the similar morpho-cultural characteristics with velvety to cottony mycelia, 5 celled conidia attached with hyaline. 2-3 setulae and a pedicel and had darker median cells. This is the first report of *Neopestalotiopsis clavispora, N. chrysea*, *Pseudopestalotiopsis* sp. and *Pseudopestalotiopsis theae* associated with gray leaf spot of mango in the Philippines.

Keywords: Gray leaf spot, *Neopestalotiopsis*, *Pseudopestalotiopis*, Beta-tubulin, Internal Transcribed Spacer

Screening of Marine Sponges-Associated Bacteria Producing Lignocellulolytic Enzymes

Wenang Maharsiwi, Rika Indri Astuti, Anja Meryandini, Aris Tri Wahyudi*
Microbiology Division, Biology Department, Bogor Agricultural University, Dramaga Campus, Bogor 16680, Indonesia

*) Author for correspondence : aristri2011@gmail.com

Abstract

Bioethanol from lignocellulosic biomass considered as a potential next generation biofuel because it is could be produced from reneweble resource. Lignocellulosic biomass pretreatment is an important step to get small polysaccharides as bioethanol precursore with hydrolyzing enzymes. Sponge-associated bacteria from marine is one of many sources to find the hydrolytic enzymes like cellulolytic, xylanolytic and ligninolytic enzymes. The aim of this research was to get sponge-associated bacteria with capability to produce lignocellulolytic enzymes that can be used for bioethanol production. One hundred bacterial isolates had succesfully been isolated from marine sponges *Crella* sp., *Agelas* sp., *Callyspongia* sp., *Hyrtios* sp. and *Spongia* sp. using spread plate method. As screened by qualitative assay, 13 isolates showed cellulolytic activities with index ranging from 0.11-0.95, and 27 isolates exhibited xylanolytic activities with index in range of 0.10-2.10, as indicated by clear zones formation around bacterial colonies on cellulose and xylan media, respectively. In addition, there are 3 isolates positively produced laccase as shown by brownish zone or brownish colony formation on guaiacol media. Interestingly, there are 3 isolates coded as AGN81, AGN89, and AGN98 have all the three types of lignocellulolytic enzymes. Furthermore, isolate AGN89 had been confirmed to have multicopper oxidase family protein gene which is responsible for laccase synthesize. Based on 16S rRNA sequence, AGN89 was highly homolog to *Pseudomonas luteola* strain NBRC 103146. In conclusion, these bacteria potentially to be explored for development of bioethanol production.

Key Words: Sponge-associated bacteria, cellulase, xylanase, laccase, 16S rRNA.

Exploring Bioprotectant Properties of *Streptomyces* spp Isolated from Rhizosphere Soils

Jepri Agung Priyanto[1], Rika Indri Astuti[1], Abdjad Asih Nawangsih[2], Aris Tri Wahyudi*[1]

[1]*Department of Biology, Faculty of Mathematics and Natural Sciences ;*[2]*Department of Plant Protection, Faculty of Agriculture, Bogor Agricultural University, Dramaga Campus, Bogor 16680, Indonesia.*

*Corresponding Author: aristri2011@gmail.com

Abstract

The Actinomycetes, mainly *Streptomyces* sp., are recognized as an important group of soil microorganisms due to their ability in producing agroactive compounds protecting plant from phytopathogenic microbes. The objective of this present study was to evaluate the biocontrol-related traits of 30 Actinomycetes isolates from rhizosphere soils including siderophore and HCN production, chitinolytic and antifungal activity. Twenty seven (90%) isolates were found to produce siderophore with siderophore production index of 0.32±0.18 - 3.38±0.38, as tested by using qualitative chrome azurol sulfonate (CAS) assay. Of 30 isolates, 26 (86%) isolates showed their capability in producing hydrogen cyanide (HCN) in production score range of 1-3.Twelve isolates (40%) exhibited various chitinolytic activities as indicated by different chitinolytic index ranging from 0.29±0.005-2.84±0.17. Interestingly, 12 chitinase-producing isolates showed markedly antifungal activities against 3 fungal pathogen including *Fusarium oxysporum*, *Rhizoctonia solani*, *Phytium* sp. in different spectra, as evaluated by dual culture method. Three isolates exhibited broad spectra, while other 9 isolates showed narrow spectra. Eight isolates attributed with four bioprotectant characters were identified by using 16S rRNA sequence analysis. Eight isolates coded as ARJ 38, ARJ 32, ARJ 15, ARJ 43, ARJ 23, ARJ 13, ARJ 22, and ARJ 42 were highly homolog (similarity ≥99%) to the genus *Streptomyces* in different taxa of species and strains. It was concluded that the selected Actinomycetes have good bioprotectant on plant.

Keywords: *Streptomyces*, Rhizosphere Soils, Siderophore, HCN, Antifungal Activity

Selection and investigation the antagonistic ability of some pathogen fungal species in plants of the actinomycete strains belonging to genus *Streptomyces*

Le Phuoc Tho[1], Tran Thi Diem Ngoc[1], Danh Gia Bao[1],
Truong Phuoc Thien Hoang[1]
[1] Nong Lam University, HCMC, Viet Nam

Actinomycetes are known as source of bioactive compounds. Particularly, actinomycetes are used to control plant pathogens upon abiliti of producing many powerful antibiotics. After isolating the actinomycete strains from 30 soil samples collected from cultivated areas in Dong Nai province, Viet Nam the co-culture method was used to determine the anti – fungal activity of isolated actinomycete strains with 3 fungal species such as *Fusarium* sp., *Colletotrichum* sp. and *Neoscytalidium dimidiatum*. Finally, the investigation of the effect of the culture medium and temperature on the fermentation process to collect the biomass of potential actinomycete strains was carried out. The results of isolation and observation of morphological characteristics were 35 *Streptomyces* species. Through the investigation of anti - fungal activity, there were 10 strains resistant to *Fusarium* sp., 11 strains resistant to *Colletotrichum* sp. and 6 strains resistant to *Neoscytalidium dimidiatum*. After that, five strains with the highest anti – fungal activity were chosen to carry out the rRNA16S molecular identification. As results, DN1, DN8, DN12, A3, A5 strain were determined as *Streptomyces massasporeus*, *Streptomyces chattanoogensis*, *Streptomyces massasporeus*, *Streptomyces coeruleofuscus* and *Streptomyces angustmyceticus*. The results showed that the *Streptomyces massasporeus* (DN1) strain produced the highest biomass at 34ºC in GA2 medium, *Streptomyces chattanoogensis* (DN8) strains produced the highest biomass at 34ºC in Gause medium, *Streptomyces massasporeus* (DN12) strains produced the highest biomass at 34ºC in GA2 medium, *Streptomyces coeruleofuscus* (A3) strains produced the highest biomass at 28ºC in Gause medium and *Streptomyces angustmyceticus* strains produced the highest biomass at 34ºC in Gause medium. Therefore, the study dedicate that these actinomycete strains have high potential for application of biological preparation to help mitigating the development of some pathogen fungal species in agriculture.

***Keywords*:** plant pathogen fungi, actinomycetes, *Streptomyces*, co-cultured copper, resistant activity.

Comparative efficiency of pSRG plasmid transformation into *Pasteurella multocida* serotypes A and D using different methods

Chanawee Somjit
Department of Genetics, Faculty of Science, Kasetsart University, Bangkok, Thailand
Chanawee.SO@ku.th

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
fsciptch@ku.ac.th

Abstract

Pasteurella multocida, a pathogen that causes of respiratory diseases in livestock such as bovine heamorrhagic seticamia and porcine pneumonia. Plasmid transformation and molecular cloning are essential tools for understanding bacteria-bacteria and bacteria-host interactions. Previous research studied adhesion and invasion of the bovine isolate of *P. multocida* with the bovine lung epithelial cells by transforming the *pSRG* dual reporter plasmid into *P. multocida* cells. The applications of the *pSRG* plasmid in the porcine strain of *P. multocida* have not been examined. This study aimed to transform the *pSRG* plasmid into two porcine strains of *P. multocida* (capsular types A and D) by comparing between heat shock and electroporation methods. Result showed that the electroporation (55.6×10^{-2} CFU) had higher transformation efficiency than the heat shock method (3.3×10^{-2} CFU), which was consistent with the previous study in the bovine strain. Thus, the *pSRG* plasmid was successfully transformed into the porcine strains of *P. multocida* and will be useful for further study bacterial interactions.

Keywords: *Pasteurella multocida*, heat shock, electroporation, *pSRG* dual reporter plasmid

Molecular evolutionary analysis of haemoglobin-binding protein A (*hgbA*) gene in *Pasteurella multocida*

Jiraya Pongpikul
Department of Genetics, Faculty of Science, Kasetsart University,
Bangkok, Thailand 10900
Jiraya.po@ku.th

Teerasak E-kobon
Department of Genetics, Faculty of Science, Kasetsart University,
Bangkok, Thailand 10900
fscitse@ku.ac.th

Abstract

Pasteurella multocida is a Gram-negative bacterium that causes infectious diseases in a wide spectrum of mammals and birds. The *hgbA* gene encodes for a TonB-dependent transporter involved in hemoglobin binding and heme transport into the periplasm. Previous comparative genomic study reported that *hgbA* was one of the essential genes in the core genome of all *P. multocida* strains. Association between molecular evolution of the *hgbA* gene and animal hosts was not examined. This project aimed to study molecular variation of the *hgbA* gene in different strains of *P. multocida* using nucleotide and protein sequence analysis. Multiple sequence alignment of the *hgbA* gene showed Alignment of the HgbA protein showed Phylogenetic analysis showed.

KEYWORDS: hgbA, TonB-dependent transporter, *Pasteurella multocida*, molecular evolution

Exploration of Surface Plasmon Resonance for Detection of Dengue Virus Based on Cadmium Sulfide Quantum Dots-Polyamidoamine Composite Thin Film

Nur Alia Sheh Omar
Functional Device Laboratory, Institute of Advanced Technology, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia
nuralia.upm@gmail.com

Yap Wing Fen*
Department of Physics, Faculty of Sciences, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia
yapwingfen@gmail.com

Jaafar Abdullah
Department of Chemistry, Faculty of Science, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia
jafar@upm.edu.my

Mohd Adzir Mahdi
Wireless and Photonics Network Research Centre, Faculty of Engineering, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia
mam@upm.edu.my

Abstract

The incidence of dengue has affected more than 2.5 billion people worldwide and there is no effective vaccine to fight dengue virus (DENV). Severe dengue symptoms such as dengue shock syndrome, dengue heamorrhagic fever, and organ dysfunction have become a leading cause of death on society. With the advancement of today's technology, the rise of optical sensor such as surface plasmon resonance (SPR) has been utilized for early detection of DENV rather than relying on blood samples or platelet counts. The useful fundamental of SPR sensor enables the monitoring of changes in refractive index in the vicinity of the surface layer of the sensor chip, and then facilitate the binding detection with DENV in real-time measurement. Experimental results revealed a fast response towards DENV in the concentration range of 0.0001 nM to 0.1 nM within 14 minutes. The equilibrium association constant (K_A= 2.53 μM^{-1}) of the proposed sensor was successfully obtained. Taken together, this proposed SPR sensor could potentially open a new window in medical diagnostics.

Keywords: Optical Sensor, Surface Plasmon Resonance, Quantum Dots, Dengue

Biosynthetic pathway of mycobacterial glycopeptidolipids reveals chemical structure of the acyl chain

Archana Vats, PhD.

CSIR-Institute of Genomics and Integrative Biology, Mathura Road, Sukhdev Vihar, New Delhi-110020. https://www.igib.res.in

Abstract

Glycopeptidolipids (GPLs) are class of glycolipids produced by several fast-growing species of mycobacteria. These are present in several opportunistic mycobacterial species and are thought to provide distinct morphological and specialized cell surface properties. GPLs contain a lipopeptide core unit modified by sugar moieties. The lipopeptide core of Mycobacterium smegmatis (Msmeg) GPL is composed of a tetrapeptide (Phe-Thr-Ala-Alaninol) and is modified with long chain fatty acid (C26-34). The hydroxyl groups of threonine and the terminal alaninol are further modified by glycosylations with 6-deoxy talose and O-methyl rhamnose moietes. While the core chemical structures of several GPLs are known from diverse mycobacterial species, the exact position of the hydroxyl group on fatty acyl chain, position of the unsaturation and its configuration remain speculative. The enzyme involved in the production of non-ribosomal peptide component and also the modifying enzymes are well characterized. However the biosynthesis of hydroxyla ted and unsaturated acyl chain remains unknown. Our studies demonstrate that a bimodular polyketide synthase along with a fatty acyl-AMP ligase is involved in the synthesis of fatty acyl chain. Along with computational investigations, genetic and biochemical studies reveal the position of hydroxyl group and suggests probable position of unsaturation on the acyl chain. Our integrative studies involving chemical synthesis, reverse phase column chromatography and mass spectrometric analysis establish that the hydroxyl group is present at the δ position of fatty acyl chain. The position of unsaturation is still debatable and requires further detailed analysis. These modifications of GPL are important from the physiological perspective, since genetic knock-out studies affects the sliding motility and biofilm formation. Interestingly, *M smeg.* genome contains several homologues of cis/trans isomerases and it is possible that these enzymes may be involved in dynamically remodeling structures and thus the function of these bacteria. Our strategy of structure elucidation based on retrobiosynthetic approach provide accurate identification of the position of hydroxyl group and also reveal functional significance of polyketide synthase and acyl-AMP ligase enzymes involved in the biosynthesis of GPLs.

Keywords: Glycopeptidolipids, Polyketide synthase, Fatty acyl chain

Gene annotation for reconstructing pathways-associated lipid metabolism of oleaginous filamentous fungus *Aspergillus oryzae* strain BCC7051

Pathomchai Dindaeng
Department of Zoology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
pa-thom-chai@hotmail.com

Chakkapan Sapkaew
Genetic Engineering and Bioinformatics program, Graduate school, Kasetsart University,
Bangkok, Thailand
zheezez@gmail.com

Kobkul Laoteng
National Center for Genetic Engineering and Biotechnology (BIOTEC), National Science and Technology Development Agency (NSTDA), Pathum Thani, Thailand
kobkul@biotec.or.th

Wanwipa Vongsangnak*
Department of Zoology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fsciwpv@ku.ac.th

Abstract

Apergillus oryzae strain BCC7051 is a great interest for biotechnological production of lipid-derived products due to its capability to accumulate high amount of lipids. However, its lipid metabolism is poorly understood. Therefore, this study aimed to annotate genes from oleaginous *A. oryzae* strain BCC7051 genome for reconstructing pathways involving in lipid metabolism. To explore, a comparative genome analysis between *A. oryzae* strain BCC7051 and reference strain RIB40 was performed for gene annotation. Afterwards, the annotated genes were used for pathway reconstruction using different metabolic databases e.g., KEGG and MetaCyc. Towards final manual curation, the results showed that 884 annotated genes out of 11,456 genes from *A. oryzae* strain BCC7051 genome were involved in metabolism. Of these 884 genes, 107 genes were associated in lipid metabolism. Interestingly, we found two unique pathways-associated lipid metabolism *of A. oryzae* BCC7051 when compared to the reference strain RIB40. The identified two pathways were very long-chain fatty acid elongation and wax biosynthesis. This study provides a useful information in lipid metabolism of *A. oryzae* BCC7051. It can be further used as a scaffold for genome-scale metabolic network reconstruction of lipid-producing fungi.

Keywords: *Aspergillus oryzae,* Genome annotation, Lipid metabolism**,** Lipid producing fungi

Identification of *Backhousia citriodora* (F. Muell) metabolites responsible for antimicrobial activity against pathogens of hospital acquired infections by using ^{1}H-NMR metabolomics approach.

Fadzil Sulaiman
Chemistry Department, Faculty of Science, Universiti Putra Malaysia,
43400 Serdang, Selangor, Malaysia
mfadzilsulaiman90@gmail.com

Nur Kartinee Kassim (Corresponding author)
Chemistry Department, Faculty of Science, Universiti Putra Malaysia,
43400 Serdang, Selangor, Malaysia
kartinee@upm.edu.my

Intan Safinar Ismail
Phytochemistry Unit, Institute of Bioscience, Universiti Putra Malaysia,
43400 Serdang, Selangor, Malaysia
safinar@upm.edu.my

Rukman Awang Hamat
Medical Microbiology and Parasitology Department, Faculty of Medicine and Health Sciences,
Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia
rukman@upm.edu.my

Azi Simon Onyema
Medical Microbiology and Parasitology Department, Faculty of Medicine and Health Sciences,
Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia
azisimon2007@gmail.com

Safwan Ahamad Bustamam
Phytochemistry Unit, Institute of Bioscience, Universiti Putra Malaysia,
43400 Serdang, Selangor, Malaysia
safwan.upm@gmail.com

Backhousia citriodora (F. Muell) or commonly known as lemon myrtle is a large shrub to medium-sized tree endemic to Queensland, Australia. Belonging to the Myrtaceace family, the prominent feature of this plant includes having strong lemon scented evergreen leaves. Hospital acquired infections by antimicrobial resistant pathogens is deemed as one of the major treats to healthcare sector worldwide for the high mortality and morbidity rates and the expenditure it costs. This study aims to investigate the antimicrobial property of the plant against pathogens of hospital acquired infections together with its metabolites profile from four different extracts. The leaves of the plants were air dried for two weeks and ground before they were soaked with four organic solvents which are hexane, chloroform, ethyl acetate and methanol for 72 hours. The dried paste of each crude extract was subjected to ^{1}H-NMR spectroscopy and the spectrum were processed for metabolomics analysis to determine the metabolites distribution. The identification of the metabolites was carried out using database library and literature search. This data is then correlated with the minimal inhibitory concentration (MIC) and minimal bactericidal concentration (MBC) of each crude extract against methicillin-resistant *Staphylococcus aureus* and multiple drug resistant *Acinetobacter baumanii.* Hexane crude extract showed the lowest MIC and MBC values among all extracts with the average value of 1.34 ± 0.26 mg/ml. The monoterpenes are the group of compounds identified exclusively from this extract which may conclude that they may contribute to the antimicrobial property of the plant against these two pathogens. This study can be expanded by the isolation of the targeted metabolites and the determination of their antimicrobial property both individually and collectively.

Keywords: *Backhousia citdriodora*, lemon myrtle, antimicrobial, MIC, MBC, 1H-NMR metabolomics, methicillin-resistant *Staphylococcus aureus*, multiple drug resistant *Acinetobacter baumanii.*

Portable *Pasteurella multocida* detection device using LAMP assay

Yanawat Pattharapisitthorn
International Program in Bioscience and Technology, Faculty of Science, Kasetsart University, Bangkok, Thailand
yanawat.p@ku.th

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
fsciptch@ku.ac.th

Abstract

Pasteurella multocida is the cause of haemorrhagic septicaemia in Asia and Africa. Infected cattle and buffaloes normally die within 24-36 hrs. Rapid detection of *P. multocida* in the animals and on the rearing areas would help prevention of serious outbreaks and the loss of livestock. This project aimed to develop the portable device for *P. multocida* detection using the loop-mediated isothermal amplification (LAMP) assay. The LAMP assay specific to *P. multocida* was successfully developed. The device was divided into two parts: incubation and visualization chambers. The first part was for incubating the reaction under the isothermal condition. The second visualization chamber was developed using a camera module, the UV light source, and the color detection algorithm for fluorescent imaging of the reaction. Results were interpreted and displayed on the screen in terms of positive or negative bacterial detection. This device will be useful for monitoring and prevention of *P. multocida* outbreak.

Keywords: LAMP assay, haemorrhagic septicaemia, *Pasteurella multocida*, bacterial detection

Determination of phenolic compounds and mulberroside F accumulation in mulberry

Nattaya Pattarapipatkul
Department of Biochemistry, Faculty of Science, Kasetsart University,
Bangkok, Thailand
Nattaya.pat@ku.th

Wannarat Phonphoem*
Department of Biochemistry, Faculty of Science, Kasetsart University,
Bangkok, Thailand
Wannarat.p@ku.ac.th

Abstract

Mulberry is a plant, growing wild and under cultivation in many temperate regions. Several bioactive compounds have been found in this plant, including phenolics. These compounds have become of interest for pharmaceuticals and cosmetic industries due to their biological activities. Mulberroside F is one of the phenolic compounds that found in leaves, barks and roots of mulberry. Previous research demonstrated that Mulberroside F not only has antioxidant activity but also shows anti-tyrosinase for inhibition of melanogenesis. Therefore, this study aimed to determine phenolic compound and mulberroside F contents in different tissues of mulberry and study the effect of Light emitting diode (LEDs) on bioactive compound production. Firstly, the phenolics extraction method was optimized using two different solvents; ethanol and methanol. Total phenolic contents were determined spectrophotometrically according to Folin-Ciocalteu method and gallic acid was used to set-up standard curve. The results demonstrated that the condition of 60% ethanol was the most efficient extraction method, giving the highest yield of phenolic content. Secondly, the amount of phenolic compounds were examined in 10 different mulberry varieties. The result showed that higher phenolic contents were found in Kamphaengsaen 42, Sakonnakhon 72 and Lhunjiaw, compared to Buriram 51 and Buriram 60. Thirdly, mulberroside F content in Kamphaengsaen 42 was quantified and analyzed by High Performance Liquid Chromatography (HPLC) . The mulberroside F was mainly found in roots, followed by stem bark and leaves respectively. To study the effect of LEDs on bioactive compound production, mulberry plants were subjected to light treatments (white, red and blue) under controlled condition. As the result, the light source significantly affects mulberroside F and phenolic compound accumulation. Finally, the biological activities of mulberry extracts such as antioxidant and anti-tyrosinase were also evaluated via colorimetric assay.

Keywords: Mulberry, Mulberroside F, Phenolic compound, Light emitting diode (LEDs)

Bioinformatics analysis to study the relationship between allergen from difference species in patient with allergies history

Natawon Hattha
Bioscience and Technology program, Faculty of Science,
Kasetsart University, Bangkok, Thailand
natawon.h@ku.th

Chomdao Sinthuvanich
Department of Biochemistry, Faculty of Science,
Kasetsart University, Bangkok, Thailand
fscicds@ku.ac.th

Abstract

An allergen is an antigen that has ability to create antibody against the allergic reaction. Allergic dermatitis includes symptoms in the skin inflammation such as itchy, swollen and red patch. Allergens from furry of animals such as dog (*Canis Familiaris*) and cat (*Felis domesticus*) are among the causes of allergic dermatitis. The objective of this study is to analyze the relationship between allergen from dog and cat in patients with allergic dermatitis using bioinformatics techniques. The method of this study can divide into three parts. First, the medical history from patients who have an allergic reaction from dog and cat were collected. Second, Python was used to analyze the collected data and create the tools. Third, R-language was used to create the program for visualization the relationship of allergen by linking node and bar graph. The result of this study is a program that can find and visualize the relationship of allergen in patients who have an allergic reaction from dog and cat. The users can further use the information to understand more about the relationship in animal allergen proteins.

Keywords: Allergen, Animal Allergen, Bioinformatic tools, Clinical analysis.

Bioinformatics-based metabolic gene cluster annotation of *Cordyceps militaris* and related entomopathogenic fungi

Ananporn Supataragul
Bioscience and Technology, Faculty of Science, Kasetsart University, Bangkok, Thailand
ananporn.su@ku.th

Wanwipa Vongsangnak*
Department of Zoology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fsciwpv@ku.ac.th

Abstract

Cordyceps militaris is an entomopathogenic fungi which is widely used in Traditional Chinese medicine. Due to the high potential in pharmaceutical field, several researchers have studied the secondary metabolites of entomopathogenic fungi. However, there are still very few reports on secondary metabolites biosynthetic genes and pathways of *C. militaris*. Thus, the aim of this study was to identify gene clusters associated with secondary metabolites biosynthesis from *C. militaris* genome and further detected the shared and specific gene clusters between *C. militaris* and other related entomopathogenic fungal genomes using developed annotation strategies. Initially, genome and protein sequences of *C. militaris* and related entomopathogenic fungi were collected from NCBI database. Then, each genome was annotated for secondary metabolic gene clusters using antiSMASH. The annotated secondary metabolic gene clusters were afterwards detected for both specific and shared gene clusters between *C. militaris* and other related entomopathogenic fungi. Accordingly, the results showed that *C. militaris* contained 53 specific secondary metabolic gene clusters and 19 shared secondary metabolic gene clusters when compared with the other related entomopathogenic fungi. Of these shared gene clusters, two gene clusters, i.e. Huperzine A and Fumosorinone biosynthetic gene clusters were interestingly identified across entomopathogenic fungi. This study provides a useful information about the evolutionary relationship between *C. militaris* and other related entomopathogenic fungi in context of secondary metabolic gene clusters.

Keywords: *Cordyceps militaris*, Entomopathogenic fungi, Gene clusters, Secondary metabolites

Comparative analysis of variants identified from human whole exome data using different variant calling and annotation tools

Oratai Thakom*

Department of Genetics, Faculty of Science, Kasetsart University, Bangkok, Thailand 10900 Oratai.th@ku.th

Teerasak E-kobon

Department of Genetics, Faculty of Science, Kasetsart University, Bangkok, Thailand 10900 fscitse@ku.ac.th

Abstract

Precision medicine has applied next-generation sequencing technique to precisely diagnose diseases and prescribe medication. Whole human exome sequencing is widely and commercially used to obtain nucleotide sequences within coding regions of the human genome. The coding regions are responsible for up to 85% of known human diseases. Analysis of the human exome data involves variant calling and annotation methods to accurately identify mutations (single nucleotide polymorphisms (SNPs), insertions and deletions (indels)) occurred in the patient exome. To date, many variant calling and annotation programs have been developed using different algorithms including filtering strategies and recommendation guidelines. Therefore, this study aimed to compare performance of six variant calling tools (GATK, SAMtools, FreeBayes, VarScan, SNVer, and VarDict) and five annotation tools (ANNOVAR, snpEff, vcfanno, GATK, and VariantAnnotator) on the same human whole exome data. Core variants could be identified. The number of variants determined from each of these tools was different and SAMtools detected the greatest number of the variants. Detailed analysis of the results is currently in progress. This study has shown that the integrative use of several variant calling and annotation tools will increase confidence of the variant identification and the usage of the exome data in precision medicine.

Keywords: next-generation sequencing, human whole exome, variant calling, variant annotation, integrative analysis

Development of mushroom database platform

Kornkanok Boonthum
Department of Bioscience and Technology (International Program), Faculty of Science,
Kasetsart University , Bangkok, Thailand
kornkanok.bo@ku.th

Mushrooms are living organisms in the kingdom fungi. They are included in phylum Ascomycota and the Basidiomycota. Mushrooms have medicinal property to decrease growth of cancer cells. Some species of mushrooms are fragrant and inviting to eat but some species smell bad and can cause dizziness. Most of mushroom species contain high levels of protein. This study aimed to use MySQL, a module in the python program, to construct mushroom database platform that can store various information of each species of mushrooms and allow for easy access of this data via website or a smartphone using PHP script.

Keywords: mushroom, MySQL, PHP script

Spatial Pattern and Temporal Variability of Sea Level Anomaly and Geostrophic Current in the Eastern Indian Ocean from Satellite Altimetry

Julian Saputra*
Graduate School of Marine Technology, IPB University, Bogor, Indonesia
julian.saputra75@gmail.com

Jonson Lumban-Gaol
Department of Marine Science and Technology, Faculty of Fisheries and Marine Science, IPB University, Bogor, Indonesia
jonson_lumbangaol@yahoo.com

James P. Panjaitan
Department of Marine Science and Technology, Faculty of Fisheries and Marine Science, IPB University, Bogor, Indonesia
jppanjaitan20@gmail.com

Agus S. Atmadipoera
Department of Marine Science and Technology, Faculty of Fisheries and Marine Science, IPB University, Bogor, Indonesia
agus.itk@gmail.com

Abstract

The Eastern Indian Ocean (EIO) has complex dynamic circulation systems affected by monsoonal wind circulation and climate variation. This research aimed to investigate the spatial and temporal variability of the sea level, and the geostrophic currents in the EIO using altimeter data. We used daily time series of Sea Level Anomaly (SLA) data from 2004-2016 time span, and applied time-series analysis of Empirical Orthogonal Function (EOF). The highest four modes were adopted. Both SLA and geostrophic zonal component had 79.68% and 35.65% of sum of explained variance, respectively. The spatial pattern of the SLA showed dominant variability spread around Sumatra and Java coasts with positive and negative anomaly, as showed in first and second modes. while the third and forth modes didn't show a substantial spatial variability. The dominant temporal variation revealed semi-annual, annual and inter-annual periodicities. Furthermore, for the geostrophic zonal current, spatial pattern in the first to third modes showed high variability around Sumatra and Java coasts, while in offshore region they showed positive-negative anomaly. In the forth modes, the spatial pattern showed low variability. The dominant temporal variation revealed annual, semi-annual and inter-annual periodicities. Based on the spatial and temporal variation of the data, the variability in the study area might be associated with the dynamic of coastally trapped Kelvin wave (CTKW), upwelling and an inter-annual anomaly of Indian Ocean Dipole (IOD) and El-Niño-South Oscillation (ENSO). It was also noticed that some pattern indicated as dynamic of South Java Current (SJC) and South Equatorial Current (SEC) signals.

Keywords: EOF, geostrophic current, SLA, variability

Identification And Retracking Waveform Identification Based On Sea Depth And Waveform Retracking Of Altimetry Satellite Data In Halmahera Sea

Maya Eria Br Sinurat
Department of Marine Science and Technology, IPB University,
Bogor, Indonesia
mayaeriabrsinurat@gmail.com

Bisman Nababan
Department of Marine Science and Technology, IPB University,
Bogor, Indonesia
Simson_naban@yahoo.com

Jonson Lumban Gaol
Department of Marine Science and Technology, IPB University,
Bogor, Indonesia
jonson_lumbangaol@yahoo.com

Abstract

The accuracy of estimated sea surface height (SSH) from altimeter satellites is strongly influenced by the waveform shape. Waveform, the microwave reflection signals from altimeter satellites, is generally in the form of ideal shape (Brown). However, in coastal, shallow, and small island waters, waveform patterns are normally very complex due to the reflection of signal interferenced from the land. The purposes of the study was to identify based on the complexity of sea depth and retrack the waveform of altimetry satellite data in Halmahera Sea. The data used for this study were 5905 waveforms (SGDR-D) of Jason-2 and Jason-3 passing through Halmahera Sea. The highest percentage of Non-Brown waveform is found at waters having depth of 0–20 m. The highest percentage of Brown waveform is found in waters having depth of more than 1000 m though Non-Brown waveforms are still found with a distance of less than 15 km from the coast. Waveforms in deeper waters but closer to coast generally tend to approach peaky pattern while waveforms in shallower but farther away from coast are generally dominated by Brown + peak pattern. All retrackers provide significant improvement in SSH data except OCOG and can estimate SSH that cannot be estimated by on-board measurement. The best retrackers dominant in Halmahera Sea are the Threshold 10% and the Improved Threshold 10%. The highest IMP is 96.71% using the 10% Improved Threshold algorithm on Jason-2 pass 164 that passed Kao Bay.

Keywords: waveform, retracking, Jason, altimetry

Stratigraphy and Depositional Environments of Permian Limestone at Thawa Phitak Cave, Khao Erawan, Lopburi Province, Thailand

Kanistagan Sreesuriyapong and Wasinee Aswasereelert

Abstract

Deposition of carbonate rocks is controlled by several factors such as temperature, pressure and degree of agitation. Therefore, analysis of carbonate rocks can lead to interpretation of depositional environments. In this research, we investigate Permian limestone found in Thawa Phitak Cave, Khao Erawan, Lopburi Province, which belong to the Khao Khad Formation, to refine its lithostratigraphy and to interpret its depositional environments. Thawa Phitak Cave is a part of a mountain range in the central part of Thailand, showing karst topography. Carbonate rocks in the study area are composed mainly of limestone with less dolomitic limestone and can be classified into 4 units in an ascending order: lime mud conglomerate, diversely fossiliferous limestone, fossiliferous limestone and pebbly fossiliferous limestone units. The lime mud conglomerate unit is interpreted to be deposited in supratidal environments, whereas the other three limestone units were deposited in intertidal environments. Based on lithologic textures, Permian limestone of Thawa Phitak Cave and Permiam limestone on the eastern side of Khao Erawan show similar sedimentary rock units but with different bedding thickness. Therefore, they represent similar depositional conditions in tidal flat environments. This study has geologic significance and can provide basic knowledge for local people to better develop Khao Erawan area as a learning centre of nature and geology.

Keywords: Carbonate rock, Karst topography, Khao Khad Formation

Speleothems of Thawa Phitak Cave at Khao Erawan, Lopburi Province, Thailand.

Yutthaphichai Srisuk and Wasinee Aswasereelert

Abstract

Khao Erawan area represents an extensive karst region, consisting of dark gray to light gray Permian limestone. It consists of steep mountains with many large and small caves. One of the most interesting caves is Thawa Phitak Cave, which is the largest cave in Khao Erawan area. The length of the cave is about 200 meters. There are abundant speleothems deposited in the cave, resulting from chemical weathering and recrystallization of calcium carbonate. In this research, we investigate speleothems to detailedly map Thawa Phitak Cave and interpret conditions of calcium carbonate deposition. After we quantitatively and qualitatively collect speleothem data together with geologic structural data, we can divide the cave cavity into 2 types: chambers and passages. Speleothems found in the cave include flowstone, drapery, stalactites and stalagmites. Flowstone is the major speleothem found in the cave with abundance of approximately 60% of total speleothems deposited in the cave, whereas abundances of drapery, stalactites and stalagmites are 20%, 10% and 10%, respectively. We can interpret that there was groundwater flowing through Permian limestone deposited in Khao Erawan area, resulting in chemical weathering of calcium carbonate. The longer this process took place, the more and the larger cavities were created. Then, the area consisted of several underground caves and was uplifted due to regional activities tectonic. Finally, it became Khao Erawan as we explore in this project. When it rained or surface water ran through the cave, the speleothems were deposited.

Keywords: Carbonate, Karst topography, Saraburi Group

The Hyperoctahedral Group

Sota Shigemori
Mathematics Division, Department of Science,
Graduate School of Science and Technology, Shinshu University,
Matsumoto, Japan
19ss105j@shinshu-u.ac.jp

Abstract

Consider the *n*-dimensional Euclidean space $\mathbb{R}^n$. Let $\boldsymbol{e}_i$ be the standard vector for $1 \leq \mathrm{i} \leq n$ Define X_n by

$$X_n = \{ \pm \boldsymbol{e}_i \in \mathbb{R}^{\mathrm{n}} \mid 1 \leq i \leq n \}.$$

We consider the polyhedron whose set of vertices is X_n. We call it the *n*-dimensional hyperoctahedron. In the case where $n = 2$, the 2-dimensional hyperoctahedron is the square. In the case where $n = 3$, the 3-dimensional hyperoctahedron is the octahedron. Hence an *n* -dimensional hyperoctahedron is a generalization of the octahedron.

Define H_n as the set of conguent transforms of the *n*-dimensional hyperoctahedron. Then H_n is a group which is called the hyperoctahedral group.

Consider the symmetric group S_n. Define the subgroup W_N of S_N by

$$W_N = \{ w \in S_N \mid 1 \leq i \leq N \Rightarrow w(i) + w(N + 1 - i) = N + 1 \}.$$

Then Weyl groups of the special orthogonal group $\mathbf{SO}_{2n+1}(\mathbb{C})$ and the symplectic group $\mathbf{Sp}_{2n}(\mathbb{C})$ are isomorphic to W_{2n+1} and W_{2n}, respectively. Moreover, H_n is isomorphic to W_{2n+1} and W_{2n}.

Keywords: the symmetric group, the hyperoctahedral group, Weyl group

THE POTENTIAL USE OF CARBON RODS OF BATTERY WASTES FOR PROCESSING WASTE OF BATIK INDUSTRIES USING ELECTRODECOLORIZATION

Ananda Aulia Parahita[1], Kartika Fathma Dewi[2]
[1]SMA IT Al-Irsyad Al-Islamiyyah Purwokerto
[1]parahita99@gmail.com
[2]SMA IT Al-Irsyad Al-Islamiyyah Purwokerto
[2]kartikafathma@gmail.com

Abstract

Along with the development of batik industries, the liquid waste which is produced from them still leads to a lot of problems, both for the environment and the living things around. Batik waste has a high content of dye and synthetic substances which are difficult to be dissolved and decomposed. The new methods to deal with batik are continuously studied and developed. One of the alternative approaches is electrodecolorization method. The selection of electrode materials is conducted to support the desired process to improve the performance of the electrode in the process electrodecolorization. The use of graphite as the electrode is expected to be an alternative and the solution of the problem. Graphite (carbon) which is most easily found can be gained from dry batteries. The waste of batteries constitues B3 waste (hazardous and toxic materials). The utilization of battery waste is indispensable in order to reduce pollution caused by it. In this study, the electrodecolorization of batik waste will be conducted by using carbon of battery waste as the electrode. The purpose of this study was to find out the ability of carbon electrode taken from battery waste in the electrodecolorization process of batik liquid waste and the optimum conditions that have to be achieved in order to reach the opmimal electrodecolorization in processing the batik liquid waste. The method used in this research is a laboratory experiment. Electrodecolorization process was performed on RBBR 100 ppm solution to find out the optimum conditions (the potential of work, the length of the process, the concentration of Na_2SO_4). Then, the results of the optimization was applied to naphthol waste. The carbon electrode was made for the application stage of the electrodecolorization of naphthol waste with the scale of 8 liter. The data analysis was conducted by measuring the absorbance with a UV-Vis spectrophotometer and carbon reusability test. The results indicated that electrodecolorization with the carbon rods of battery waste managed to degrade the waste naphthol of 60% with the scale of 8 liters after 18 hours with the potential work of 9 volt and the salt concentration of 0.5 M. The carbon electrodes also had a good resistance that after 18 hours, the mass of the electrodes decreased by 50%.

Keywords : Electrodecolorization, battery wastes, carbon rods, batik liquid wastes

Differential Pulse Polarography at Dropping Carbon Fluid Electrodes

Takuya Okada*
Graduate School of Medicine, Science and Technology, Department of Science and Technology, Materials Science and Engineering Division, Fundamental Molecular Science Unit, Shinshu University, Matsumoto, Japan
19hs301j@shinshu-u.ac.jp

Abstract

Differential pulse polarography at a dropping mercury electrode is one of the most sensitive electrochemical measurement methods, and was once widely used for trace analyses. Because of the toxicity of mercury, it is highly desired to develop the method without using mercury. Here we applied dropping carbon fluid electrode (DCFE) to differential pulse polarography. A mechanical system for the automatic removal of carbon drops was devised. With the aid of a laboratory-made Python program, differential pulse polarography at DCFE of a model compound (ferrecenecarboxylate) was performed.

Keywords: Differential Pulse Polarography, Dropping Electrode, Carbon Fluid Electrode

Measurement of the Real Potential of Chloride Ion in Mixed Solvent by Using a Streaming Carbon Powder Electrode

Mariko Sakamaki*
Chemistry Unit, Department of Science, Graduate School of Science and Technology, Shinshu University, Matsumoto, Japan
19ss304c@shinshu-u.ac.jp

Abstract

Real potential of the solvation of ion is the negative value of ionic work function, and can be estimated by potentiometry of a voltaic cell, in which the two half cells are separated by an air gap. The Kenrick method with a mercury jet electrode has been used for this type of measurements and considered reliable. However, very few reports have appeared on the voltaic cell of this type, because of its relatively complicated experimental setup. In this study, we applied streaming carbon powder electrode, as a less toxic and inexpensive alternative to the mercury jet electrode. The real potential of chloride ion in water-methanol mixed solvent was measured.

Keyword : Work Fanction, Real Potential

Determination of Carbon Isotope Ratios in Honey by Isotope Ratio Mass Spectrometry (IRMS)

Nipon Saiwong
Department of Applied Radiation and Isotopes, Faculty of science, Kasetsart University, Bangkok, Thailand
nipon.saiw@ku.th

Ridthee Meesat*
Department of Applied Radiation and Isotopes, Faculty of science, Kasetsart University, Bangkok, Thailand
fscirim@ku.ac.th

Abstract

Honey is a nutritious natural product from honeybee collected nectar from various secretions of plant flowers and it is well-known for its health benefit potential since ancient times. According to Codex Alimentarius 2011 regulation, honey cannot be added other substances or additives. However, it has motivated fraudulent effort of honey adulation by direct or indirect adding with cheap sugar-syrups. The sophisticated detections of the honey adulation using modern analytical techniques are important. In this project, we focus on measurement of stable carbon isotope rations using elemental analysis isotope ratio mass spectrometry (EA IRMS). Plant sources used for honey adulation can be separated into C3 and C4 plans, based on their carbon metabolism. In general, the most of honey-contributing plants resulted from rice, wheat and all trees are C3 plants, meanwhile corn and sugarcane are C4 plants. The EA IRMS technique can be used to measure $^{13}C/^{12}C$ ratio ($\delta^{13}C$, ‰) which is used to classified honey adulation. In addition, the carbon ration from protein extraction of honey samples is performed to confirm the honey adulation. We have collected 13 wild and commercial honey samples. The results show that the $\delta^{13}C$, ‰ of the samples are in the range of $\delta^{13}C$, ‰ and protein from -18.37 to 26.53‰ and -20.99 to -27.79‰, respectively. Basically, based on Codex regulation, the carbon ratio cannot be less than -23. In this investigation, the honey adulation can be found eight samples.

Keywords: Honey adulteration, EA IRMS, Protein, Stable carbon Isotope ratios

Chirality Effects on an Electron Transport in Single-walled Carbon Nanotube Coupling to a Quantum Dot

Jakkapong Charoenpakdee
Department of Physics, Faculty of Science, Kasetsart University,
Bangkok, Thailand
jakkapong.cha@ku.th

Sutee Boonchui*
Department of Physics, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fscistb@email.com

Abstract

We investigate that effects of the asymmetric velocities of Dirac particles, calculated by inducing curvature-induced σ-π mixing and Slater-Koster type projection for π-π and σ-π hopping integrals, on the transmission and reflection of a single plasmon can be switched on or off by controlling the detuning and changing the interparticle distances between the quantum dot (QD). We also showed that the transmission spectra of an electron interacting with a two-level QD and a V-type three-level QD are quite the same as those with three two-level QDs when the spacing between the two-level QD and the Vtype three-level QD is equal to the spacing between twolevel QDs in the three two-level QD system.

Keywords Carbon nanotube, chirality, Slater-Koster type projection,
V-type three-level QD .

Detection of Dicentric Chromosomes from Blood Samples of Radiation Workers

Adinun Uma
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University,
Bangkok, Thailand
adinun.u@ku.th

Wanwisa Sudprasert*
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University,
Bangkok, Thailand
wanwisa.s@ku.ac.th

Abstract

Radiation is known to induce abnormalities in the nuclei of cells. A dicentric chromosome (DC) is an abnormal chromosome with two centromeres. The formation of DCs is a consequence of radiation exposure. Biological radiation dose can be estimated from DC frequencies in metaphase cells. In the present study DC analysis was used to evaluate the absorbed doses received in peripheral blood lymphocytes of subjects employed in Nuclear Medicine Department in hospitals. Blood samples from control and exposed individuals were cultured, fixed, and stained. Metaphase images from Giemsa-stained slides were captured using an automated microscopy system. The DCs were manually scored in accordance with the IAEA manual. A linear-quadratic calibration curve was generated based on DC frequencies in blood samples exposed to known physical doses. The results show that no dicentric chromosomes were observed in occupationally exposed radiation workers.

Keyword: Dicentric chromosome, metaphase, lymphocytes

Effects of Gamma Radiation on Chemical Compositions and Biomolecules of Mulberry Leaves

Amornrat Lakhan
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
amornrat.lak@ku.th

Wanwisa Sudprasert*
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
wanwisa.s@ku.ac.th

Abstract

Mulberry leaves (*Morus alba*) are the main source of food used for silkworm cultivation. The quality of mulberry leaves is an important factor for silkworm to produce silk with high quality. The leaves with suitable size and smooth skin are desirable for silkworms. The production of high nutrient artificial food which can be easily digested and absorbed by silkworms is an alternative for the sustainable sericulture. Gamma irradiation has been recognized as a reliable and safe method for improving the nutritional value in several feeds. This aim of this study was to evaluate the effects of gamma irradiation on chemical composition of mulberry leaves. Gamma irradiation was performed with a cobalt-60 source at doses of 20, 40, 60 and 80 kGy. The Fourier Transform Infrared (FTIR) spectrometer was used to scan the samples from 650 to 4000 cm^{-1}. Proximate analysis was done to determine the chemical compositions including crude protein, crude fiber, moisture and ash in irradiated mulberry leaves compared with non-irradiated samples. The results indicate that gamma irradiation of mulberry leaves was effective in decreasing fiber content, resulting in increasing digestibility. This study suggests that gamma irradiation can be used an alternative method to improve the quality of mulberry leaves for silkworm feeds.

Keywords: gamma radiation, chemical composition, biomolecules, mulberry leaves

Evaluation of acute gamma radiation on lipid peroxidation and chromosome aberration on garlic

Apissara Tastha
Department of Applied Radiation, Faculty of Science, Kasetsart University, Bangkok, Thailand
Apissara.t@ku.th

Katarut Chusreeaeom.
Department of Applied Radiation, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscikac@ku.ac.th

Abstract

The world has many various pollution and effect on environment because of various factor such as chemicals, toxic and also radiaonuclide. Radionuclide contamination of the environment can be caused by various factors such as nuclear waste disposal, nuclear power testing and nuclear accidents. Due to the chemical properties of cesium (Cs+) and potassium (K+) are similar, they can easily be taken up by plants then cause chromosome aberration. Many methods have invented to test effect of radiation. One of those methods is Allium test. The objective of this research were to study the effect of acute gamma radiation on chromosome aberration of garlic and examined the appropriate techniques on preparation root-tip for somatic chromosome investigation. The garlic root tips were exposed to gamma radiation using a Gamma MarkI at nuclear technology research center, Kasetsart University at the dose of 2,4,6,8 and 10 Gy(dose rate was 3.7371 Gy/min). The fixative duration conducted at 8 and 24 hours after irradiation. Chromosome aberration and mitotic index (MI) were evaluated by microscopic analyses. The MDA contents, product of lipid peroxidation, on galic leaves were also examined. The results showed that the most suitable fixative duration of the cell was 24 hours after irradiation. The chromosome aberration induced by gamma radiation found in this experiment were chromosome fragments, chromosome bridges and micronucleus. The total chromosome aberration were significantly different higher than control (non-irradiated) at the dose of 2,4 and 6 Gy . The MDA of garlic leaves were the highest at the dose of 10 Gy.

Keywords : Gamma radiation, Allium test, chromosome aberration

Morphological changes of the red blood cells treated with silicon (^{28}Si) ions in CBA/CaJ mice

Benjamint Sukeepean and Paiboon Reungpatthanaphong*
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
*For Correspondence: fscipbr@ku.ac.th

Abstract

Silicon (^{28}Si) ions are generally referred to as heavy and high energy (HZE) particles. Their impact to health could be significant because of high mass and linear energy transfer (LET) characteristics. When the red blood cell exposed to their ions , high risk cancer has been considered the dominant hazard from exposure to HZE particles. The purpose of this study was to determine the genetic alteration related to radiation exposure. Which ions focus on inducing damage in the body since such damage is highly relevant to the induction of genomic instability and an eventual neoplastic transformation of hematopoietic cells. The biological effects of 28Si ion with different energies using various biological endpoints such as cytogenetics in human fibroblasts .

The results from these *In vitro* studies clearly indicate that 28Si ions can be harmful to cells in culture even at low doses. Their ion suppressed the immune function of mice. Therefore, the CBA/CaJ mice was selected as an mice model because existing data indicate that it is radiosensitive and an appropriate mice strain for studying. In this study, male CAB/CaJ mice were irradiated with doses of 0, 0.1, 0.25, 0.5 Gy of 300 MeV/n ^{28}Si before analyzed morphological changes of the red blood cells using Atomic Force Microscope (AFM). The results of this study indicated that the higher dose (0.1, 0.25, 0.5 Gy of 300 MeV/n ^{28}Si 0.1, 0.25, 0.5 Gy of 300 MeV/n) of Silicon (^{28}Si) may cause the morphological changes in dose response relationship with the multiply damage at the surface of red blood cells.

In conclusion, Silicon (^{28}Si) exposure can induce morphological changes of red blood cells in dose dependent manner which may cause abnormal surface and shape of red blood cells.

Keywords : Silicon (^{28}Si) ions, Atomic force microscope, morphological changes, CBA/CaJ mice

Effect of Chronic Gamma Radiation on Chromosome Aberration in *Allium sativum* L.

Isika Kerdkeaw

Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand

b5810406424@ku.ac.th

Katarat Chusreeaeom*

Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand

fscikac@ku.ac.th

Abstract

Radionuclides are found throughout nature and it exists in soil and water. The radioactivity present on air or in the agricultural land may transfer to the crop grown on it. Garlic (*Allium sativum* L.) is a famous herb that is grown around the world. In Thailand, garlic is also one of the popular bulb crops used as spice and condiment in many dish. However, garlic can absorbed heavy metals and radioactive elements from area contaminated. The objective of this study was to observe the abnormalities of chromosomes of root tip cells of the garlic (2n = 16) after chronically exposure to gamma radiation. Garlic seedlings were continuously exposed to gamma radiation from a cobalt-60 source at the Nuclear Technology Research Center, Kasetsart University. They were placed 1.5 meters from the source at the doses of 0, 6, 12, 21, 27, 33, 39, 45, 51 และ 57 Gy (dose rate of 0.31 Gy/hr). Chromosome abnormalities and mitotic index (MI) were evaluated by microscopic analyses. Cells were fixed at 24 hours after exposure, chromosome abnormalities were observed in 0.17 , 3.67 , 17.17 , 18 , 12.67 , 28.5 , 6.5 , 7.5 , 11.5 and 3.33% of the cells of plants exposed to 0 , 6 , 12 , 21 , 27 , 33 , 39 , 45 , 51 and 57 Gy radiation, respectively. The most commonly observed chromosome abnormality was micronucleus at interphase, followed by fragments and bridges. As for the growth rate following chronic irradiation, record the height of gallic plants at the age of 10 days and 30 days.

Keywords: chronic irradiation, gamma ray, Allium test, chromosome abnormality

Effect of apigenin on gamma ray-induced morphological changes of the red blood cells in CBA/CaJ mice

Jidapa Hirunpan and Paiboon Reungpatthanaphong
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
For Correspondence: fscipbr@ku.ac.th

Abstract

Apigenin has been used as a protector or mitigator against oxidative damage and inflammation induced by toxic agents and radiation. The objective of this study was to investigate the effect of apigenin on Gamma ray-induced morphological changes of the red blood cells in CBA/CaJ mice.

Three hours after gamma irradiation, CBA/CaJ mice in treatment group were single intraperitoneally injected with apigenin at the doses of 0, 10, 20, and 40 mg/kg body weight, respectively. Blood sample were collected on Day-3 and Day-10 and then smeared on the slide for morphological changes analysis of the red blood cells using Atomic Force Microscope (AFM).

The results demonstrate that apigenin-treated groups showed to decrease the number of morphological changes of red blood cells after gamma ray irradiation in dose response relationship when compared to the control group. In conclusion, apigenin may decrease the number of gamma ray-induced morphological changes of red blood cells in dose dependent manner.

Keywords: Apigenin, Atomic Force Microscope, Gamma ray, Morphological changes, CBA/CaJ mice

Synthesis Bio-plastic mixed with Silver Nanoparticles to against Bacteria by Gamma Irradiation

Jirawan Prongsanthea
Department of Applied Radiation and Isotope, Faculty of Science,
Kasetsart University, Bangkok, Thailand
Jirawan.pst@ku.th

Ridthee Meesat*
Department of Applied Radiation and Isotope, Faculty of Science,
Kasetsart University, Bangkok, Thailand
fscirim@ku.ac.th

Abstract

Silver Nanoparticles (AgNPs) have recently attracted great attentions have many medical and industrial applications. The nanoparticles are usually synthesized by chemical and physical approaches. However, major disadvantages of both approaches are non eco-friendly and costly synthesis processes. The aim of this work was to synthesis of silver particles by gamma Co-60 irradiation using stabilizers polyvinyl alcohol (PVA) and study physico-chemical characterization was done by UV–visible, scanning electron microscopy (SEM), Uniaxial tensile tests following ASTM D882 and the antibacterial activities of bio-plastic mixed with nanosilver, which had been prepared with 4 different nanosilver concentrations (0, 20, 50, and 1000 ppm). Bio-plastic mixed with nanosilver were tested against opportunistic gram–negative and gram-positive bacterium, Staphylococcus aureus and Escherichia coli by AATCC 147 Antibacterial Parallel Streak Test Method. The results were shown that Bio-plastic mixed with nanosilver inhibited the growth of opportunistic bacteria shows that the higher nanosilver concentrations, the antibacterial activity higher become. Therefore, the improved efficiency of bio-plastic can be used as a coatings or packaging for the food industry.

Keywords: Silver Nanoparticles, Gamma irradiation, Antibacterial activity,Bio-plastics

Effect of Gamma Radiation on Nutrients of Edible Bird Nest

Kanokwan Chooprasit
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
kanokwan.choop@ku.th

Wanwisa Sudprasert*
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
wanwisa.s@ku.ac.th

Abstract

Edible bird nest (EBN) is widely consumed as a health food product due to its high beneficial effects to human beings. The raw edible bird nests are commonly contaminated with microorganisms, thus they should be subjected to sterilization process. Gamma irradiation is a process used to kill microorganisms on a variety of different products. This study was carried out to investigate the effect of gamma irradiation on amino acid profile and nutritional values of EBN. The EBN was ground, sieved and irradiated using Co-60 with doses of 0, 10, 15, 20, 25, 30 kGy. The compositional properties including protein, carbohydrates, fat, fiber and moisture were determined by proximate analysis. The functional groups of irradiated EBN samples were determined by Fourier Transform Infrared (FTIR) Spectroscopy. The results show that gamma irradiation at doses as high as 20 kGy, the minimum dose required for sterilization of EBN, did not give significant changes on nutritional quality and amino acid profile of EBN.

Keywords: gamma radiation, edible bird nest, nutrients

The Study of Lead and Cadmium Absorptions in Vetiver, Mini Pearl Moss and Coontail using The X-RAY fluorescence Analyzer.

Kwanjira Tanapakdee
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
Kwanjira.tan@ku.ac.th

Chanis Pornnumpa*
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
Fscicnp@ku.ac.th

Abstract

Lead and cadmium are widely used in industrial applications such as mining, metal industry, smelting, plastic industry, and battery factory. Both elements are able to contaminate in the nature from releasing industrial wastewater and entering water sources in residential areas. Lead and cadmium are toxic heavy metals that cause adverse health effects in humans and animals. Exposure to these toxins into the body may cause adverse effects on the various systems of the body as vomiting, nausea, abdominal pain, high blood pressure, including accumulation in the internal organs of the body. Wastewater that is contaminated with lead and cadmium can be treated in many ways to improve water quality. Phytoremediation is a one of natural methods that uses the ability of plants to treat inorganic and organic substances contaminated in soil, water and air to reduce toxicity that affects humans.

In this research, phytoremediation with three plants: vetiver grass (*Chrysopogon zizanioides*)**,** mini pearl moss (*Blepharostoma trichophyton*), **and coontail** (*Ceratophyllum demersum L.*) were used to adsorb lead and cadmium in the water. A comparative study of the heavy metal adsorption efficiency was carried out by planting three plants into the control pond and the contaminated lead and cadmium ponds, three plant types were collected every 1 week, 2 weeks, and 3 weeks to compare the analysis results by X-RAY fluorescence analyzer. The results obtained will be used to guide the selection of plants that are effective in treatment and absorb lead and cadmium contaminated water.

Keywords: Lead, Cadmium, Phytoremediation

Evaluation of DNA Damage Induced by Low-Dose Gamma Radiation in Human Blood Cells using DNA Comet Assay

Munchusa Samutphong
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University,
Bangkok, Thailand
munchusa.s@ku.th

Wanwisa Sudprasert*
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University,
Bangkok, Thailand
wanwisa.s@ku.ac.th

Abstract

Normally, human beings are constantly exposed to radiation from natural, such as UV rays from sunlight, radioactive or man-made sources. The people who work with radiation will receive higher amount of radiation than publics. The comet assay, also known as single-cell gel electrophoresis, can detect DNA damage and the repair kinetics at the level of a single cell. It has been widely used in radiation biology in recent years. The comet assay is a sensitive technique for *in vivo* human biomonitoring, especially in cases of incidental exposure to ionizing radiation. This study aimed to determine the relationship between DNA damage and the low absorbed doses in the range of 0-1 Gy. Whole blood samples from healthy donors were irradiated using a Co-60 source. The comet assay was conducted under alkaline conditions. For each dose, 50 cells were analyzed with an automatic digital analysis system, determining tail length, tail moment and Olive moment. The results show no correlation between the extent of DNA damage and the absorbed doses ranging from 0 to 1 Gy, thus the dose-response relationships could not be established due to the doses are too low. However, the increased comet parameters found in samples exposed to low dose as 0.25 Gy show significant levels of DNA damage compared to those observed in control samples. Our findings indicate that the comet assay is a rapid screening and sensitive technique to assess the DNA damage induced by low doses of ionizing radiation.

Keywords: comet assay, low-dose gamma radiation, DNA damage, human blood cells

Effects of Electron Beams on Nutrients and Elements of Edible Bird Nest Powder

Napassorn Pongsak
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
napassorn.po@ku.th

Wanwisa Sudprasert*
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
wanwisa.s@ku.ac.th

Abstract

Edible bird nests (EBNs) are produced from swiftlet saliva (edible-nest swiftlet). They are commonly consumed as a health supplement because they contain rich sources of nutritional components. The raw edible bird nests are contaminated with pathogens and microorganisms, therefore sterilization is needed. Electron beam (E-beam) irradiation is a process that can effectively sterile a variety of edible products. This study aimed to explore the effect of E-beam irradiation on amino acid profile and nutritional values of EBNs. The EBNs were ground, sieved and irradiated at doses of 0.0, 10.0, 15.0, 20.0, 25.0 and 30.0 kGy using 10 MeV E-beam. Proximate analysis was conducted to determine the compositional properties including protein, carbohydrates, fat, fibre and moisture. The Fourier Transform Infrared (FTIR) Spectroscopy was used to determine the functional groups of essential components in irradiated EBN samples. The results indicate that E-beam irradiation did not significantly affect amino acid profile and nutritional quality of EBNs.

Keywords: edible bird nest, electron beam irradiation, nutrients, elements

Evaluation of Gamma radiation dose for *in vitro* induced mutation of *Cordyline fruticosa* L.

Nualnapa Yidnoradin
Department of Applied radiation and isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
Nualnapa.y@ku.ac.th

Katarut Chusreeaeom*
Department of Applied Radiation, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscikac@ku.ac.th

Abstract

dose of gamma radiation that is suitable for *in vitro* induced mutation of cordyline. Plantlets of cordyline cultured on MS medium were exposed to acute irradiation from Cs-137 at the doses of 0, 10, 20, 30, 40, 50 and 60 Gy. For chronic irradiation with a Co-60 source, cordyline were exposed to 0, 27, 51and 78 Gy. After irradiation, plantlets were transferred to the fresh media (MS) supplemented with BA 0.5 mg/l. The number of survival plantlets and plant growth in M_1V_1 generation were recorded. The results showed that percentage of survival plantlets and growth of cordyline were decreased when the radiation dose increased. At 60 days after irradiation, the $GR_{50(60)}$ values to acute irradiation was estimated to 30 Gy. Whereas, the $LD_{50(60)}$ values was estimated to 50 Gy. It was not possible to calculate the $LD_{50(60)}$ and $GR_{50(60)}$ after chronic irradiation and subsequent to noticed that low-dose rate unaffected plant survival along with stimulated growth. Some abnormalities observed in the M_1V_2 and M_1V_3 generation of the irradiated plantlets were variegated leaf and changed in leaf color. The chlorophyll contents after gamma exposure were also observed.

Keywords: gamma radiation, *Cordyline fruticosa L.*, tissue culture, chlorophyll content

Antioxidant Activity and Radioprotective Effect of Mulberry Leaves on Human Lymphocytes

Nuntakan Saikaeokoet and Paiboon Reungpatthanaphong*
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
*For Correspondence: fscipbr@ku.ac.th

Abstract

Mulberry leaves (*Morus alba* L.) are widely used in traditional herbal tea which based on their antioxidant property. This study aimed to determine antioxidant activity and radioprotective effect of mulberry leaves on human lymphocytes. Water extracted of mulberry leaves at various time (2, 30, and 60 minutes) at 100°C was determined antioxidant activity by using DPPH, ABTS and FRAP assay. The results demonstrate that the water extracted of mulberry leaves for 30 minutes showed the highest antioxidant activity in DPPH and ABTS assay (EC_{50} value of 87.98±1.02 µg /mL and 11.612±0.17 µg/mL, respectively) when compared to water extracted for 2 minutes (EC_{50} value of 98.39±2.20 µg /mL and 16.25±0.14 µg/mL, respectively) and water extracted for 60 minutes (EC_{50} value of 88.58±4.93 µg /mL and 12.40±0.17 µg/mL, respectively).Therefore the water extracted of mulberry leaves for 30 minutes showed the highest antioxidant activity. In conclusion, mulberry leaves exhibited their antioxidant activity and radioprotective potential on human lymphocytes through decreasing the number of dicentric chromosome.

Keywords: antioxidant activity, mulberry leaves, radioprotective, dicentric chromosome

Effect of Gamma Radiation on Antioxidant Properties and Bacterial Inhibition of Sericin from extracted Cocoon

Orawan Kiewglom
Department of Applied Radiation and Isotope, Faculty of Science,
Kasetsart University, Bangkok, Thailand
orawan.kie@ku.th

Ridthee Meesat*
Department of Applied Radiation and Isotope, Faculty of Science,
Kasetsart University, Bangkok, Thailand
fscirim@ku.ac.th

Abstract

Silk is a natural fiber produced from Bombyx mori silkworm. Sericin ($C_{15}H_{23}N_5O_8$) or a silk protein are about 20-30% of cocoons. The natural protein from silk fiber can be food, medical and cosmetic industry because its properties such as antioxidant, anti-inflammatory, inhibiting bacteria and removes skin cells. One of the most application of nuclear technology is irradiation for preservation of food products. In this project, the main objective is to study effects of gamma radiation on gram-positive and gram-negative bacterial inhibition and antioxidant properties of sericin. The protein powder samples were irradiated by a ^{137}Cs gamma irradiator with dose rate 4.0 ± 0.2 Gy/min at a dose of 0, 10, 20, 25, 30 kGy. The dose rate was measured by Fricke dosimeter. Staphylococcus aureus, Escherichia coli and Bacillus cereus were used to evaluate antibacterial activity of the extracted protein. The irradiated serisin samples were screened by agar-well diffusion method. The results shown that at 200 mg/ml of serisin samples could not inhibit gram-positive and gram-negative bacteria. DPPH radical scavenging assay and quantitative favoniod compounds were used to test antioxidant activities of irradiated serisin samples. It was found that the antioxidant activity and flavonoid compound tend to increase according to the amount of radiation dose exposure.

Keywords: Sericin, Gamma Radiation, Bacteria, Antioxidant, Flavonoid compound

Effect of Gamma radiation and NaCl Elicitors on Biochemical Components of Butterhead Lettuce under hydroponic

Panitharn Ditiphaeng
Department of Applied Radiation, Faculty of Science, Kasetsart University, Bangkok, Thailand
Panitharn.d@ku.ac.th

Katarut Chusreeaeom.
Department of Applied Radiation, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscikac@ku.ac.th

Abstract

Elicitor is the one of the stress agent that enhances the production on the content of some biochemical in plant cell. The objective of this study was to determine the effects of two elicitors, gamma radiation and NaCl, on some biochemical components of butterhead lettuce (*Lactuca sativa* L.). The experiment was conducted under hydroponic system with treatments including gamma irradiation to dry seeds at the dose of 50 Gy, 100 Gy, 150 Gy, 100 mM of NaCl, 300 mM of NaCl, 50 Gy+100 mM of NaCl, 50 Gy+300 mM of NaCl, 100 Gy+100 mM of NaCl and 100 Gy+300 mM of NaCl. Relative water content (RWC), chlorophyll contents, total soluble solid (%brix) and Total phenolic compound (TPC) were recorded. The result showed that relative water content of the treatments received NaCl decreased due to salinity stress whereas the treatment received 50 Gy gamma radiation were significantly increased compared to control. Both elicitor effected to chlorophyll contents and total soluble solid showed significantly decreased compared to control. Total phenolic compound are under investigation.

Keywords : Butterhead Lettuce, physical elicitor, hydroponic, biochemical components

The measurement of indoor radon-thoron concentrations and effective dose assessment around residential areas in Phang Nga province.

Patipan Wamamad
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
patipan.wa@ku.th

Chanis Pornnumpa*
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscicnp@ku.ac.th

Abstract

Radon and thoron are naturally occurring radioactive gases from the decay of uranium and thorium series. Normally, uranium and thorium can be found in soil, rocks, minerals on the earth's crust, including building materials that use these materials for constructions. People living in places where radon and thoron accumulations have opportunity to receive radioactive gases from inhalation and affect health. Alpha particles emitted from radioactive gases are able to interact with the lung surface and the bronchi in the respiratory system, which may lead to lung cancer. In this research, residential areas in Phang Nga province were selected for study because it was found that Phang Nga is one of the high radiation background areas in Thailand. The solid-state alpha track detectors with high-low air exchange chambers were used to monitor indoor radon-thoron concentrations in volunteer houses. The concentration values obtained in this research could be used to calculate the annual effective dose for population in Phang Nga areas

Keywords: Enviromental Radiation, Radon, Thoron, indoor radon-thoron

Effects of Gamma Irradiation on Antioxidant Activity of *Tiliacora triandra* Leaf Extract

Paweenuch Sirisutthidecha
Department of Applied Radiation and Isotope, Faculty of Science, Kasetsart University, Bangkok, Thailand
paweenuch.sir@ku.th

Ridthee Meesat*
Department of Applied Radiation and Isotope, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscirim@ku.ac.th

Abstract

Tiliacora triandra (Yanang) has been used extensively as an ingredient in traditional Thai cuisine and medicine. It has been proved that composes of a lot of active compounds. In general, gamma irradiation can be used to improve the safety and extends the shelf life of foods and herbs by reducing or eliminating microorganisms and insects. Therefore, the purpose of this research is to study of effects of gamma irradiation on antioxidant activity of *Tiliacora triandra* leaf extract. The *T. triandra* powder were irradiated by gamma radiation at the dose 0, 5, 10, 20 and 25 kGy by a Gammator with Cesium-137 source, packed in polyethylene container and maintained at 4 °C. Irradiated leaf powder samples were extracted with ethanol. The extracted solutions were used to test antioxidant activity by 2,2diphenyl-1-picrylhydrazy (DPPH) assay and lipid peroxidation inhibition method. The results shown that gamma irradiation at 5, 10, 20 and 25 kGy were not significantly effect on antioxidant activity and lipid peroxidation inhibition of *T. triandra* leaf extraction.

Keywords: Antioxidant activity, Gamma irradiation, *Tiliacora triandra*

Generation of Dose–Response Curve for Dicentric Chromosomes Generated by Manual Scoring

Peerawan Sangondee
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
peerawan.s@ku.th

Wanwisa Sudprasert*
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
wanwisa.s@ku.ac.th

Abstract

Dicentric chromosome assay (DCA) is a method used for radiation biodosimetry. This method is based on determination of dicentrics, a type of chromosomal abnormalities, in blood samples after exposed to radiation. The number of chromosome aberrations are directly related to the absorbed doses received by blood samples. The DCA method is accepted internationally as a "Gold standard" in radiation biodosimetry since dicentric chromosomes are specific to radiation exposure and has a low background value. The main objective of this research is to create a dose-response curve of dicentric chromosomes in human lymphocytes exposed to gamma radiation with the doses ranging from 0 to 5 Gy. Whole blood was drawn from a volunteer and then exposed to gamma radiation from Co-60 (dose rate = 0.57 Gy / min) with the doses of 1, 2, 3, 4 and 5 Gy. The peripheral blood lymphocyte samples were cultured, fixed and stained. The metaphase images were captured on Metafer 4 system and dicentric chromosomes were counted at least 100 dicentrics or 1000 metaphases. The data obtained were plotted using the CABAS program (Chromosomal ABerration cAlculation Software). The established dose-response curve was compared with the data obtained from the NIRP (National Institute for Radiological Protection, China CDC). The results indicated that the generated dose-response curve was effective in estimation of the absorbed doses in blind samples, comparing with data obtained from the NIRP.

Keywords: Dicentric chromosomes, dose-response curve, radiation biodosimetry

Influence of NaCl Salinity and Low-dose Gamma Radiation on growth induction of Butterhead Lettuce

Phetcharin Yimjiam
Department of Applied Radiation and Isotope, Faculty of Science, Kasetsart University, Bangkok Thailand
phetcharin.y@ku.th

Katarat Chusreeaeom
Department of Applied Radiation and Isotope, Faculty of Science, Kasetsart University, Bangkok Thailand
fscikac@ku.ac.th

Abstract

Butterhead Lettuce (*Lactuca sativa* L.), a typical salad vegetable, is the most popular for diet propose as it provides high nutrition, little starch or sugar and low energy value. This research project aims to study the effect of gamma radiation exposure and Sodium Chloride on growth induction of butterhead lettuce grown under hydroponic system. The use of gamma radiation and NaCl Salinity being as elicitor, the stress of the plant were conducted with treatments including gamma irradiation to dry seeds at the dose of 50 Gy, 100 Gy, 150 Gy, 100 mM of NaCl, 300 mM of NaCl, 50 Gy+100 mM of NaCl, 50 Gy+300 mM of NaCl, 100 Gy+100 mM of NaCl and 100 Gy+300 mM of NaCl. Leaves number, plant height, dimension of canopy, shoot and root fresh weight, shoot and root dry weight and fiber. The results showed that leaves number, shoot dry weight and root dry weight of the treatment treated with 50 Gy gamma radiation were not significant different compared to control while other treatments were decreased. The dimension of canopy, shoot fresh weight, root dry weigh and fiber of the treatment treated with 50 Gy gamma radiation were significantly higher than control, treatment that treated with 100 mM NaCl showed not significant different whereas other treatment were decrease.

Keyword: Gamma radiation, NaCl salinity, Butterhead Lettuce, growth induction

X-ray Dosimetry for Diagnostic Radiation using Fricke gel dosimeter

Pimchanok Wilasri
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
Pimchanok.wi@ku.th

Ridthee Meesat
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscirim@ku.ac.th

Abstract

Radiation measurements are extremely important for people who work with radiation, such as medical radiation workers, patients, industrial radiation workers, etc. There are many ways to measure the radiation dose. This research focus on the study of radiation dosimetry with Fricke gel dosimeter because it exhibits cheap, easy preparation, excellent water and tissue equivalence for dosimetry. Radiation dose can be measured from Ferric ion (Fe^{3+}) due to oxidation of Ferrous (Fe^{2+}) caused by radiolytic species from irradiation to ammonium ferrous sulfate solution, in which the Fe^{3+} ion concentration is linearly related to the radiation absorbed dose. The most used Fricke Gel or Fricke Xylenol Gel (FXG), which consists of adding porcine skin gelatin and xylenol orange dye (XO) to the original solution. However, the FXG can be performed quite high radiation dose (4-400 Gy). In general, X-ray screening to diagnose patients, use of low dose (80-150 keV for X-ray diagnostic energy range), the FXG can measure the minimum dose of 2 Gy. Therefore, the use of substances that increase the sensitivity of FXG is required, the benzoic acid and sorbitol acts as sensitizer for the oxidation, the composition of the dosimetric solution used 0.2 mM Ammonium ferrous sulfate, 50 mM sulfuric acid, 0.5 mM xylenol orange, 7% gelatin, 0.2 sorbitol, and 0.2 benzoic acid. In this experiment, the best sensitizer between sorbitol and benzoic acid was used to compare the amount of X-ray in each energy.

Determination of Dicentric Chromosomes in Human Lymphocytes Induced by Gamma Irradiation

Punika Piyaphanukayn
Department of Applied Radiation and Isotope, Faculty of Science, Kasetsart University, Bangkok, Thailand
punika.pi@ku.th

Wanwisa Sudprasert*
Department of Applied Radiation and Isotope, Faculty of Science, Kasetsart University, Bangkok, Thailand
wanwisa.s@ku.ac.th

Abstract

Dicentric assay is a method used in radiation biodosimetry that can help to assess the radiation absorbed dose in people who exposed to radiation from occupation, nuclear accidents and living near high level radiation facilities. In this study, dicentric chromosomes in human lymphocytes induced by gamma irradiation were determined. Blood samples were exposed to a Co-60 gamma source at the dose rate of 0.57 Gy/min for the low dose of 0, 0.10, 0.25, 0.50, 0.75 and 1.0 Gy, after that the irradiated blood samples were cultured. Dicentric chromosomes were analyzed and then a dose-response curve between the frequency of dicentrics and the absorbed doses were established. The result show that constructed dose-response curve can be used to determine the absorbed dose in blood samples exposed to unknown doses of gamma radiation.

Keywords: Low-dose gamma rays, dicentric, radiation biodosimetry

Antioxidant Activity and Radioprotective Effect of Mushroom on Human Lymphocytes

Raphiphan Chutimun and Paiboon Reungpatthanaphong*
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
*For Correspondence: fscipbr@ku.ac.th

Abstract

Mushrooms have several health benefits because they contain more nutritional value which are high content of fiber and protein but low in calories. The objectives of this study were to investigate antioxidant activity and radioprotective effect of ethanolic extraction of three mushrooms including *Ganoderma lucidum*, *Agaricus subrufescens Peck* and *Tremella Fuciformis Berk.* They were determined antioxidant activity by using DPPH, ABTS and FRAP assay. The results demonstrated that the ethanolic extracted of *Ganoderma lucidum* showed the highest antioxidant activities in DPPH and ABTS assay (EC_{50} value of 348.84± 16.29 µg /mL and 271.53± 15.16 µg/mL, respectively) when compared to *Agaricus subrufescens Peck* (EC_{50} value of 610.12 ± 104.02 µg /mL and 376.21 ± 15.19 µg/mL, respectively) and *Tremella Fuciformis Berk* (EC_{50} value of 1943.09 ± 169.89 µg /mL and 1298.48 ± 53.25µg/mL, respectively). Moreover, FRAP value of ethanolic extracted of three mushrooms showed 322.50±7.58 µM, 51.50±5.56 µM and 40.86±3.64 µM, respectively. The radioprotective effects of all ethanolic extracted on human lymphocytes were determined by using Dicentric chromosome assay. In conclusion, all ethanolic extracted mushrooms could exert antioxidant activity and radioprotective potential on human lymphocytes through decreasing the number of dicentric chromosome.

Keywords: *Ganoderma lucidum*, *Agaricus subrufescens Peck*, *Tremella Fuciformis Berk*, Mushrooms, Antioxidant, Radioprotective

Antioxidant activity and Radioprotective effect of Tamarind seed on Human Lymphocytes

Sitanun Tomyim and Paiboon Reungpatthanaphong*
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
*For Correspondence: fscipbr@ku.ac.th

Abstract

This study aims to investigate antioxidant activity and radioprotective effect of Tamarind seed on human lymphocytes. Ethanolic extracted Tamarind seeds was determined antioxidant activity by using DPPH, ABTS and FRAP assay. The results demonstrated that the ethanolic extracted of Tamarind seed showed antioxidant activities in DPPH and ABTS assay (EC_{50} value of 4.85 ± 0.02 µg /mL and 5.82 ± 0.03 µg/mL, respectively). Moreover, the FRAP value exhibited 2317.29±0.04 µM/mg. The radioprotective effect was determined on human lymphocytes using dicentric chromosome assay. Whole blood was irradiated by *Cobalt-60* (^{60}Co, 2 Gy) after treated with the ethanolic extracted of Tamarind seed at the doses of 0,25,50 and 100 µg/ml, respectively. The results demonstrate that the ethanolic extracted of Tamarind seed at a dose of 100 µg/ml showed the lowest the number of dicentric chromosome when compared the other doses. In conclusion, Tamarind seeds could exert both of antioxidant activity and radioprotective effect which it showed to decrease the number of dicentric chromosome-induced by ^{60}Co irradiation.

Keywords: Tamarind seed, antioxidant activity, radioprotective effect, dicentric chromosome

Study of gamma irradiation effects on antioxidant activities of Thai holy basil (*Ocimum tenuiflorum*) leaves extract

Sutita Rodpinthong
Department of Applied Radiation, Faculty of Science, Kasetsart University, Bangkok, Thailand
Sutita.r@ku.th

Ridthee Meesat*
Department of Applied Radiation, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscirim@ku.ac.th

Abstract

Ocimum tenuiflorum or Thai holy basil have been used as a traditional ingredient in Thai cuisine and as a medicinal herb because of its aromatic and health benefit properties. In general, radiation is used to eliminate the risk of food-borne illnesses, prevent or slow down spoilage, arrest maturation or sprouting and as a treatment against pests. ^{60}Co and ^{137}Cs are common radioactive sources for gamma irradiation. In this project, the main objective is to study effects of gamma irradiation on antioxidant activities of extracted Thai holy basil leaves. The *O. tenuiflorum* leaf powder samples were irradiated at the absorbed dose of 0 5 10 20 and 25 kGy by a ^{137}Cs irradiator with dose rate 4.0 ± 0.2 Gy/min. The dose rate was measured by Fricke dosimeter. The irradiated samples were extracted by absolute ethanol solvent. DPPH radical scavenging assay and lipid peroxidation examination were used to evaluate antioxidant activities of the extracted herb. It shown that the antioxidant activities increase as a function of radiation dose. The results can confirm the radiation can increase active compounds in the irradiated herb samples.

Keyword: Basil, *Osimum basilicum*, Free radical, Antioxidant activity

In vitro Selection of Drought Tolerance Rice (*Oryza sativa* cv. RD43) through PEG and Gamma ray Induced mutation

Thanaporn Rodthaing
Department of Applied Radiation and Isotope, Faculty of Science, Kasetsart University, Bangkok Thailand
Thanaporn.ro@ku.th

Katarat Chusreeaeom
Department of Applied Radiation and Isotope, Faculty of Science, Kasetsart University, Bangkok Thailand
fscikac@ku.ac.th

Abstract

A drough-tolerant genotypes should be improved for the stability of food security owing to the climate change and global warming. The objective of this research project are to develop the potential drought tolerance rice (*Oryza sativa* cv. RD43) and to study the appropriate dose of gamma radiation to induce mutation in rice. Seeds of non-glutinous rice RD43 were surface sterilized and cultured on MS medium supplemented with benzyladenine (BA) growth regulators at a concentration of 6, 12 and 24 mg/l for inducing multiple shoot. Then, after 30 days, plantlet were subcultures to the MS media for irradiation manner. Samples were exposed to acute gamma radiation at Nuclear Technology Research Center, Kasetsart University at doses of 0, 15, 30, 45, and 60 Gy (dose rate of 3.74 Gy/min). After irradiation, subcultures were grown on new MS medium; the number of new tillers on surviving plantlets were counted at 30 days after transplant. The determination for drought tolerance hand on M_1V_3 generation through MS medium containing 0%, 10% and 15% polyethylene glycol (PEG-6000).

The results showed that the optimal concentration of BA for multiple shoots induction of RD43 was 24 mg/l. The number of new tillers decreased when the gamma doses increased. The median growth reduction was calculated to 111.3 Gy. Seventy-three percentage of plantlets treated with 15%PEG were proliferate at 16 days whereas 72% of plantlets treated with 10%PEG were proliferate at 16 days and decreased afterword.

Keyword: Gamma ray, drought tolerance, *in vitro* seletion, mutation

Antioxidant Activity and Radioprotective Effect of *Thunbergia laurifolia* Lindl. on Human Lymphocytes

Tissanamadee Charoensuk and Paiboon Reungpatthanaphong*
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
*For Correspondence: fscipbr@ku.ac.th

Abstract

Thunbergia laurifolia Lindl. called “Rang Jeud” in Thai, is a herbal medicine, containing many pharmacology activities which has been used for herbal beverage as their health promoting property. This study aimed to determine antioxidant activity and radioprotective effect of *T. laurifolia* Lindl. on human lymphocytes. Water extracted of *T. laurifolia* Lindl. at various time (2, 30, and 60 minutes) at 100 ºC was determined antioxidant activity by using DPPH, ABTS and FRAP assay. The results demonstrate that the water extracted of *T. laurifolia* Lindl. for 30 minutes showed the highest antioxidant activities in DPPH and ABTS assay (EC_{50} value of 159.38 ± 21.52 µg /mL and 191.19 ± 3.88 µg/mL, respectively) when compared to water extracted for 2 minutes (EC_{50} value of 384.82 ± 3.67 µg /mL and 450.96 ± 9.14 µg/mL, respectively) and water extracted for 60 minutes (EC_{50} value of 216.17 ± 21.68 µg /mL and 233.52 ± 9.13 µg/mL, respectively). Moreover, FRAP value of water extracted of of *T. laurifolia* Lindl. for 2, 30, and 60 minutes exhibited 84.93 ± 0.01 µM/mg, 404.71 ± 0.02 µM/mg and 309.25 ± 0.02 µM/mg, respectively. The radioprotective effect of *T. laurifolia* Lindl. on human lymphocytes were determined by dicentric chromosome assay. *T. laurifolia* at the concentration of 100 µg/ml has been shown to decrease the number of dicentric chromosome which exhibited radioprotective effect on human lymphocytes. In conclusion, *T. laurifolia* may exert antioxidant activity and radioprotective potential on human lymphocytes through decreasing the number of dicentric chromosome.

Keywords: *Thunbergia laurifolia* Lindl., antioxidant activity, radioprotective effect, dicentric chromosome

Determination correction factors for the free-air ionization chamber for low energy x-rays by an experimental method

Udomsap Chanthason
Department of Applied Radiation and Isotopes, Faculty of Science,
Kasetsart University, Bangkok, Thailand
udomsap.ch@ku.th

Ridthee Meesat
Department of Applied Radiation and Isotopes, Faculty of Science,
Kasetsart University, Bangkok, Thailand
ridthee.m@ku.ac.th

Abstract

Free-air ionization chamber standards for the determination of air kerma are important for low-energy x-ray sources. The project focus on development of the air kerma measurement of a X-ray standard source of the secondary standard laboratory of Office of Atoms for Peace (OAP). It is very important to evaluate the correction factors in order to be used for the standard calibration. The correction factors are composed of the polarity effect, wall transmission effect, and ion recombination, during low energy X-ray exposure at 23 kV, 28 kV and 30 kV using a standard characteristic X-ray source, according to reference standards International Bureau of Weights and Measures (BIPM). The results were compared with calculation data. In this project, the correction factors for the polarity effect, wall transmission effect, and Ion recombination were 1.0020, 0.9999 and 1.004, respectively, meanwhile the reference results from BIPM were 1.0005, 1.0000, and1.0006, respectively. The uncertainty of the experiment was not more than 0.0005 at a 95% confidence, at temperature 18-22 ^{o}C, atmospheric pressure 99 - 102 kPa and humidity ~ 65%.

Keywords: free-air ionization chamber, polarity effect, Wall transmission effect, Ion recombination effect

Detection of Gamma-Irradiation Induced DNA Damage in Human Blood Cells using Comet Assay

Wannasit Thanawan
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
wannasit.t@ku.th

Wanwisa Sudprasert*
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
wanwisa.s@ku.ac.th

Abstract

Comet assay is a technique used for detecting DNA damage of individual eukaryotic cell. In this study, the quantitative comet assay was used to investigate the DNA damage in human blood cells irradiated with gamma ray at doses of 0-5 Gy. The study revealed the significant increase in DNA damage at all doses over the control. However, we did not find a clear correlation between the extent of DNA damage and the absorbed doses ranging from 1 to 5 Gy, causing the difficulty of establishing dose-response relationships for the dose studied. This might be due to the repair effect occurred since the comet assay was conducted at 24 hours after irradiation. The increased comet values found in exposed samples in the present study indicate highly significant levels of radiation-induced DNA damage compared with controls. Our results indicate that the alkaline Comet assay might be a useful additional complement to standard biodosimetric methods as it can be used to differentiate between the exposed and control groups.

Keywords: gamma-irradiation, Comet assay, DNA damage, biodosimetry

Effects of Electron Beam Irradiation on Chemical Compositions and Biomolecules of Mulberry Leaves

Waralee Thepsiri
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
Waralee.the@ku.th

Wanwisa Sudprasert*
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
Wanwisa.s@ku.ac.th

Abstract

Mulberry (Morus alba) is a well-known Thai economic plant. It can be grown in all weather conditions. However, some seasons may affect the production of mulberry leaves, resulting in low yield and not enough for feeding of silkworms. The other restriction is the low quality of mulberry leaves and the silkworms do not like to eat. Therefore, the production of artificial diet for replacement of fresh leaves is needed in order to be able to feed silkworms throughout the year. The purpose of this study was to investigate the effect of the electron beam on the chemical compositions and biomolecules of mulberry leaves. Mulberry leaves var. Burirum 60 were irradiated with electron beam at the doses of 0, 10, 15, 20, 30 kGy. Structural analysis was carried out by Fourier transform infrared spectroscopy (FT-IR). Proximate analysis was done to determine the chemical properties including moisture, ash, crude lipid, crude protein and crude fiber. The results show that electron beam irradiation caused a little changes in chemical properties and structures in mulberry leaves. Therefore, electron beam irradiation may be used as an alternative method for improving quality of mulberry leaves for silkworm feeding. This finding provides basic information for future production of artificial diet for silkworms.

Keywords: electron beam, irradiation, chemical compositions, biomolecules, mulberry leaves

Increasing Value of Agricultural Waste for Skin Care Ingredient

Chonnikan Sirithanachote
Department of Biochemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
chonnikan.si@ku.th

Sasimanas Unajak*
Department of Bipchemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
sasimanas.u@ku.th

Abstract

Waste products from food industrial is becoming a valuable ingredient for any purpose for example in cosmetics industry. Thailand, world food producing country, produces, processes and exports several agricultural products oversea. Therefore, fish skin from fisheries product processing plant and mushroom stalks were used as raw materials to isolate important ingredients. Then, this research aimed to extract collagen from skin of Asian seabass (*Lates calcarifer*), tilapia (*Oreochromis niloticus*) and catfish (*Plotosus canius*) to compare their yield and biological activity of a skin's collagen from those fish species. Maximum absorptions of extracted collagens were observed at 199 nm. All ASC extracted were enhance their solubility at acidic pH range (1−4) and basic pH range (10 – 12), however, they lost their solubilities in the pH range of 6-8 and the NaCl concentration above 2% (w/v). Purified collagens from those fish demonstrated the same pattern of protein on 10% SDS-PAGE with approximately 116 kDa (α1 and α2), 200 kDa (β), and larger than 200 kDa (γ). Alternatively, pepsin-soluble collagen (PSC) was prepared by treated with 0.1% (w/v) pepsin for 48 h. Properties of PSC were determined as similar as ASC. Protein profile of PSC showed similar pattern with ASC but smaller protein bands with approximately 70 – 80 kDa were detected. These results demonstrated that pepsin could partially digest collagen from fish skin. Both ASC and PSC will use as a raw material for different purposes rather than ingredient in cosmetics such as supporting materials for bone.

Active ingredients from Jew's ear or (black) wood ear (*Auricularia auricular-judae*) were extracted with 50% ethanolic extracted at 50 ° C for 3 hours. The extracts were tested for anti-collagenase and elastase activities and showed the inhibition activity of collagenase (55.35 %) and elastase (49.35%) with direct proportion to the increasing in concentrations of mushroom extract. Meanwhile, with the same concentration of epigallocatechin gallate (EGCG)(positive control) demonstrated lower inhibition activity of collagenase and elastase with 32.18% and 15.14%, respectively. These results enlighten on the utilization of waste products from the food processing industry for future application.

Keywords: fish skin, collagen, mushroom, anti-collagenase and elastase activities

Effects of zinc oxide nanoparticles on expression of zinc transporter genes in bacteria

Jarukan Jakor
Department of Biochemistry, Faculty of Science, Kasetsart University,
Bangkok, Thailand
Jarukan.j@ku.th

Nattanan T-Theinprasert*
Department of Biochemistry, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fscinnp@ku.ac.th

Abstract

Zinc oxide nanoparticles (ZnO NPs) possess unique semiconducting and optical properties that are used for a wide variety of application. ZnO NPs are biodegradability with low toxicity. However, transportation of ZnO NPs within cells has been unclear. Therefore, the objective of this study was to study the effects of ZnO NPs on expression of zinc transfer genes in *Bacillus subtilis* (YtgA) using qPCR. By performing multiple sequence alignment, zinc transporter genes are strongly conserved within a group of bacteria, yeasts, plants and animals. However, they are weakly conserved across the group. The study successfully designed primers based on the sequence conservation. This work is now under going for optimization of bacterial RNA extraction using TriZol.

Keywords: Zinc oxide nanoparticles, zinc transporter, *Bacillus subtilis*, TriZol

Analysis of phosphoproteins in response to hydrophobic substrate in *Yarrowia lipolytica*

Jutamas Jaewjanthuk
Department of Biochemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
jutams.jae@ku.ac.th

Napapol Poopanitpan
Department of Biochemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscinpp@ku.ac.th

Abstract

Yarrowia lipolytica has various capabilities of metabolizing carbon sources for example sugar, glycerol, lipid, and *n*-alkane. Moreover, the yeast has high accumulation of lipids in cells. An ability of growth in lipids and alkane was also found. From previous studies, *YlSNF1*, an ortholog gene of *ScSNF1* encoding serine-threonine protein kinase in *Saccharomyces cerevisiae*, was known as a regulator of lipid accumulation in *Y. lipolytica*. Furthermore, the deletion mutant of *YlSNF1* (Δ*snf1*::ADE1) showed a complete loss in growth on *n*-alkane. So, to elucidate the regulation of alkane utilization by YlSnf1p, this study was focused on a comparative analysis of phosphoproteins in wild-type and Δ*snf1*::ADE1 strain. Two yeast strains were cultured to reach appropriate growth rates. Then, yeast cells was shifted to media containing in each carbon source (glucose, glycerol, oleic acid, and decane) and incubated at 30 °C for 3 and 16 hours. After incubation, cells was harvested and lysed by glass bead shocker. Protein concentration of crude extracts was quantified by BCA assay. First, total proteins in each condition were analyzed by SDS-PAGE technique. The result showed that protein patterns of wild-type and Δ*snf1*::ADE1 cells shifted to oleic acid and *n*-decane are slightly different from that in glycerol and glucose at 3 and 16 hrs. Second, Large scale purification of phosphoprotein will be performed by Pierce® phosphoprotein enrichment kit. Then, purified phosphoprotein will further be analyzed by SDS-PAGE technique and stained by specific dye.

Keywords: Phosphoprotein, Hydrophobic substrate, Oleaginous yeast

Development of an efficient method of purifying DNA using silica matrix for application in biotechnology

Kotchakorn Posuwan
Department of Biochemistry, Faculty of Science, Kasetsart University,
Bangkok, Thailand
b5710403890@ku.ac.th

Somchai Pornbanlualarp
Department of Biochemistry, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fsciscpl@ku.ac.th

Abstract

The DNA marker is a short DNA fragments with definite sizes widely used to identify the approximate size of interested DNA molecules in agarose gel electrophoresis. This special project is aimed to *in vitro* and *in vivo* synthesized the DNA marker with defined size. *In vitro* syntheses of 500, 1000, 15000, 2000 and 2500 bp DNAs are accomplished by PCR, using *Taq* DNA polymerase, plasmid with known sequence as template and a set of design primers. In vivo syntheses of DNA with defined size (i.e., 3000 and 4000 bp) are accomplished by using engineered plasmid and replicate the plasmid in the E. coli host, using E. coli DNA polymerase. To maximize high yield of DNA in purification, the high copy number plasmid pUC118 is selected. This plasmid is reported to exist in *E. coli* host at ~700 copies/cell. To construct a pUC3K, a plasmid with exactly 3000 bp, pUC118 was digested with *Hind*III and *Ehe*I, followed by blunt ending with T_4 DNA polymerase and circlization with T4 DNA ligase. The pUC3K obtained were subsequently used to generate pUC4K and pUC5K. By pUC3K-T vector prepared in this project, pUC4K and pUC5K can be generated by ligating pUC3K-T vector with the purified 1000 bp PCR fragment, using T_4 DNA ligase. Finally, the plasmid DNAs with defined size (pUC3K, pUC4K, etc) can be purified at high yield by the standard alkali lysis method. DNA with defined size (500, 1000, 1500, 2000 and 2500 bp) can be amplified by PCR at a total volume of 5-15 ml and are purified by various method including polyethylene glycol precipitation, column chromatography and ultrafiltration using Amicon pressure cell. DNA obtained after purification are quantify by the Picogreen DNA quantification method.

Keywords: DNA marker, PCR, Taq DNA polymerase, T4 DNA ligase, pUC3K-T vector, Picogreen DNA quantification method

Effect of light irradiation on Asiaticoside and Madecassoside production in *Centella asiatica*

Kotchakorn Thongrob
Department of Biochemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand kotchakorn.thon@ku.th

Wannarat Phonphoem*
Department of Biochemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
Wannarat.p@ku.ac.th

Abstract

Centella asiatica is one of a well-known medicinal plant in many Asian countries, including Thailand. Asiaticoside and madecassoside are the major bioactive triterpene glycosides found in this plant. The pharmacological properties of asiaticoside and madecassoside include wound healing, antioxidant, antibacterial and anti-cancer effects. However, both asiaticoside and madecassoside are present at relatively low quantities in normal cultivated plants. The objectives of this study therefore were to study the effect of light irradiation on asiaticoside and madecassoside production in *C. asiatica* and investigate the expression of genes involved in triterpene biosynthetic pathway. The plants were grown under normal condition and subjected to different wavelengths of light for the period of 5 days. Leaf samples were then harvested for bioactive compound extraction using methanol. High Performance Liquid Chromatography (HPLC) was used to quantify asiaticoside and madecassoside contents in the leaf extracts. The results showed that red-light and blue-light seem to have an effect on both asiaticoside and madecassoside accumulation, when compared to white-light. Morphological character and growth rate were also monitored during the treatment. The expression of squalene synthase (*CaSQS)* and β-amyrin synthase (*CabAs*) genes in response to light treatments were next examined by qRT-PCR. In addition, hydroponic system was set-up in this study for growing *C. asiatica* plants in order to reduce soil contamination and control growth rate. The results provide an approach for cultivating plants with high bioactive compounds.

Keywords: *Centella asiatica*, Asiaticoside, Madecassoside, light

Determination of phenolic compounds and mulberroside F accumulation in mulberry

Nattaya Pattarapipatkul
Department of Biochemistry, Faculty of Science, Kasetsart University,
Bangkok, Thailand
Nattaya.pat@ku.th

Wannarat Phonphoem*
Department of Biochemistry, Faculty of Science, Kasetsart University,
Bangkok, Thailand
Wannarat.p@ku.ac.th

Abstract

Mulberry is a plant, growing wild and under cultivation in many temperate regions. Several bioactive compounds have been found in this plant, including phenolics. These compounds have become of interest for pharmaceuticals and cosmetic industries due to their biological activities. Mulberroside F is one of the phenolic compounds that found in leaves, barks and roots of mulberry. Previous research demonstrated that Mulberroside F not only has antioxidant activity but also shows anti-tyrosinase for inhibition of melanogenesis. Therefore, this study aimed to determine phenolic compound and mulberroside F contents in different tissues of mulberry and study the effect of Light emitting diode (LEDs) on bioactive compound production. Firstly, the phenolics extraction method was optimized using two different solvents; ethanol and methanol. Total phenolic contents were determined spectrophotometrically according to Folin-Ciocalteu method and gallic acid was used to set-up standard curve. The results demonstrated that the condition of 60% ethanol was the most efficient extraction method, giving the highest yield of phenolic content. Secondly, the amount of phenolic compounds were examined in 10 different mulberry varieties. The result showed that higher phenolic contents were found in Kamphaengsaen 42, Sakonnakhon 72 and Lhunjiaw, compared to Buriram 51 and Buriram 60. Thirdly, mulberroside F content in Kamphaengsaen 42 was quantified and analyzed by High Performance Liquid Chromatography (HPLC). The mulberroside F was mainly found in roots, followed by stem bark and leaves respectively. To study the effect of LEDs on bioactive compound production, mulberry plants were subjected to light treatments (white, red and blue) under controlled condition. As the result, the light source significantly affects mulberroside F and phenolic compound accumulation. Finally, the biological activities of mulberry extracts such as antioxidant and anti-tyrosinase were also evaluated via colorimetric assay.

Keywords: Mulberry, Mulberroside F, Phenolic compound, Light emitting diode (LEDs)

Lateral Flow Test for Drug Allergy Detection

Natthapon Manatjaroenlap
Department of Biochemistry, Faculty of Science, Kasetsart University,
Bangkok, Thailand
Natthapon.ma@ku.th

Chomdao Sinthuvanich*
Department of Biochemistry, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fscicds@ku.ac.th

Abstract

Antibiotic drugs are currently among the first options for treatment of diseases associated with infection. The patients who are allergic to antibiotic drugs will have restrictions on drug use. If the patient is taking medication, it will result in allergic reactions such as itching, rash, difficulty breathing or anaphylactic shock that may lead to death. Therefore, it is important to monitor drug allergy in each patient. General diagnostic methods may use skin pick tests or blood tests. The limitations of such examination include time consuming, high cost, and inconvenience of traveling to the inspection site. This research therefore focuses on developing a drug allergy test in the form of a strip to be easy to use and to quickly observe the results. In this research, allergy detection of 4 antibiotic drugs was examined which are ampicillin, penicillin G, streptomycin and tetracycline. Two aspects of experiments were performed. First, aptamer, a single strand DNA, specific to immunoglobulin E for patients with drug allergy was screened by biopanning method. The IgE-aptemer interaction was monitored by capillary electrophoresis followed by polymerase chain reaction. Second, the distribution of drug on membrane strips was investigated. In this experiment, the drugs were individually coated onto the membrane, Then, drug distribution was monitored by ninhydrin reaction, sakaguchi reaction and ferric chloride reaction for ampicillin and penicillin G, streptomycin, and tetracycline, respectively. The result showed that penicillin G gave negative result on the ninhydrin reaction while ampicillin, streptomycin, and tetracycline gave positive results on ninhydrin reaction, sakaguchi reaction and ferric chloride reaction, respectively. Next, nitrocellulose and polyvinylidene fluoride (PVDF) membrane were selected to monitor the retention of drug on the membrane . It was found that the drug in the solution was not able to permeate into the PVDF membrane, while the nitrocellulose membrane could not retain the drug on the membrane. Interestingly, streptomycin gave negative results on both types of membranes even though the reaction provided positive result in solution. In conclusion, this work offer preliminary data for optimization of lateral flow test for drug allergy detection.

Keyword: drug allergy, aptamer, antibiotic drug

Synergistic antioxidant activity of mycelium extract from mushrooms

Nissapuk Nonthammasak
Department of Biochemistry, Faculty of Science, Kasetsart University,
Bangkok, Thailand
Suchanan.sa@ku.th

Pichamon kiatwuthinon*
Department of Biochemistry, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fscipmk@ku.ac.th

Abstract

A free radical is an unstable molecule or atom due to lack of electrons. Several biological molecules inside cells such as proteins nucleic acids and phospholipids may be affected by the free radicals. In the event that body cells are damaged by the free radicals, the molecules of the cells in the body become unstable. To terminate the free radicals' activity, an antioxidant is used to offer a stable pair of electrons. Therefore, obtaining antioxidant is one way to prevent the cellular damages. Mushrooms are considered as one of medicinal plants that exhibit several biological activities including antioxidant activity. Each type of mushroom has different nutritional values and active compounds. Here, the aim of this study is to investigate a synergistic effect of antioxidant activity from 5 varieties of mushrooms. The 5 types of mushrooms used in this study are *Phellinus igniarius, Lentinus squarrosulas Mont., Hericium erinaceus, Ganoderma lucidum* and a commercial beverage product from mushroom extract. The active compounds from the mycelium of the 5 mushrooms were extracted by various solvents and used for examining their antioxidant activities by using oxygen radical absorbance capacity (ORAC) and ferric reducing antioxidant power (FRAP) assays. The results of the ORAC assay showed that all individual mushroom extracts exhibited more potent antioxidant activity than the standard L-Ascorbic acid. Additionally, the synergistic antioxidant activity between the two most potent mushroom extracts which found in the mixture of *Ganoderma lucidum* and *Hericium erinaceus* with ethanol extraction was demonstrated with an antioxidant activity of approximately 90 %. For FRAP assay, all mushroom extracts did not show the ability to change a toxic Fe^{3+} to a non-toxic Fe^{2+} when compared to the standard L-Ascorbic acid. The results from this study will be useful in developing various mushroom supplements, preventing diseases and also bringing natural products to the maximum benefit.

Keywords: Free radical, Antioxidant, Mushroom extract, ORAC assay, FRAP assay

Detection and Characterization of *Aeromonas spp.* from Aeromonad Disease Nile Tilapia (*Oreochromis niloticus*)

Noramon Anantasuk
Department of Biochemistry, Faculty of Science, Kasetsart University,
Bangkok, Thailand
noramon.a@ku.th

Sasimanas Unajak*
Department of Biochemistry, Faculty of Science, Kasetsart University,
Bangkok, Thailand
sasimanas.u@ku.th

Abstract

Aeromonas spp. are common bacteria in the aquatic environment and known to cause wound infection, sepsis, and other diseases. The bacteria often cause Aeromonad disease in fish especially in Nile tilapia (*Oreochromis niloticus*) which is economic importance fresh water fish species. Tilapia with aeromonad diseased exhibits sign of symptom such as bleeding, wounds, abdominal swelling and mass mortality would observe within few days after onset of the disease. For this reason, the identification of pathogenic *Aeromonas* spp. is important for pathogenesis and prognosis of disease distribution. More than 100 strains of *Aeromonas* spp. were isolated from diseased tilapia. Biochemical analysis and Blast search analysis of 16s rRNA sequence (1,500 bp) of all isolated bacteria demonstrated 7 different species of *Aeromonas* spp. including *A. taiwanesis*, *A. dhakensis*, *A. caviae*, *A. jandaei*, *A. hydrophila*, *A. schubertii* and *A. veronii*. However, phylogenetic tree analysis of 16s rRNA from candidate 12 strains could not well distinguish *A. taiwanesis*, *A. dhakensis*, *A. caviae*, and *A. jandaei* apart which demonstrated that those techniques cannot accurately identify *Aeromonas* spp. Then, gyrase gene (1,100 bp) were amplified from candidate 12 strains. Bioinformatics analysis of gyrase gene was conducted to affirm identity of isolated bacteria. Multiplex PCR analysis for the diagnosis of Aeromonad bacteria in Nile tilapia would be performed to characterize *Aeromonas* spp. which will use as a tool for diagnose aeromonad disease in tilapia.

Keywords: Aeromonad Disease, Nile Tilapia, 16s rRNA, gyrase gene

Cloning and Expression of Acidic Polypeptide Materials

Onpailin Thanitruengsak
Department of Biochemistry, Faculty of Science, Kasetsart University,
Bangkok, Thailand
onpailin.th@ku.th

Chomdao Sinthuvanich*
Department of Biochemistry, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fscicds@nontri.ku.ac.th

Abstract

Hydrogels are hydrophilic polymer, capable of absorbing large amounts of water or biological fluids. They are insoluble materials due to the presence of cross-links between the constituents that form the polymeric network. Peptides and proteins are important building blocks in the design of hydrogels, since they are easily degraded by the body, highly biocompatible and viscoelastic. At present, this peptide-based hydrogel has potentials in biomedical applications such as tissue engineering and wound healing. In this study, we aim to produce a polypeptide-based hydrogel that can response to pH induction by using recombinant DNA technology and protein expression in *Escherichia coli*. First, a monomeric DNA that encode repetitive β-strand polypeptide was designed. Then, they were ligated by concatamerization method. The resulting concatamers were ligated to pET19b_ter vector and subsequently transformed into *E.coli*. stain DH5α for cloning. After, the colonies were selected on ampicillin LB agar, the recombinant gene was amplified by colony PCR, examined by agarose gel electrophoresis, and analysed by DNA sequencing. Finally the pH- responsive polypeptide-based hydrogel was over-expressed in *E.coli*. stain BL21(DE3) and analysed by polyacrylamide gel electrophoresis. This investigation will provide a biomaterial production of polypeptide-based polymer.

Keywords: polypeptide-based hydrogel, concatamerization, recombinant gene, biomaterial

Expression and characterization of CtBglA2 beta-glucosidase from *Clostridium thermocellum*

Parichat Putthasang
Department of Biochemistry, Faculty of science, Kasetsart University,
Bangkok, Thailand
parichat.pu@ku.th

Prachumporn Kongsaeree*
Department of Biochemistry, Faculty of science, Kasetsart University,
Bangkok, Thailand
fscippt@ku.ac.th

Abstract

Beta-glucosidase is an essential enzyme in the process of cellulose degradation into glucose as it catalyzes the hydrolysis of the beta-1,4-glucosidic linkages. This process is important because glucose is often used as a precursor to produce ethanol, which is a major alternative bio-energy in many industries. In this study, we used CtBglA2 beta-glucosidase from *Clostridium thermocellum*, which is an anaerobic and thermophilic bacterium, because it produces high levels of extracellular cellulases, enabling the cells to grow independently on cellulose and cellobiose. The coding sequence of CtBglA2 (GenBank accession number X60268.1) was synthesized, and cloned into pET15b by GenScript, USA. The recombinant plasmid (pET15b-CtBglA2) was transformed into *Escherichia coli* DH5α, and the sequence of CtBglA2 was confirmed by DNA sequencing. Then, the recombinant plasmid was transformed into *E. coli* BL21 (DE3) for protein expression. The optimum concentration of isopropyl β-D-1-thiogalactopyranoside (IPTG) to induce protein expression was found to be 0.05 mM by varying different IPTG concentrations. CtBglA2 appeared as a single protein band of 50 kDa on SDS-PAGE. Cell pellet was lyzed by sonication, and CtBglA2 was purified from the soluble cell lysate by using Nickel sepharose chromatography. The optimum temperature of CtBglA2 was at 60 °C, and its optimum pH was at pH 5.5. CtBglA2exhibited at least 80% remaining activity after incubation at temperatures between 4-10 °C, or at pHs between 5-10, for 30 min. So, CtBglA2 beta-glucosidase from *C. thermocellum* could catalyze reactions at high temperatures, and was stable in a wide range of pH, but it could maintain its activity only when stored at low temperatures. However, more studies about its structure and kinetic properties are needed in order to fully appreciate its capabilities.

Keywords: beta-glucosidase, *Clostridium thermocellum*, activity of enzyme, expression

Evaluation of antioxidative properties of protein hydrolysate from Thai rice

Patsara Charoensri
Department of Biochemistry, Faculty of Science, Kasetsart University,
Bangkok, Thailand
patsara.c@ku.ac.th

Pichamon Kiatwuthinon*
Department of Biochemistry, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fscipmk@ku.ac.th

Abstract

Free radicals adversely affect lipids, proteins, and DNA leading to a number of human diseases such as cancer, degenerative eye and Alzheimer's disease. Several natural products and food have been reported to act as an antioxidant to free radical. Rice proteins were found to possess these activities. As a result processing of rice in the protein hydrolysate product would add more value to rice and generate income for Thai farmers. Thus. The aim of this study was to investigate the antioxidant properties of protein hydrolysates from 6 Thai rice varieties. The six different varieties of rice in this study were E-Luang, E-Meut, Nuay Keua, Hom Mali, Hom Mali Surin, and Kao Gor. First, protein was extracted from grounded dried rice endosperm with a sodium dodecyl sulfate (SDS) solution.The protein was then digested by enzymes found in stomach and duodenum of small intestine which are pepsin and trypsin, respectively. The resulting protein hydrolysates contained a combination of short peptides . The rice protein hydrolysates were then investigated for their antioxidant activities by using the oxygen radical absorbance capacity (ORAC) techniques and ferric reducing antioxidant power assay (FRAP). The result from ORAC assay showed that all 6 rice varieties had antioxidant activities which were 39.39%, 34.84%, 24.15%, 58.87%, 39.37% and 56.05% for E-Luang, E-Meut, Nuay Keua, Hom Mali, Hom Mali Surin, Kao Gor, respectively. FRAP assay the experiment are on-going. The results from this study can be used to develop for use in medical and beauty products, which will add value to Thai rice in the future.

Keyword : rice; protein hydrolysate; antioxidant activity; ORAC; FRAP

Computational approaches to drug discovery against polymerase of rabies virus.

Pavit Klomkliew
Department of Biochemistry, Faculty of Science, Kasetsart University,
Bangkok, Thailand
Pitiput.K@ku.ac.th

Kiattawee Choowongkomon
Department of Biochemistry, Faculty of Science, Kasetsart University,
Bangkok, Thailand
Kiattawee.C@ku.ac.th

Abstract

Rabies is a viral disease spread to people from the saliva of infected animals. There is currently no drug that can treat rabies. If a person or animal receives the rabies virus and showing symptoms and will die every life. From other research, we know that polymerase of rabies virus is responsible for changing negative-sense single-stranded RNA virus to positive-sense single-stranded RNA virus. The present study was, therefore, undertaken to approaches to drug discovery against polymerase of rabies virus using molecular modeling and molecular docking. First, the 3D structure of rabies polymerase was predicted and the target site for docking small molecule was identified by molecular modeling method. Second, the molecular docking method, the GOLD program, was used to study the interaction between polymerase drugs in the DrugBank databases and the rabies polymerase. The docked result showed that Degarelix and Eritoran are potential drugs to inhibit the activity of the polymerase. This study demonstrates a possible for drug development for rabies with inhibition of polymerase.

KEYWORDS: rabies, negative-sense single-stranded RNA virus, polymerase, molecular modeling, molecular docking, DrugBank databases

Production of recombinant protein 26SK and its effect on cancer cell growth

Pitsinee Klatham
Department of Biochemistry, Faculty of science, Kasetsart University,
Bangkok, Thailand
pitsinee.k@ku.th

Chotika Yokthongwattana*
Department of Biochemistry, Faculty of science, Kasetsart University,
Bangkok, Thailand
fscicks@ku.ac.th

Abstract

Ribosome inactivating proteins (RIPs) are catalytic toxins that inactivate ribosome and inhibit protein synthesis. In previous studies, RIPs have been developed as immunotoxins in an attempt to cancer treatment such as lymphoma. In this study, recombinant RIPs type I, 26SK, from *E. coli* has been produced by culturing the starter culture at 37 °C for 16-18 hours in a shaking incubator. The starter cell cultures were further inoculated into new LB media containing antibiotics and cultured at 37 °C for 2-3 hours in a shaking incubator until the OD_{600} reaches nearly 0.4 to 0.6. Induction of the recombinant protein production was performed by adding the 0.1M of IPTG and incubated at 30 °C for 1 hours. The cell culture were harvested by centrifugation at 2,000 x g, 4 °C for 10 minutes. Then, the cell pellets were resuspended in 20 ml ice-cold 1x PBS. The crude proteins were stored at 4 °C prior cancer cell treatments. The crude proteins were used in cancer cell treatment by 2-*fold* serial *dilution*. The maximum concentration of protein is 5 mg/ml. The cancer cell lines used in this research were breast cancer cell lines (MCF-7 and MDA-MB 453) and liver cancer cell line (HepG2). The MCF-7 and HepG2 cell lines were prepared in Dulbecco's modified Eagle's medium (DMEM) supplement and the MDA-MB 453 cell line was prepared in L15 medium supplement with 10% activated fetal bovine serum (FBS) and 1% Penicillin-Streptomycin. These cell cultures were thrived in chamber under a humidified 5%CO_2 atmosphere at 37°C until the cell confluence reaches 60 to 80 percent. After that, pre-warmed 0.25% Trypsin-EDTA was added for dissociated adherent cells and the cells were counted by using 10 microliters of cells mixed with 90 microliters of Trypan Blue cell staining dye. Then, 7,000 cells supplemented with complete media were seeded into 96-well plate. The 96-well plate will be incubated at 37 °C for overnight. The viability of all cancer cell lines were assessed by 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyl tetrazolium bromide (MTT assay) and calculated % viability of cell lines. However, the result show that 5mg/ml of crude protein 26SK could not inhibit the growth of all cancer cell lines. This study may be a guidelines for further study of cancer cell treatment.

Keyword: Ribosome inactivating protein, MCF-7, MDA-MB 453, Hep G2

Expression analysis of genes involved hydrophobic substrate metabolism in *Yarrowia lipolytica*

Pooncharas Harpe
Department of Biochemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
pooncharas.h@ku.ac.th

Napapol Poopanitpan
Department of Biochemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscinpp@ku.ac.th

Abstract

Yarrowia lipolytica can accumulates lipid within its cells. This yeast has been played as an essential model in the study of lipid metabolism to produce the renewable energy instead of petroleum oil. Moreover, this yeast is grown in various types of carbon sources. Previous study investigated the characterization of the deletion mutant of *ScSNF1* ortholog gene in *Y. lipolytica* (Δ*snf1::ADE1*). This result showed that Δ*snf1::ADE1* was not grown in the culture media containing *n*-alkane as a hydrophobic substrate, but increased the lipid accumulation when compared with wild-type (CXAU/AI). Furthermore, the complementation of *YlSNF1* gene into Δ*snf1::ADE1* recovered the ability to grow in the culture media containing *n*-alkane. This study aimed to compare the expression of major genes involved in hydrophobic substrate metabolism between CXAU/AI and Δ*snf1::ADE1* using Northern blot analysis technique. First, the method of cell preparation and RNA extraction was optimized to obtain high yield and good quality of RNA. Second, specific probes of *ALK*, *POT1* and *PAT1* gene were amplified by PCR DIG Probe Synthesis Kit (Roche, USA). From agarose electrophoresis technique, the movement of DIG-labeling probes is slower than that of unlabeling probe, because of increasing the molecular mass of labeling probes after DIG-conjugated dUTP was incorporated into DNA probes. Thus, this result showed that DIG-labeling probes are successfully generated. Finally, total RNAs in each sample will be transferred to Hybond-N+ membrane and further analyzed by northern hybridization with DIG-labeling probe.

Keyword: Hydrophobic substrate metabolism**,** Gene expression, Northern blot analysis

Development of Loop mediated isothermal amplification (LAMP) PCR for detecting NPV virus in silkworm, *Bombyx Mori*

Pornpawee Keawkerd
Department of biochemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
Pornpawee.kae@ku.ac.th

Ratree Wongpanya*
Department of Biochemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscirtw@ku.ac.th

Abstract

Bombyx mori nucleopolyhedrosis virus or *Bm*NPV is a pathogen which is causing of losing of silkworm in sericulture. *Bm*NPV can infect silkworm passing digestion system. After *Bm*NPV infection, they split viral DNA in midgut. *Bm*NPV will slowly infection and damage to the midgut then the viral DNA will spread into various tissue of *Bombyx mori*. Spot of protein virus crystal and fragile body will be observed on body of silkworm because viral generate protease and chitinase, the enzyme which can digest protein and chitin. Finally, in the end infection state the silkworm will climb in to the top of threshing basket and hang in it and their body will sprout the protein virus crystal extravasation then another silkworm will be infected by *Bm*NPV and then they will finally dead. So in this work, the researcher try to study about detection *Bm*NPV using Loop-mediated Isothermal Amplification polymerase chain reaction or LAMP PCR. LAMP PCR use four primers and recognize six specific sign LAMP PCR is better PCR because it is specific and easy to use .in this study, the researcher will use LAMP PCR for detection Polyhedrin gene in silkworm which is highly conserve gene. So Polyhedrin gene was easy to detect. The researcher will hope that this research will help and useful in the sericulture industry for detection *Bm*NPV gene to product the medicine for protect silkworm form this disease. Moreover, for separate infection silkworm from normal silkworm.

Keywords: *Bm*NPV, LAMP PCR, Polyhedrin

Study of anti-ageing potential of protein hydrolysate from silkworm pupae

Saowalak Yasamuth
Department of Biochemistry, Faculty of Science, Kasetsart University,
Bangkok, Thailand
Saowalak.ya@ku.th

Suttida Chukiatsiri*
Department of Biochemistry, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fscistd@ku.ac.th

Abstract

Skin ageing is a process in which both extrinsic and intrinsic factors lead progressively to a loss of structural integrity and physiological functions. In dermis, three primary extracellular matrix (ECM) components, including collagen, elastin and glycosaminoglycan (GAGs) or hyaluronic acid (HA), have been focused on majority of the anti-ageing research. Additionally, inhibition of tyrosinase, a key enzyme in melanogenesis, have been studied for skin whitening. Previous studies indicated nutritional values of silkworm pupae, *Bombyx mori*, showing high percentages of total proteins (55.6%) and high levels of essential amino acids such as valine, methionine and phenylalanine. Moreover, *Bombyx mori* (Nanglai), and wild silkworm (Eri), *Samia ricini*, play a role in various industries such as *Bombyx mori* (Nanglai), and wild silkworm pupae, *Samia ricini* (Eri). Crude proteins were extracted and hydrolysated protein by trypsin, pepsin and papain to determine anti-aging activities, including anti-collagenase, anti-elastase, anti-hyaluronidase and anti-tyrosinase activities by in vitro enzymatic assays. All assays were evaluated using an inhibitory concentration (IC50) value. The results showed that both crude proteins of Eri and Nanglai had high anti-collagenase activity with IC50 values of 637.16 ± 8.74 µg/ml and 648.96 ± 9.95 µg/ml, respectively. Protein hydrolysate by pepsin of Eri (IC50 = 714.82 ± 14.47 µg/ml) had the strongest elastase inhibitory activity, in contrast, crude protein of Nanglai (IC50 = 870.30 ±17.26 µg/ml) had the better activity than their protein hydrolystes. Furthermore, both protein hydrolysates by trypsin of Eri and Nanglai had high anti-hyaluronidase activity with IC50 values of 660.67 ± 0.90 µg/ml and 633.77 ± 5.09 µg/ml, respectively. Finally, evaluation of anti-tyrosinase activities showed that only crude proteins of Eri and Nanglai had inhibitory activity with IC50 value of 841.94 ± 55.32 µg/ml and 1667.71 ± 40.02 µg/ml, respectively. The results concluded that protein hydrolysates by pepsin and trypsin had more potential against elastase and hyaluronidase activities in vitro than crude proteins. This research is possibly useful as a new knowledge of development for anti-skin ageing products.

Keywords: anti-ageing, enzymatic assays, protein hydrolysate

Expression and purification of C-type lectin in the black tiger shrimp, *Penaeus monodon*

Sasiprapa Supsin
Department of Biochemistry, Faculty of Science, Kasetsart University,
Bangkok, Thailand
sasiprapa.sup@ku.ac.th

Ratree Wongpanya*
Department of Biochemistry, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fscirtw@ku.ac.th

Abstract

C-type lectins are a large group of proteins with a Ca2+ dependent that plays important roles in pathogen recognition and clearance of pathogens as part of the innate immune system. As important molecules involved in the identification of non-self-molecules, C-type lectin induces the immune responses after binding to the invading microorganisms. The immune actions of C-type lectin have been determined, including phagocytosis, activation of the respiratory burst and antiviral immunity. The aims of this study are to express and purify a recombinant C-type lectin of the black tiger shrimp, *Penaeus monodon*. The C-type lectin was cloned into an expression vector, pET-32a and transformed into *E. coli* strain BL21 Star (DE3). The recombinant protein was expressed in the bacterial system after induction with 0.5 mM IPTG. Then, recombinant proteins were purified by Ni-NTA affinity chromatography. The recombinant protein concentration was determined using BCA assay. The SDS-PAGE was carried out to measure the recombinant protein molecular mass. Also, western blot was performed by using a HRP conjugated anti-His antibody. The results showed that the recombinant protein can be produced in a soluble form in the bacterial system and can be purified by His-trap column using 300 mM imidazole. By using SDS-PAGE and western blot, the molecular mass of recombinant proteins is 39 kDa. In 1 L cell culture, 0.088 mg of the recombinant protein concentration can be obtained. For future work, the interaction between C-type lectin and β-integrin will be determined by pulldown assay. Then, phagocytosis analysis will be verified after gene knockdown in shrimp hemocytes. The result of this study would be helpful for understanding the function of C-type lectin in shrimp innate immunity.

Keywords: C-type lectin, black tiger shrimp, *Penaeus monodon*

The study of organelle-specific titin in aortic valve endothelial cells on the aortic and ventricular side

Thanakorn Chonkaew
Department of Biochemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
thanakorn.cho@ku.th

Napachanok Mongkoldhumrongkul
Department of Biochemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscinnm@ku.ac.th

Abstract

Titin protein was firstly found in the cytoplasm in the sarcomere of the striped muscle cells. It was later discovered in the nucleus of non-sacromeric cells such as cervical cancer cells, bone cells and germ cells. The isoforms of titin proteins found in the human heart muscle include N2B and N2BA, the longer, isoforms. Heart failure is a disease associated with the abnormalities of the heart's structure or function and the increased ratio of titin isoform N2BA over N2B. However, it has not been revealed whether that the titin proteins found in the nucleus and cytoplasm have different isoforms or not. This research aimed to study and compare the ratio of titin isoforms between the nucleus and cytoplasm of valve endothelial cells on the aortic side (aVEC) and the ventricular side (vVEC) of the porcine aortic valves. The endothelial cells were side-specifically isolated from the aortic and the ventricular side by the frozen-plate isolation technique. Subsequently, organelle specific (cytoplasm and nuclear) protein extraction was performed and protein amount was quantitated by ProteoquantTM Proteome Quantification Assay Kit (BCA). The results of side-specific isolation from pooled sample (3 aortic valves) showed that the amount of cytoplasmic and nuclear proteins from vVECs was higher than aVECs and sufficient to carry out the further steps. The efficiency of cytoplasmic and nuclear protein extraction was analysed by Western blot analysis using α-tubulin and histone as cytoplasmic and nuclear specific markers, respectively. The results of Western blot analysis showed that the organelle specific (cytoplasm and nuclear) protein extraction from 3 aortic valves has not succeeded. The titin isoforms in cytoplasm and nucleus will be examined by Western blot analysis using vertical agarose gel.

Keyword: Titin, Aortic valve, Aortic side, Ventricular side

Characterization the interaction of EGFR complex with drugs by using SPR techniques

Thaninrat Uthaipattanadech
Department of Biochemistry, Faculty of Science, Kasetsart University,
Bangkok, Thailand
b5810404669@ku.ac.th

Kiattawee Choowongkomon
Department of Biochemistry, Faculty of Science, Kasetsart University,
Bangkok, Thailand
Kiattawee.c@ku.th

Abstract

Cancer, the disease that killed many people on this planet. There are currently no drugs that can cure cancer for patients to recover permanently. Therefore, the researcher is interested in studying by using the protein derived from EGFR cancer cells (Epidermal growth factor receptor) to analyze the binding affinity between a tyrosine kinase of EGFR and drugs by using the SPR (Surface plasmon resonance) technique. The SPR technique is used to analyze the binding between ligands and proteins. In this research, the SPR was used to determine the K_D value by the tyrosine kinase inhibitors to exhibit the binding properties with the tyrosine kinase of EGFR. In the case of this study, the K_D of EGFR with Afatinib and Erlotinib displayed 1.29×10^{-5} and 2.84×10^{-5}, respectively. However, the results of this experiment were just a part of the data, which also requires many other experimental data to be combined to develop drugs that can treat cancer better and this information may be useful for further research on the production of cancer drugs.

Keywords: Surface Plasmon resonance , Epidermal growth factor receptor , drugs

Investigation of biological activities of extracts from orchid hybrid

Thanyawan Pengoan
Department of Biochemistry, Faculty of Science, Kasetsart University,
Bangkok, Thailand
thanyawan.pe@ku.th

Attawan Aramrak*
Department of Biochemistry, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fsciawa@ku.ac.th

Abstract

Orchids are important economic plants because they have various biological activities such as anti-cancer, anti-inflammatory and antioxidant activities besides its beauty. In this research, two orchid hybrids, *Dendrobium* Topaz Dream × *Dendrobium bigibbum* (Dt×Db) and *Ascocenda* Suksamnan Gold × *Vanda* Pacharee's Delight (A×V), were extracted with different solvents, and were tested for its biological activities. The antioxidant activity using DPPH assay showed that A×V extracted with ethanol has the highest scavenging activity while AxV extracted with propanol has the highest when using ABTS and FRAB assays. In addition, the orchid extracts were tested for depigmentation. Results revealed that none of the extracts contains anti-tyrosinase activity, the enzyme involved melanin biosynthesis. Anticancer activity against human skin cancer cell line (A431) was also studied using MTT assay. Overall, Dt×Db extracts demonstrated stronger inhibition on A431 cell viability than A×V extracts. It was found that A431 cells can survive about 40%, compared with a normal cell, when treated with Dt×Db extracts from methanol, ethanol, and propanol. Based on this research, it can conclude that Dt×Db contains anticancer property at least against skin cancer, whereas A×V has ability to scavenge free radicals. Therefore, orchid hybrid could be useful in drug and cosmetics development in the future work.

Keywords: orchid, antioxidant, anti-tyrosinase, anti-skin cancer

Isolation and study of single cell algae for production of high value substances

Tipnipa Panichakarn
Department of Biochemistry, Faculty of science, Kasetsart University,
Bangkok, Thailand
tipnipa.p@ku.th

Chotika Yokthongwattana*
Department of Biochemistry, Faculty of science, Kasetsart University,
Bangkok, Thailand
fscicks@ku.ac.th

Abstract

Plant pigments are color substances that can absorb light. There are many types, each of which can absorb light at different wavelengths and convert it into energy for living things by photosynthesis. There are reports of the uses of pigments in the production of cosmetics, supplements and food for aquatic animals. Sample of pigments such as neoxanthin, violaxanthin, antheraxanthin, lutein, zeaxanthin, b-carotene, chlorophyll A, chlorophyll B and asthaxanthin, which the amount of pigment extracted is an important factor for further utilization. The production of the pigment of the organism requires stimulation with conditions that cause stress such as raising of various temperatures. The time of receiving light, salt concentration and nitrogen source. Green algae are organisms belong to the Chlorophyta group. At present, green algae is widely used as a source of high value pigments. Because green algae can be easily cultivated and grow quickly compared to other organisms. This research therefore focuses on studying the optimum conditions that allow green algae to produce various pigments by collecting samples from natural water sources for cultivation and stimulation that cause stress in order to increase the amount of pigment. From this research, about 30 microalgae lines have been isolated. Some of the isolated lines showed positive signal for sudan III staining which was sued to stain oil-soluble substance. Some of isolated revealed change of the colony color after heat treatment. One of the isolated lines, JP1, were selected for further study. HPLC analysis suggested that there are various pigments in JP1 which are neoxanthin, violaxanthin, antheraxanthin, lutein, zeaxanthin, b-carotene, chlorophyll A, chlorophyll B.

Keyword: Green algae, Pigment, Stress conditions

Anti-bacterial activity of green synthesized zinc oxide nanoparticles

Thitiradsadakorn Jaition
Department of Biochemistry, Faculty of Science, Kasetsart University,
Bangkok, Thailand
titiradsadakorn.j@ku.ac.th

Nattanan T-Theinprasert*
Department of Biochemistry, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fscinnp@ku.ac.th

Abstract

Zinc oxide nanoparticle (ZnO NP) is one of the most well used nanoparticles for different applications such as food industries, agriculture, cosmetics including oral hygiene materials. Moreover, ZnO NP has demonstrated good antibacterial activities on a broad spectrum of bacteria. However, current chemical synthesis of ZnO NP produces toxic chemicals such as H_2S, metallic precursor and toxic template that affect environment. Thus, use of plant material to synthesize zinc oxide nanoparticles is the best choice for environmentally friendly approach and this method is lower cost than other methods. Previously, we demonstrated that mixing of 0.02 M zinc acetate with the appropriate concentrations of banana peeled extract in the optimal synthesis condition resulted in ZnO NPs that possess anti-bacterial activity. However, the previous synthesis offered small amounts of ZnO NPs. This study therefore aimed to synthesize ZnO NPs in a larger scale by mixing 1 M or 2 M of zinc acetate with the appropriate concentrations of banana peeled extract. Then, newly synthesized ZnO NPs were characterized and investigated for antibacterial activity against both Gram-positive and Gram-negative bacteria. The study also attempted to improve antibacterial activity of newly synthesized ZnO NPs by thermal annealing. As a result, this study successfully generated higher amounts of ZnO NPs. By performing an agar disc-diffusion method, the results showed that ZnO NPs possess anti-bacterial activity specifically against Gram-positive bacteria, *Bacillus subtilis* and *Staphylococcus epidermidis*, but had no effect on the Gram-negative bacteria, *Enterobacter aerogenes* and *Escherichia coli* in both light and dark conditions. Moreover, thermal annealing of newly synthesized ZnO NPs showed a greater growth inhibition against *B. subtilis* only when ZnO NPs were suspended in phosphate buffer under dark condition. Finally, these findings shed light on a high potential of green synthesis of ZnO NPs from food waste (banana peels) and opportunity to increase values of agriculture wastes.

Keywords: Zinc oxide nanoparticles, Green synthesis, Banana peeled extract, Anti-bacterial activity, thermal annealing

The construction of c-terminal NT-proBNP nanobody for the development of heart failure strip test

Vipaporn Tansathaweerat
Department of Biochemistry, Faculty of Science, Kasetsart University,
Bangkok, Thailand
v.tansathaweerat@gmail.com

Napachanok Mongkoldhumrongkul*
Department of Biochemistry, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fscinnm@ku.ac.th

Abstract

Heart failure is a clinical syndrome that results from any structural damage of the heart muscle causing the heart cannot pump the blood efficiently. Thus the functional impairment of ventricular filling or ejection of the blood occurs (Maya et al., 2019) . The symptoms of patients who have heart failure are not clear, including shortness of breath, weakness, chest pain and increased need to urinate at night and edema (Maya et al., 2019). When the ventricular wall is stretched, the cardiomyocytes of the ventricle produces Pro B-type natriuretic peptide (Pro-BNP) as prehormone and releases it into the blood. Pro-BNP is then cleaved into 1. B-type natriuretic (BNP) (32 amino acids) which is the active form and 2. Natriuretic pro B-type peptide (NT-proBNP) (76 amino acids). NT-proBNP has longer half-life than BNP in the plasma, at about 120 minutes, whereas BNP has 20 minutes (Weber et al., 2006). Nowadays, NT-proBNP is used as a biomarker to diagnose heart failure. It can be measured by using Enzyme-linked immunosorbent assay (ELISA) technique and analyzed by a specialist and high equipment. In this study, we generated a nanobody that is specific to c-terminal part of NT-proBNP with 15 amino acids long (EGIRGHRKMVLYTLRAPR) by using biopanning and phage displayed techniques. These techniques are the methods for the selection of monoclonal antibodies and peptides displayed on phage against a given antigen (Christ D., 2010) . After the first round of biopanning, the phage that bound specifically on the peptide was eluted and diluted with Luria-bertani broth at different concentrations, then overexpressed in *E. coli* TG1, spread on plates and incubated at 37°C overnight with the selection of Ampicillin. The titer plates of the phage clones displayed 172 colonies, 16 colonies and 2 colonies from 10^{-1}, 10^{-2} and 10^{-3} dilutions of the eluted phage, respectively. Thirty-two colonies were chosen from the 10^{-1} plate to perform superinfection by adding the helper phage and IPTG. All phage was selected by Kanamycin for the specificity test by ELISA. The colonies that had the O.D. at 450 nm higher than 0.1 were selected and the results revealed 3 colonies that bound with NT-proBNP. Then high affinity binding with NT-proBNP compared to BSA and a peptide, composed of 15 amino acids, of such 3 clones was investigated. Subsequently, *E.coli* Hb2151 will be infected for the expression of protein/nanobody displayed on the phage. Finally, the nanobody with the highest affinity of binding to NT-proBNP will be used to develop the strip test for the diagnosis of heart failure. The kit will be constructed to be easy to use and not expensive for the benefits of Thai people who live far from the hospital equipped with ELISA.

Keyword: Heart Failure, NT-peoBNP, Biopanning, phage displayed

Expression and characterization of CtBglA1 beta-glucosidase from *Clostridium thermocellum*

Warisara Tungkamanee
Department of Biochemistry, Faculty of science, Kasetsart University,
Bangkok, Thailand
warisara.t@ku.th

Prachumporn Kongsaeree*
Department of Biochemistry, Faculty of science, Kasetsart University,
Bangkok, Thailand
fscippt@ku.ac.th

Abstract

Beta-glucosidase is an important enzyme involved in degradation of cellulose by hydrolysis of the beta-1,4-glucosidic bonds to yield glucose molecules. Glucose can be used as a precursor to produce ethanol which is an alternative bioenergy. The efficient and stable beta-glucosidase is required for producing the large amount of glucose. In this study, we tried to find the enzyme which has the highest rate of cellulose degradation and is stable at high temperature. Therefore, CtBglA1 beta-glucosidase from *Clostridium thermocellum* (GenBank accession number ABN52659.1) was investigated in this study. *C. thermocellum*, which is a thermophilic gram-positive bacteria, has a capacity to degrade cellulose by producing active cellulolytic enzymes from several genes including CtBglA1, and yield the fermentable end-products. The synthetic recombinant plasmid (pET15b-CtBglA1) was synthesized by GenScript, USA, and transformed into *Escherichia coli* DH5α. The 1341 bp of CtBglA1 gene was confirmed by agarose gel electrophoresis and by DNA sequencing. The recombinant plasmid was transformed into *E. coli* BL21 (DE3) for expression. By varying the concentrations of isopropyl β-D-1-thiogalactopyranoside (IPTG), we found that 0.1 mM of IPTG was the optimum concentration to be used as an inducer. CtBglA1 was expressed as a single protein band at 49 kDa on SDS-PAGE. CtBglA1 was purified from cell pellet by sonication and Nickel-column chromatography, and used in all characterization studies. The optimum temperature of CtBglA1 was at 70 °C, and its optimum pH was at pH 5.5. CtBglA1 showed at least 80% remaining activity after incubation at temperatures between 4-20 °C, or at pHs between 4-10, for 30 min. So, CtBglA1 beta-glucosidase from *C. thermocellum* could catalyze the reactions at high temperatures, and was stable in a wide range of pH but in a narrow range of temperatures. Further studies will be performed to characterize its kinetic parameters and substrate specificity.

Keywords: beta-glucosidase, *Clostridium thermocellum*, characterization, expression

Study of protein hydrolysate activities from silkworm pupae against non-communicable diseases

Wisanee Meechusaeng
Department of Biochemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
wisanee.m@ku.th

Suttida Chukiatsiri*
Department of Biochemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscistd@ku.ac.th

Abstract

As wearing cloths made from silk are popular, silkworm pupae become a waste product after silk drawing. Previous research found that silkworm pupae contain high quality of proteins and essential fatty acids. So, study tends towards medical applications. Nowadays, the rate of non-communicable diseases including diabetes, heart disease and cancer are increasing. However, it can be prevented. Previous studies have demonstrated that protein extracts from silkworm pupae had biological activities against most causes of non-communicable diseases. Thus, the objective of this study is to investigate bioactivities of protein hydrolysates by pepsin and trypsin against non-communicable diseases including anti-inflammatory, anti-diabetic and antioxidant activities. Two species of silkworm pupae were used; Thai-multivoltine silkworm pupae, *Bombyx mori* (Nanglai) and Wild silkworm pupae, *Samia ricini* (Eri). Assays were evaluated using inhibitory concentration (IC_{50}) value. The results of anti-inflammatory assay showed that protein hydrolysate by pepsin strongly inhibited degradation of albumin. The IC_{50} values of Nanglai and Eri were 872.448±105.123 µg/ml and 638.488±31.792 µg/ml, respectively. For anti-diabetic assay, protein hydrolysates of both species by pepsin showed strongest α-glucosidase inhibitory activity (IC_{50}= 587.82±32.690 µg/ml and 702.444±16.025 µg/ml, respectively). By contrast, protein hydrolysates by trypsin had better α-amylase inhibitory activity than another. The IC_{50} values of Nanglai and Eri were 1,259.446±86.067 µg/ml and 1,188.778±37.224 µg/ml, respectively. The results of DPPH radical-scavenging activity assay showed that protein extracts from Nanglai (IC_{50}= 1,301.832±454.838 µg/ml) had more effective antioxidant activity than protein hydrolysates whereas protein hydrolysate by trypsin from Eri had effective antioxidant activity (IC_{50}=1,570.292±103.372µg/ml). In addition, the results of chelating ability of ferrous ion showed that protein hydrolysates by pepsin of both species had strong activities (IC_{50} of Nanglai and Eri were 494.56±16.170 µg/ml and 497.512±15.198 µg/ml, respectively). Therefore, this study demonstrated that protein hydrolysates had biological activities to against causes of non-communicable diseases and also may be useful to prevent non-communicable diseases in the future.

Keywords: Silkworm pupae, Protein hydrolysate, Non-communicable diseases

Computer aided discovery against tyrosine kinase of EGFR

Ittipon Shu
Department of Bioscience and technology, Faculty of Science, Kasetsart University, Bangkok, Thailand
Ittipon.sh@ku.ac.th

Kiattawee Choowongkomon
Department of Biochemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
Kiattawee.c@ku.ac.th

Abstract

Epidermal growth factor receptor (EGFR) is a transmembrane protein which plays a role as a growth receptor regulating gene amplification including cell proliferation, anti-apoptosis, and et cetera which the uncontrollable process will lead to many types of cancer. Many clinical methods were developed targeting EGFR and from many research, peptide has been used as drugs for cancer but it quickly metabolized. Therefore, cyclic peptides are used for this research to observe its properties. In this study, we use molecular modeling to predict the 3D structure of cyclic peptide and molecular docking using GOLD to study the interaction between tyrosine kinase of EGFR and cyclic peptides. Our dock result showed a score of 26.11 for A68 and 11.55 for AA1 which it is not a good interaction between EGFR and cyclic peptide. Furthermore, we will mutate all 19 amino acid of cyclic peptide in every position between two ends of the ring which are methionine and dock against EGFR to observe the best formation between EGFR and cyclic peptide. There would be a possibility that we would find some of the cyclic peptides that has greater efficiency to inhibit EGFR. This study provides the insight of the interaction that will be useful for drug development for cancers.

KEYWORDS: EGFR, cell proliferation, anti-apoptosis, molecular modeling, cyclic peptide, molecular docking

Optimization of ethanol production from sugarcane top using thermotolerant yeast Kluyveromyces marxianus DMKU 3-1042 through simultaneous saccharification and fermentation (SSF) process

Phonlakrit Sirisopitakul
Department of Bioscience and Technology, F:aculty of Science, Kasetsart University, Bangkok, Thailand
Phonlakrit.si@ku.th

N oppon Lertwattanasalrnl *
Department oflvlicrobiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscinple@ku.ac.th

Abstract

At present, we have increased consumption of petroleum, which is conventional energy, and when it is burned it generates gas ·carbon dioxide that causes the global warming. Therefore, wc are tuming to renewable energy to decrease petroleum consumption problem. In Thailand, there are cultivation of sugarcane and sugarcane tops will become waste after the sugarcane is harvested. This research aim to study the appropriate condition for ethanol production from sugarcane tops, which contain 38-50 % of cellulose, 23-32 % of hemicellulose, and 15-25 % of lignin. The potential of sugarcane tops in the production of ethanol was studied through simultaneous saccharification and fermentation (SSF) process using a the1motolerant yeast Kluyveromyces marxianus DMKU 3-1042 .and enzyme ACCELLRASE® 1500. Before to SSF, sugarcane tops were pretreated by alkaline treatment incubated at 40 °C under a shaking condition of200 rpm for 24 hours. Four factors, sugarcane top loading, pre-hydrolysis times, inoculum sizes, and Tween20/80, which affect ethanol production via-SSF, were investigated. In substrate loading, 20 grams of sugarcane tops roduced highyst ethanol production. Now other factors are being tested. This preliminary result showed that optimization of these factors is useful in improvement of ethanol production.

Keywords: simultaneous saccharification and fermentation (SSF) process, ethanol fermentation, thermotolerant yeast, Kluyveromyces marxianus

Effects of brassinosteroid mimic on seedling growth and some physiological change of melon under salinity stress

Amornrat Poolsin
Department of Botany, Faculty of Science, Kasetsart University,
Bangkok, Thailand
amornrat.poo@ku.th

Kanapol Jutamanee*
Department of Botany, Faculty of Science, Kasetsart University,
Bangkok, Thailand
faaskpj@ku.ac.th

Abstract

The effects of 7,8-dihydro-8a-20-hydroxyecdysone (DHECD), a brassinosteroid mimic, on seedling germination and some physiological changes of *Cucumis melo* L. cv. Princess and Cat were studied. The DHECD at the concentration of 10^{-5} and 10^{-6} M were applied to the germination seed under stress condition by 150 mM sodium chloride for 9 days. The results showed that 10^{-6} M DHECD increased seedling growth, fresh weight and dry weight of the Princess cultivar, but no difference in growth was observed in Cat cultivar. Application of DHECD at all concentrations had no effect on changing of plant stress indicators: MDA and H_2O_2 contents. The results indicated that application of DHECD could alleviated salt stress only in the Princess cultivar. Moreover, salt stress had no effect on changing of MDA and H_2O_2.

Key words: brassinosteroid mimic, salinity stress, *Cucumis melo* L.

Developmental Anatomy of Flower and Pod of Bambara Groundnut (*Vigna subterranea* (L.) Verdc.)

Chalanton Kaewngam
Department of Botany, Faculty of Science, Kasetsart University,
Bangkok, Thailand
chalanton.ka@ku.th

Prasart Kermanee*
Department of Botany, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fscipsk@ku.ac.th

Abstract

The current work aims to study developmental anatomy of flower and pod of Bambara Groundnut (*Vigna subterranea* (L.) Verdc.) at cellular and tissue levels. The Bambara Groundnut was grown in natural conditions. The various stages of floral buds and developing pods were collected. The permanent slides were made, using the paraffin method. The results showed that the development of flower initiated from a terminal bud and an axillary bud at 20 days after germination, and developed to the blooming stage at 34 days after germination. The peduncle elongated and reached the soil surface, and started to form the pod at 15-25 days after blooming. The proembryo reached the globular, heart and torpedo stages at 35, 49 and 56 days after blooming, respectively. When the pods were 63 days after blooming, the embryos were mature. Pods and seeds developed fully at 70 days after blooming. The developmental anatomy of pods grown was also studied in soilless condition. The flowers completely developed into mature pods as in the normal condition.

Keywords: Bambara Groundnut, Flower development, Pod development, Anatomy

Morphology and molecular biology methods for identifying the species of stonewort (Family Characeae) in Kasetsart University

Chawin pipatpronpakdee
Department of Botany, Faculty of Science, Kasetsart University, Bangkok, Thailand
chawin.pi@ku.th

Nuttha Sanevas*
Department of Botany, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscintsv@ku.ac.th

Abstract

Diversity of stonewort (Characeae), in different environments within Kasetsart University which resulted in changes of shape, size and morphology was studied by using DNA Barcoding technique. Three types of DNA marker were used, i.e., ITS2, *matK* and *rbcL*. Amount of DNA fragment from 11 samples of stonewort was increased by PCR process with ITS2, *matK* and *rbcL* in 4, 8 and 11 samples, respectively. From the result, *rbcL* was used to identifying the stonewort samples. According to NCBI database and the result from Phylogenetic tree by MEGA7 program, the samples were classified into five species and two genera of stonewort including, *Chara corallina* Klien ex C. L. Wildenow, *C. zeylanica* Willdenow, *Nitella acuminata* A. Braun ex Wallman, *N. oligospira* A. Braun and *N. pseudofabellata* A. Braun.

Keywords: Characeae, stonewort, molecular biology, DNA barcoding

Comparative biological activity of *Polyalthia suberosa* (Roxb.) Thwaites in Champi Sirindhorn Forest, Lopburi.

Isariyaporn Chaisakorn
Department of Botany, Faculty of Science, Kasetsart University, Bangkok, Thailand
email:isariyaporn.c@ku.th

Sutsawat Duangsrisai*
Department of Botany, Faculty of Science, Kasetsart University, Bangkok, Thailand
email:fscissw@ku.ac.th

Abstract

Polyalthia suberosa (Roxb.) Thwaites belongs to Annonaceae. In folk wisdom, the pericarp of this plant was used to heal wound in mouth. Moreover, it has been reported that leaves and branches of this plant have anti-HIV activities *in vitro*. However, there was no report about comparing the antioxidant activities between leaves and pericarp of this plant yet. Therefore it became the objective of this study. Leaves and pericarps of *Polyalthia suberosa* (Roxb.) Thwaites were extracted and determined for total phenolic content (TPC), total flavonoid content (TFC), DPPH and FRAP assay. For TPC and TFC, leaves gave higher amount of phenolic (56.556 µg/mg) and flavonoid (4.608 µg/mg) than that of pericarp. It was consistent with the antioxidant activities. For DPPH assay, leaves showed lower IC_{50} (335.910 µg/mg) than that of pericarp (1822.465 µg/mg). In case of FRAP assay, leaf also showed higher activities (118.083 µg/mg) than that of pericarp (7.556 µg/mg).the ability free radicals when leaves and pericarp were tested by DPPH assay, leaves extract IC_{50} over the effect pericarp extract. The results of the study showed that leaves extract were more effective for antioxidant purposes than that of pericarp extract. Antibacterial, anti-inflammatory activities will be further studied.

Keywords : *Polyalthia suberosa* (Roxb.) Thwaites, antioxidant activities, total phenolic content, total flavonoid content.

Phytochemistry of *Pandanus odorifer* (Forssk.) Kuntze and it's Bioactivity

Kanlaya Kinking
Department of Botany, Faculty of Science, Kasetsart University,
Bangkok, Thailand
email: kanlaya.ki@ku.th

Srunya Vajrodaya*
Department of Botany, Faculty of Science, Kasetsart University,
Bangkok, Thailand
email: fscisyv@ku.ac.th

Abstract

Agricultural commodity for export, such as fruits are often destroyed by fungi which causes low quantity products. Synthesis chemical used for controlling diseases causes by fungi always be harmful to costumer's healthy and also international trade. So, it is necessary to look for natural plants which could be sources of bioactives compounds for using instead of those synthetic chemicals. Lipophilic root bark extract from *Pandanus odorifer* (Forssk.) Kuntze collected from Chanthaburi province was supported for ito antifungal activity against *Collectotrichum gloeosporioides* , fungi causes anthracnose. This research aims to isolate antifungal compounds from root bark of *P. odorifer* by using chromatographic technique and broth microdilution method with fungus causes diseases in Banana ito *Collectotrichum musae* and *Fusarium oxysporum*. It was found that the Lipophilic root bark extract from *P. odorifer* showed minimum inhibitory concentration (MIC) values against spore germination of *C. musae* as 2,500 µg / ml at 24 hours, but no effect against spore germination of *F. oxysporum*. Further investigation are in experimental stage.

Keywords: *Pandanus odorifer*, Phytochemistry, Bioactivity

Comparative Phytochemistry and Biological Activity in *Magnolia sirindhoniae* Noot&chaiermglin.

Krissakon Sriprom
Department of Botany, Faculty Science, Kasetsart University
Bangkok, Thailand
email:krissakon.s@ku.th

Sutsawat Duangsrisai*
Department of Botany, Faculty Science, Kasetsart University
Bangkok, Thailand
email:fscissw@ku.ac.th

Abstract

Magnolia sirindhoniae Noot&chaiermglin. (Champi Sirindhorn) belong to family Magnoliaceae. A newly discovered species in Thailand was found by Piya chaiermglin. in 1999. This species is classified as endangered. In this study, we aimed to compare total phenolic, total flavonoid content and antioxidant activities of leaf, pericarp and seed of *Magnolia sirindhoniae*. Plants were macerated with methanol for 7 days. The dried crude extract of each part was determined for total phenolic content (TPC), total flavonoids content (TFC) and antioxidant activities; nitric oxide radical scavenging (NO), the oxidation ferric reducing antioxidant power assay (FRAP) and DPPH assay. The result showed that leaf had the highest TPC (30.566 µg/mg), TFC (71.541 µg/mg) more than those of pericarp and seed. For DPPH assay, leaf extract showed the best activities among three parts with the IC_{50} value 301.526 µg/mg, followed by 502.906 µg/mg in seed and 808.214 µg/mg in pericarp. So did FRAP assay, leaf gave the highest activities with the value 66.440 µg/mg while seed and pericarp showed 28.338 µg/mg and 21.656 µg/mg respectively. However, NO activities didn't fall in the same trend. The highest activities was found in seed, followed by pericarp and leaf, respectively.From this study, it could be concluded that leaf of *Magnolia sirindhoniae* Noot&chaiermglin. Extracts contained highest amount of phenolic and flavonoid contents and showed the highest antioxidant activities among three parts of the plant. This finding supported that leaf of Magnolia can be analyzed for further pharmaceutical use.

Keywords: Champi Sirindhorn, *Magnolia sirindhoniae* Noot&chaiermglin., Antioxidant.

Effect of Sodium Chloride on Growth of Melon (*Cucumis melo* L.) Seedling

Nattamon Promchaisri
Department of Botany, Faculty of Science, Kasetsart University,
Bangkok, Thailand
nattamon.pr@ku.th

Kanapol Jutamanee*
Department of Botany, Faculty of Science, Kasetsart University,
Bangkok, Thailand
faaskpj@ku.ac.th

Abstract

The study on effect of sodium chloride (NaCl) on growth of melon seedling (*Cucumis melo* L.) were determined. The experiment design was completely randomized design and consisted of 0, 50, 100, 150 and 200 mM of NaCl. The results showed that NaCl at 150 and 200 mM decreased seedling elongation when compared to non NaCl application. Moreover, NaCl at 200 mM decreased fresh and dry weights of seedling. A Study of lipid peroxidation by measurement of malondialdehyde (MDA) revealed that NaCl at 200 mM in Cat cultivar and NaCl at 100, 150 and 200 mM NaCl in Princess cultivar had higher MDA content than untreated seedlings. Study of hydrogenperoxide (H_2O_2) revealed that H_2O_2 trend to increase in Cat cultivar and NaCl at 200 mM increased H_2O_2 in Princess cultivar. The results indicated that stress condition caused the reduction of melon seedling and finally caused the increase of stress indictor as H_2O_2 and MDA.

Key Word: *Cucumis melo* L., sodium chloride, malondialdehyde, hydrogenperoxide

Wood Anatomy of Dillenaiceae in Thailand

Nithikan Lutanawat
Department of Botany, Faculty of Science, Kasetsart University,
Bangkok, Thailand
Nithikan.l@ku.th

Prasart Kermanee*
Department of Botany, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fscipsk@ku.ac.th

Abstract

The Dilleniaceae plants are found in decidous forest. The members of this family are widely used for garden decoration. In addition, the wood are suitable for home furniture. In this study four wood species belong to the family Dilleniaceae including *Dillenia ovata* Wall.ex Hook.f.&Thoms, *Dillenia obobata* (BI.) Hoogl, *Dillenia perviflora* Griff and *Dillenia indica* Linn were collected and investigated. The wood samples were prepared into permanent slides using a sliding microtome technique and a cell maceration method. It was found that all species have diffuse-porous woods. Rays are multiseriate homocellular and uniseriate homocellular. Deposit substance was observed in *Dillenia indica* and *Dillenia ovata*.

Keywords : Anatomy, Wood, Dilleniaceae

Species Circumscription of *Aneura* Dumort. species (Aneuraceae, Marchantiophyta) in Thailand

Nopparat Anantaprayoon
Department of Botany, Faculty of Science, Kasetsart University,
Bangkok, Thailand
nopparat.an@ku.th

Ekaphan Kraichak*
Department of Botany, Faculty of Science, Kasetsart University,
Bangkok, Thailand
ekaphan.k@ku.th

Abstract

Aneura Dumort. is a simple thalloid liverwort with problematic species circumscription, because they have a small number of distinct morphological characters. Two species are currently reported from Thailand, including *A. pinguis* (L.) Dumort. and *A. maxima* (Schiffn.) Steph. This research focuses on species circumscription of the *Aneura* species found in Thailand. A detailed morphological and anatomical examination produced qualitative and quantitative characters for numerical taxonomy and statistical analyses. Molecular data from four regions, *trnL-F, psbA, rbcL* and ITS2 were generated to support the species circumscription. The results showed that most characters in the study could not be used to clearly delimit the species. Phylogenetic trees also showed the overlapping between two species and with several subgroups within *A. pinguis*.

Keywords: Bryophytes, Integrative Taxonomy, Liverworts, Phylogeny

Evaluation of DNA barcoding markers and species circumscription of *Sphagnum* L. From Phu Luang wildlife sanctuary Loei province

Pakawat Jarupund
Department of Botany, Faculty of Science, Kasetsart University,
Bangkok, Thailand
Pakawat.J@ku.th

Ekaphan Kraichak*
Department of Botany, Faculty of Science, Kasetsart University,
Bangkok, Thailand
ekaphan.k@ku.th

Abstract

Sphagnum are large nonvascular plants. *Sphagnum* is distributed throughout the world and reaches its highest abundance in the cool temperate areas. In nature, there is a high variation of morphology within species. The identification species of *Sphagnum* with morphology alone is difficult. Therefore, this project focuses on methods DNA barcording for identification of *Sphagnum* found in Phu Luang Wildlife Sanctuary. We used genetic information *Sphagnum* and morphological characters to examine species delimitation in this genus. We evaluated DNA of 10 markers: *nad5, SrbcL, rbcL, psbA, rps4, trnL-F, matK*, ITS, ITS2 and 26S. From The data analysis showed that the DNA barcording could not completely identify *Sphagnum* species from Phu Luang Wildlife Sanctuary, because the circumscription of *Sphagnum* is problematic when examined with principal component analysis of morphological data.

.

Keywords: *Sphagnum,* DNA barcording, DNA markers

Diversity of Plants Resources in Murals and Sculptures at Ratcha-orasaram Temple

Piyalak Rattanasirisup
Department of Botany, Faculty of Science, Kasetsart University,
Bangkok, Thailand
piyalak.r@ku.th

Srunya Vajrodaya*
Department of Botany, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fscisyv@ku.ac.th

Abstract

Historical investigation of the diversity of plant resources in murals and sculptures at Ratcha-orasaram temple was conducted from October 2018 to March 2019. Method of this investigation are surveying and photos collecting from 3 areas i.e. The Sermon Hall, Vihara of the Reclining Buddha and Phra Ubosot. The data were analyzed and compared with actual plants in order to identify plant species and show the meaning of these plants that symbolize the auspiciousness, based on information from botanical documents, Chinese – Thai cultural documents, principle and beliefs of each species. It was found 40 plant species of auspicious symbols could be identified. Some murals and sculptures could not be identified may due to these come from the imagination of the artisans who produce works.

Keywords: Ratcha-orasaram temple**,** Plants, Auspicious

Factors influencing differences between the community of epiphytic lichens and bryophytes.

Sangsuree Thippawan[1]
[1]Department of Botany, Faculty of Science, Kasetsart University
Bangkok, Thailand
email: sangsuree.t@ku.th

Ekaphan Kraichak[1,*]
[1]Department of Botany, Faculty of Science, Kasetsart University
Bangkok, Thailand
email: fsciepk@ku.ac.th

Abstract

An epiphyte is a plant that grows on other trees. In nature, it can be found on almost any tree. The characteristics of host trees can affect the occurrence of epiphytes. This study investigated the effect of two factors (Host Species and Host Size) on epiphytes. We surveyed and estimated the cover of epiphytes (lichens and bryophytes) on 6 host species including *Barringtonia macrostachya* (Jack) Kurz, *Dipterocarpus grandiflorus* (Blanco) Blanco, *Gluta elegans* (Wall.) Hook. f., *Mallotus peltatus* (Geisel.) Müll. Arg., *Shorea gratissima* Dye, and *Streblus ilicifolius* (Vidal), totaling 1326 stems. The study site is located in the Khao Chong long-term forest dynamics plot, in Trang Province. We found 33 lichens Species and 19 bryophyte Species. We analyzed the effect of host species and host size on differences in the number of epiphytes species and cover, using by ANOVA and Regression. The results showed that host species significantly affected the epiphytes. The number of species and coverings of lichens was the lowest, but the coverage of bryophytes was greatest in *S. gratissima.* When the size of the host increased, the number of bryophyte species and cover increased in *D. grandiflorus*, *M. peltatus*, and *S. gratissima*, but the number of epiphytes species and the cover remained constant in *B. macrostachya*, *G. elegans*, and *S. ilicifolius*. The results of the study indicate a need to maintain the diversity of tree species and large trees to preserve the diversityofthe epiphytes (lichens and bryophytes).

Keywords: bryophytes, epiphytes, lichens

Antioxidant and Anti-bacteria activities against *Propionibactecrium acnes* of *Zingiber montanum* (J. Koening) Link ex A. Dietr.extract

Suchanya Taprab
Department of Botany, Faculty of Science, Kasetsart University, Bangkok, Thailand
email: suchanya.ta@ku.th

Sutsawat Duangsrisai*
Department of Botany, Faculty of Science, Kasetsart University, Bangkok, Thailand
email: fscissw@ku.ac.th

Abstract

Zingiber montanum (J. Koening) Link ex A. Dietr. is a common medicinal plant that can be found in every household. Medicinal benefits have been used since ancient times in the treatment of pain relief. In this study, total phenolic content (TPC), total flavonoid content (TFC), and antioxidant activities; nitric oxide radical scavenging (NO), oxidation ferric reducing antioxidant power assay (FRAP) and DPPH assay were investigated. Dried rhizomes were crushed, soaked in 50% ethanol, filtered and then dried. The crude extract of *Zingiber montanum* (J. Koening) Link ex A. Dietr.were dissolved in 50% methanol and 100% methanol. The results showed that 50% methanol extract had higher content of phenolic (22.24 µg/mg) and flavonoid(17.479 µg/mg) more than in that of extracted by 100% methanol. However, 100% methanol crude extract showed better antioxidant activities of FRAP assay (19.949 µg/mg) and DPPH assay (IC_{50}equivalent to 722.982 µg/mg). Bacterial inhibition test on *Propionibactecrium acnes* using crude extracts from *Zingiber montanum* (J. Koening) Link ex A. Dietr. will be further analyzed.

Keywords: *Zingiber montanum* (J. Koening) Link ex A. Dietr., Antioxidant, Phenolic content, Flavonoid content

Diversity and growth of Stonewort (Characeae) in nursery of the Department of Botany, Faculty of Science, Kasetsart University

Supamart Phumkhokruk
Department of Botany, Faculty of Science, Kasetsart University
Bangkok, Thailand
Supamart.p@ku.th

Nuttha Sanevas*
Department of Botany, Faculty of Science, Kasetsart University
Bangkok, Thailand
fscintsv@ku.ac.th

Abstract

Diversity of stonewort (Characeae), as well as studies of growth and some water quality effected growth in nursery of the Department of Botany, Faculty of Science, Kasetsart University were studied from September 2017 to July 2018. Four species and two genera of stonewort including *Chara corallina* Klien ex C. L. Wildenow, *C. zeylanica* Willdenow, *Nitella pseudofabellata* A. Braun and *Nitella* sp. were recorded. The four species of stonewort were grown with some water quality found that the average of water temperature at 30.44 °C, pH 7.54, DO 7.18 mg/l, TDS 90.40 ppm and NaCl 63.45 ppm. Growth and development of thallus and gametangia of *C. corallina*, *C. zeylanica* and *N. pseudofabellata* were observed about 3 months. *C. zeylanica* main axis cell was longest as a percentage of 146.15, which the rate of growth of main axis cell was 0.63 cm/month. While a width of cell of *N. pseudofabellata* was the widest as percentage of 10.24 and having 0.034 cm/month of the width rate of growth. The development of antheridia and oogonia of all species was found during 3-5 days and 4-5 days, respectively. And the development of *C. zeylanica* oospore was the fastest at 3 days after found the oogonia.

Key words: characeae, stonewort, water quality, growth

The creation of transgenic plants with fluorescent tag-ATG8 expressions which use for the study of autophagy processes in plant

Atitaya Panyadee
Department of Genetics, Faculty of Science, Kasetsart University,
Bangkok, Thailand
atitaya.pa@ku.th

Anongpat Suttangkakul*
Department of Genetics, Faculty of Science, Kasetsart University,
Bangkok, Thailand
anongpat.s@ku.th

Abstract

Autophagy is a degradation process found in eukaryotic organisms. It uses ubiquitin conjugation pathway with the interaction of 2 ubiquitin-like conjugation pathway related proteins; *ATG8* and *ATG12*. *ATG8* is often used a molecular marker to check the autophagy process. Autophagy is important in responding to nutrients starvation and abiotic stress. Pentatricopepide repeat (PPR) protein is also related to abiotic stress by functioning in RNA modification process in chloroplast. However, interaction between PPR and autophagy has not been well-studied. Therefore, in this research, we would like to study this interaction by creating transgenic plants containing fluorescent tag-ATG8 in *ppr* mutant background, and the atg5 *ppr* double mutant. First, we optimized annealing temperature for detecting the presence of PPR wildtype alleles. The temperature tested were 50, 51, 52.9, 55.7, 59.1, 62, 63.8, 65 o Celsius. The result suggested that all temperature tested can be used. Next, GFP-AtATG8, mcherry-GFP-AtATG8, GFP-CsATG8, mcherry-GFP-CsATG8 were transformed into Arabidopsis *atg5-1* and *atg7-1* and *Col-o* by using floral-dip method. The protocol for floral-dip in the lab suggested dipping the plants twice to increase efficiency. However, all plants were dead, which could be because these plants were weak or the agrobacterium culture used were too concentrated. We then attempted dipping the plants only once and the plant survived. After that, the seeds with insertion were selected on hygromysinB medium and then tested the genotype by PCR. In summary, we have tested the annealing temperature for amplifying PPR gene and created transgenic plants with fluorescent-tagged ATG8, which can be used for studying the genetic interaction between autophagy process and RNA editing in the future.

Keywords: Autophagy, Pentatricopepide repeat (PPR) protein, transgenic plants, *ATG8*

Cloning of salt tolerant genes in *Dendrobium* orchid

Benjarat Muangkham
Department of Genetics, Faculty of Science, Kasetsart University,
Bangkok, Thailand
benjarat.mu@ku.th

Anongpat Suttangkakul*
Department of Genetics, Faculty of Science, Kasetsart University,
Bangkok, Thailand
anongpat.s@ku.th

Abstract

Dendrobium orchid is an economic plant that generates income for the country. Salinity cause the plants to stop growing and has a major impact on plant growth and crop production. The important genes involved in salinity response in plants include *Salt Overly Sensitive* gene *(SOS1)* and *Sodium / hydrogen exchanger 1 (NHX1)* gene. *SOS1* maintaining ion homeostasis and *NHX1* is important for proton exchange in cells. These genes have not been well studied in *Dendrobium* orchid. Therefore, the aim of this research is to clone and determine the sequence of these gene for uses in improving salt tolerance in *Dendrobium*. We cloned the gene using Genomic DNA as template for Polymerase chain reaction (PCR). The factors related to PCR that are examined in this research are annealing temperature, different taq polymerase enzyme, and PCR additive such as enhancer. The annealing temperature tested were 50.0, 53.9, 56.3, 58.3, 59.4, 60.0°C , The result showed that the appropriate annealing temperature for *SOS1* gene is a 59.4 °C and for *NHX1* gene is a 60.0 °C. The enzyme tested for PCR are the Q5 DNA polymerase & Taq DNA polymerase. The result showed that the appropriate enzyme for PCR is the Q5 DNA polymerase. For PCR additive, the research is ongoing and will be reported in the future. In summary, we have successfully find the appropriate annealing temperature and enzyme for amplifying *Dendrobium SOS1 and NHX1* gene which will be ligated with vector (pGxT) and transformed into *Escherichia coli* for subsequent studies.

Keywords: *Dendrobium* orchid, *NHX1*, salt tolerant, *SOS1*

Tissue culture and genetic transformation using Agrobacterium in *Jatropha curcas*

Chiratchaya Kittapaspong
Department of Genetics, Faculty of Science, Kasetsart University,
Bangkok, Thailand
E-mail: chiratchaya.ki@ku.th

Sompid Samipak*
Department of Genetics, Faculty of Science, Kasetsart University,
Bangkok, Thailand
E-mail: fscispsp@ku.ac.th

Abstract

Jatropha curcas is a tropical deciduous plant with multi-purposes including being used as a medicinal resource, as a living fence and as a biofuel crop whose oil can be obtained from the seeds. This research aimed carry out tissue culture protocol and genetic transformation process using Agrobacterium-mediated method in *J. curcas*. Cotyledon was found to be suitable for these processes. The explants were transformed with PCXSN HA_MC containing ethylene response factor gene (ERFVII-3MA) and hygromycin resistant gene (Hyg). Greenish callus were induced from cotyledon of KUBP 78-9 *J. curcas* variety when cultured on Murashige and skoog's (MS) medium supplement with various plan hormones and antibiotic to regenerated shoot. Multiple shoot were obtained and now are under verification for presence of the transgene was confirmed by using PCR.

Keywords: *Jatropha curcas*, *Agrobacterium tumefaciens*, Genetic transformation, Tissue culture

Gene editing in tomato using CRISPR/Cas9

Sompid Samipak
Department of genetics, Faculty of science, Kasetsart University
fscispsp@ku.ac.th

Gosin Chantharuthai
Department of genetics, Faculty of science, Kasetsart University
E-mail: gosin.c@ku.th

Abstract

The CRISPR/Cas9 (Clustered Regulatory Interspaced Short Palindromic Repeats/CRISPR associated protein 9) system has successfully been used in various organisms for precise targeted gene editing. We are using the CRISPR/Cas9 system to introduce specific mutations. In this study, three genes, Lanceolate (LC), Carotenoid Isomerase (CRTISO) and Defective Chloroplasts and Leaves (DCL) were used for testing targeted mutagenesis in tomato (*Solanum lycopersicum*) plants through an *Agrobacterium tumefaciens*-mediated transformation method. The expected mutations would lead to easy to observe phenotypes.

Development of molecular markers for the detection of drought tolerance of mulberry

Iriyana Akkaraprasit
Department of Genetics, Faculty of Science, Kasetsart University,
Bangkok, Thailand
Iriyana.a@ku.th

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

Abstract

Mulberry (*Morus* spp.), is a major important tree, is cultivated in Thailand and other countries across the world. Mulberry leaves play a crucial role in driving the sericulture industry as it serves as the single feed for silkworm. In many parts of Thailand encounter non-sufficient irrigation system causes the water deficient for mulberry cultivation, which affects the mulberry growth. This situation could be solved by the utilization of drought tolerance mulberry cultivars. The objective of this study is to develop the molecular markers for the detection of drought tolerance in mulberry. The 20 pairs of Inter-simple sequence repeat (ISSR) primer were used to analyze the genetic diversity among drought tolerant and drought susceptible varieties. The result showed that only primer number 9, 12, 13, 15 and 18 can amplify the polymorphic bands between these two varieties. The eight polymorphic bands, ranging from 600 to 3,000 base pairs, were cloned. Only 2,500 bp amplified from Primer 9 was sent out for sequencing. The sequence were blasted in NCBI database. Our sequences showed the highest similar score with HMA3 protein gene of *Morus notabilis* (MG773150.1). HMA3 is an essential protein involved in drought stress of *Morus*. This finding can be used to design specific primer to develop the markers for selection of drought tolerant mulberry cultivars in the future.

Keywords: *HMA3*, ISSR, Molecular markers, Mulberry

Cloning and transformation of group *VI-L ERF* from mungbean into *Arabidopsis* for increasing tolerant to abiotic stress

Jaruwan Sreeratree
Department of Genetics, Faculty of Science, Kasetsart University,
Bangkok, Thailand
jaruwan.sre@ku.th

Piyada Juntawong*
Department of Genetics, Faculiy of Science, Kasetsart University,
Bangkok, Thailand
fscipdj@ku.ac.th

Abstract

Abiotic stresses such as heat, drought, salinity and submergence can heavily damage crop production. Typically, these stresses induce accumulation of reactive oxygen species in plant cells resulting in cell death. This work focuses on molecular cloning and overexpression of mungbean stress responsive transcription factor namely the group VI-L Ethylene Responsive Factor (ERF). The group VI-L ERF gene was amplified from mungbean complementary DNA (cDNA), cloned into pCXSN-Ti binary vector and transformed into *Escherichia coli*. The *E. coli* containing the recombinant plasmid was selected on kanamycin. The recombinant plasmid was extracted and subjected to DNA sequencing. The selected recombinant plasmid was subsequently transformed into *Agrobacterium tumefaciens* which will be used for floral dipping into *Arabidopsis thaliana* plant. In order to obtain the transformants, seeds will be selected on hygromycin media. Future work will use the transgenic plants for functional analysis of group VI-L ERF.

KEYWORDS: abiotic stress, *Aradopsis*, mungbean, group *VI-L ERF*

DNA barcoding of fungus-growing termites

Jindarat Kouhathong
Department of Genetics, Faculty of Science, Kasetsart University,
Bangkok, Thailand
Jindarat.ko@ku.th

Mingkwan Nipitwattanaphon*
Department of Genetics, Faculty of Science, Kasetsart University,
Bangkok, Thailand
Mingkwan.n@ku.th

Abstract

Fungus-growing termites in Thailand are in the subfamily Macrotermutinae. This termite group culture fungus by making appropriate conditions for fungal growth within their nest and eat asexual spore of fungus for food. Several species are similar in morphology, making it impossible to clearly identify species or may misidentify species. In addition, there is a need to increase the database of fungus-growing termites in Thailand, which currently has been rarely study. In this study, we used DNA barcoding techniques to identify fungus-growing termites in Thailand by using two mitochondrial genes, COI and COII, and compared the result of species identification by the two genes. We also constructed a molecular phylogeny to help species identification and to study evolutionary relationship of these termites. From a total of 95 samples, we found seven species belonging to five genus, *Macrotermes annandalie*, *Macrotermes carbonarius*, *Macrotermes gilvus*, *Microtermes obesi*, *Odontotermes sp.*, *Ancistrotermes pakistanicus* and *Hypotermes makhamesis*, We suggest that DNA barcoding with the COII gene is better than COI gene because it was easier to amplify and there are more sequences in the database compared to the COI gene.

Keywords: Fungus-growing termites, Mitochondrial DNA, DNA barcoding

Optimization of the *Anopheles* recombinant protein expression and purification in *E. coli*

Kanjanabhorn Aksonsit
Department of Genetics, Faculty of Science, Kasetsart University,
Bangkok, Thailand
Kanjanabhorn.a@ku.th

Anchanee Kubera*
Department of Genetics, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fsciacs@ku.ac.th

Abstract

Malaria is caused by the infection of the *Plasmodium* parasite and transmitted by female *Anopheles* mosquito. When the female *Anopheles* mosquito bites, the parasite from the saliva of the mosquito will enter in the blood of a human. This disease is spread in the tropical countries, including Thailand. In this study, two *Anopheles* genes, *Antennapedia homeotic protein* (*Antp*) and *Fibrinogen-related protein* (*FREP*) were focused. These two genes were synthesized and cloned into pET28a. The recombinant plasmids were transformed into *E. coli* BL21(DE3). The recombinant proteins were expressed in *E. coli* under the IPTG induction. The results showed that these two proteins were successfully expressed as the soluble forms with histidine tag. The affinity chromatography using Ni^{2+} matrix was used to purify the recombinant proteins. The purified proteins will be further confirmed by LC/MS.

Keywords: malaria**,** *Anopheles dirus, Antp, FREP*

Meiotic chromosomes of the passionvine bug, *Leptoglossus gonagra*

Kredmook Butprom
Department of Genetics, Faculty of Science, Kasetsart University, Bangkok, Thailand
kredmook.b@ku.th

Mingkwan Nipitwattanaphon*
Department of Genetics, Faculty of Science, Kasetsart University, Bangkok, Thailand
mingkwan.n@ku.th

Abstract

The passionvine bug, *Leptoglossus gonagra* (Heteroptera: Coreidea) is a polyphagous insect found in many places in Thailand. They have type of chromosome called holocentric chromosomes, which spindle fibers can attach a long the whole chromosomes. In this study, male passionvine bugs collected from Buriram province were studied for meiotic chromosome behavior and karyotype using lacto-aceto-orcein staining. The result showed that chromosome complement of *L. gonagra* was 2n= 10 + XY. Like other heteropteran species, meiotic chromosome behavior of *L. gonagra* showed that autosomes were divided pre-reductionally while sex chromosomes were divided post-reductionally. At metaphase I, sex chromosomes formed a pseudobivalent, while the autosomal bivalents arrange in a circle. The karyotype of *L. gonagra* will be presented.

Keywords: meiosis, karyotype, holocentric chromosome

The Effect of Transgenic Papaya on the Diversity of Soil Microbe

Kunnika Thongrak
Department of Genetics, Faculty of Science, Kasetsart University,
Bangkok, Thailand
kunnika.t@ku.th

Anongpat Suttangkakul*
Department of Genetics, Faculty of Science, Kasetsart University,
Bangkok, Thailand
anongpat.s@ku.th

Abstract

Papaya is an important economic crop of Thailand. But nowadays, papaya yield has been damaged from diseases including papaya rings pot virus. Therefore, biotechnology and genetic engineering have been used to develop papaya to be able to resist viruses. Although transgenic papaya gives better results in disease resistance than wild type, there is still concern about the effects of transgenic plant on the environment especially the impact on the diversity of soil bacteria. Therefore, this study aimed at examining the diversity of antibiotic-resistant bacteria as well as finding methods for extracting high quality DNA for metagenome. Therefore, we conducted experiments in two parts. First, soil used to grow transgenic papaya, wild type papaya, and pre planting soil were compared. For the second part soil in landfill ponds with or without transgenic papaya were compared. The abundance of bacterial in all soil samples were analyzed by culturing on LB and TSA medium both with and without antibiotics. The number of soil microbe grown in the medium was then tested using the Friedman's Test. The results showed that there is no statistically significantly different among the sample. In addition, this study requires a method for extracting DNA suitable for metagenomic from soil samples. We tested three methods including manual protocol (Tanveer etal, 2016), protocol E (Gupta, 2016) and QIAamp® Fast DNA Stool Mini Kit protocol. The results showed that manual protocol provided better DNA quality that can be used in DNA amplification reaction than protocol E but protocol E provided a greater DNA yield than manual protocol. Mini Kit protocol provided a very low amount of DNA compared to manual protocol and protocol E, and cannot be used in the next step. Therefore, we concluded that growing transgenic papaya does not affect the diversity of culturable bacteria in the soil and the manual extraction method is the most suitable for extracting soil microbe DNA for metagenomic analysis.

Keyword: Papaya, Metagenomic analysis, Soil Microbe

Effect of LED light on expressions of flowering genes in *Jasminum sambac*

Lakkhana Wongsrisang
Department of Genetics, Faculty of Science, Kasetsart University,
Bangkok, Thailand
lakkhana.w@ku.th

Sompid Samipak*
Department of Genetics, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fscispsp@ku.ac.th

Abstract

Jasminum sambac or Malila is a well-known flowering plant in Thailand. Malila is an economically important plant with distinctive fragrance. It is considered a symbol of Mother's day in Thailand and it is widely used in Buddhism as a garland to make offering to Buddha. It grows well in hot climate but in the wintertime, Malila flower less produce supply shortage in the market. This study aimed to analyze expressions levels of genes that are related to the flowering of jasmine including *AGL15*, *CLV*, *MCM3* and *TCX2*. Primers were designed based on *J. sambac* sequences found in the Sequence Read Archive. Polymerase Chain reaction were done on Malila's genomic DNA while quantitative PCR (qPCR) was done on Malila's cDNA converted from the RNA extracted from *J. sambac* flower tissues.

Keywords: *Jasminum sambac***,** Malila**,** Sequence Read Archive**,** quantitative PCR

Characterization of anti-biofilm producing endophytic actinomycetes against *Escherichia coli* and *Staphylococcus aureus*

Natkamol Thoraneenitiyan* and Arinthip Thamchaipenet**
Department of Genetics, Faculty of Science, Kasetsart University, Bangkok, Thailand
*natkamol.t@ku.ac.th, **arinthip.t@ku.ac.th

Abstract

Escherichia coli and *Staphylococcus aureus* are respective Gram-negative and Gram-positive bacteria that secrete virulence factors involved with biofilm formation and cause infection. Biofilm is a complex architecture containing exopolysaccharides, proteins and nucleic acids which helps bacteria adhere a surface and protects them from stresses by diminishing of antibiotics and host defenses that caused bacterial perseverance in chronic infections. Actinomycetes are Gram-positive filamentous bacteria which are known as dominant producers of antibiotics including agents against biofilm formation. In this work, 33 strains of endophytic actinomycetes that showed no antimicrobial activity against *Escherichia coli* and *Staphylococcus aureus* were tested for anti-biofilm activity against those bacteria on 96-well plate using crystal violet assay. The aim is to screen for anti-biofilm agents that have no anti-microbial activity such as short peptides or enzymes. The results showed that 14 and 2 strains of endophytic actinomycetes decreased more than 50% biofilm formation of *E. coli* and *S. aureus*, respectively. These positive strains were identified by PCR amplification and sequencing of 16S rRNA genes and compared to the type strains using EzBioCloud. Multiple alignment of 16S rRNA gene sequences was performed using ClustalX Phylogenetic tree was generated using neighbor-joining method by MEGA version 7.0 with boothstrapping 1000 times. The supernatant of positive strains has been treated with proteinase K and heat to examine whether the releasing anti-biofilm agents are proteins or enzymes. This work supports that endophytic actinomycetes are potential sources for anti-biofilm compounds.

Type and quantity of carotenoid under normal condition and high light condition in lichen photobionts

Nutpapar Pikulkaew
Department of Genetics, Faculty of Science, Kasetsart University,
Bangkok, Thailand
nutpapar.p@ku.th

Anchalee Sirikhachornkit
Department of Genetics, Faculty of Science, Kasetsart University,
Bangkok, Thailand
anchalee.si@ku.ac.th

Abstract

Carotenoids are pigments that are important components of the photosynthesis and photoprotection. They are found in photosynthetic organism such as plants, algae and blue-green algae (cyanobacteria) and in non-photosynthetic organisms including fungi and bacteria. Some carotenoids such as β-carotene, lycopene, lutein, sstaxanthin and zeaxanthin can be useful and valuable substances. Lichens are defined as coexistence between groups of fungi called mycobionts and green algae or blue-green algae (cyanobacteria) called photobionts. This coexistence of these organisms results in lichens being able to adapt to inappropriate environments. In this study, we identified lichen photobionts from the environment by PCR and characterized the types and quantity of carotenoid in each photobiont in normal and oxidative stress conditions. The growth rate of each lichens in different solutions was measured. In conclusion, oxidative stress had an effect on the quantity of carotenoid in the photobionts, which might be important for adaptation of lichens in unfavorable environments.

Keywords: Lichens, oxidative stress, carotenoid, photobionts

Molecular Identification of wild edible mushrooms

Pacharaporn Maneein
Department of Genetics, Faculty of Science, Kasetsart University,
Bangkok, Thailand
pacharaporn.m@ku.th

Mingkwan Nipitwattanaphon*
Department of Genetics, Faculty of Science, Kasetsart University,
Bangkok, Thailand
mingkwan.n@ku.th

Abstract

Mushrooms are fungal species belonging to the phylum Basidiomycota and Ascomycota that has a higher evolution than other types of mold. There are two types of mushrooms: edible and poisonous mushrooms. Some edible wild mushrooms that are found in nature may have incomplete characteristics for species identification, so molecular identification can be used instead. In this study, we identified 31 species of edible mushrooms from the dipterocarp forest in Nakhon Ratchasima and Sakon Nakhon using morphological characters. Then, molecular identification was applied by using polymerase chain reaction (PCR) to amplify the internal transcribed spacer (ITS) of the rRNA gene and then used Sanger sequencing to obtain the barcoding sequences. Sequences were BLASTed to the GenBank database to get the identified species. The sequences were aligned using MAFFT multiple sequence alignment and performed phylogenetic analysis to help species identification and also study evolutionary relationships. The species identification by both methods will be compared and our results will be presented.

Keywords: internal transcript spacer (ITS), DNA barcoding, evolution

Evaluation of pumpkin diversity by ISSR markers

Rinrapas Nakarakjirachote
Department of Genetics, Faculty of Science, Kasetsart University,
Bangkok, Thailand
E-mail: rinrapas.n@ku.th

Sompid Samipak*
Department of Genetics, Faculty of Science, Kasetsart University,
Bangkok, Thailand
E-mail: fscispsp@ku.ac.th

Abstract

Pumpkin (*Cucurbita moschata* Decne.) is a well-known vine vegetable with hands for adhering to various support. The leaves are succulent, single-leaf, pentagonal, with hair on both sides while the flowers are bell-shaped with bright yellow color. Pumpkin fruits have many characteristics, generally, round shape with slightly rough surface. They are native to the Americas, but can be grown in both tropical and cold regions and now have been found around the world. There are many varieties of pumpkins with various fruit sizes, shapes and flesh textures. This study aims to assess the genetic diversity of a pumpkin germplasm collected at Rajamankala University of Technology, Lanna using 36 Inter-Simple Sequence Repeat (ISSR) markers.

KEYWORDS: *Cucurbita moschata*, DNA marker, ISSR marker, PCR-ISSR

Origin of ancient crocodiles excavated from archaeological sites in Thailand.

Sarawanee Suetrong
Department of Genetics, Faculty of Science, Kasetsart Univerity,
Bangkok, Thailand sarawanee.su@ku.th

Wunrada Surat*
Department of Genetics, Faculty of Science, Kasetsart Univerity,
Bangkok, Thailand fsciwrds@ku.ac.th

Abstract

Hor-Ek archaeological site is located in Nakhon Pathom and the age of this site is around 1,200 years old. Many evidence such as prehistoric polished stone tools, earthenware, sea shells, modern objects and mandible of the crocodile had been found in this site in 2009. This study aims to identify species of crocodile bones. Five ancient crocodile bones were collected from Hor-Ek archaeological site. The characteristics of the bone specimens that we collected were different. Ancient DNA (aDNA) was a genetic material obtained from ancient specimens and was damaged caused by environment factor. Thus, the DNA of these specimens extracted by two methods that were specific for ancient specimens including the method that using silica beads and another one using spin column. In addition, the DNA concentration was detected using Qubit® Fluorometer, which showed that DNA extraction by using a spin column had a higher DNA concentration than extraction by using silica beads. Thus, this suggested that DNA extraction by using a spin column was better than using silica beads. From the analysis of the evaluation of aDNA fragment, size and quantity by the Agilent 2100 bioanalyzer, it showed that some samples had no detectable peaks. These results suggested samples that had been stored for a long time degraded DNA and the methods for DNA extraction needed to be adjusted for increasing the quality and quantity of DNA that was highly degraded ancient DNA specimens.

Keywords: Ancient crocodile, DNA extraction, Ancient DNA

DNA barcoding of *Russula* mushrooms

Saruta Bubphapasom
Department of Genetics, Faculty of Science, Kasetsart University,
Bangkok, Thailand
Saruta.b@ku.th

Mingkwan Nipitwattanaphon*
Department of Genetics, Faculty of Science, Kasetsart University,
Bangkok, Thailand
mingkwan.n@ku.th

Abstract

Russula is one of ectomycorrhiza fungi, which form ectomycorrhizal symbiotic relationships with higher plants. Many *Russula* are edible mushroom. They have similar morphology but various colors, making it difficult to identify species. In addition, if the obtained samples were incomplete, it may affect species identification. In this study, we used DNA barcoding techniques to classify 20 species of *Russula* mushroom in Thailand, including 5 species of non-*Russula* mushroom belonging to the family *Russulaceae* collected from the 72nd Year HM Queen Sirikit Chalermprakiat Dry Dipterrocarp Park, Kasetsart University Chalermphrakiat Sakonnakhon Province Campus and dipterocarp forest, Wang Nam Khiao Forest Student Training Station, Nakhon Ratchasima Province. We amplified the *internal transcribed spacer* (*ITS*) of the *rRNA* gene in the nucleus by using Polymerase Chain Reaction (PCR) and sequenced. The obtained mushroom sequences were BLASTed to identify species *via* DNA barcoding method. Additionally, we constructed phylogenetic trees to help *Russula* mushroom identification. *Russula* sequences will be deposited in the database to increase the data of mushroom from Thailand, which currently under study. Our study will be useful for *Russula* mushroom identification in the future.

Keywords: Ectomycorrhizal fungi, *Russula*, DNA barcoding, Phylogenetic

Finding the active compounds against *Anopheles* protein to inhibit the *Plasmodium* development.

Siripen Rungsuwannarat
Department of Genetics, Faculty of Science, Kasetsart University,
Bangkok, Thailand
Siripen.r@ku.th

Anchanee Kubera*
Department of Genetics, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fsciacs@ku.ac.th

Abstract

Malaria is an infectious disease caused by the *Plasmodium* parasites. Saglin protein is a receptor protein located on the salivary glands of *Anopheles* spp. This protein is expressed when the salivary glands are invaded by *Plasmodium* sporozoites. Saglin can bind to the *Plasmodium* sporozoite thrombospondin related anonymous protein (TRAP). The aim of this study was to express, purify and determine the folding of the recombinant protein, saglin. This protein was expressed in the *E. coli* under IPTG induction. Saglin was expressed as an inclusion body. This protein was dissolved in 6M urea and purified using Ni^{2+} affinity chromatography. The purified protein was dialyzed in 1XPBS. SM1 peptide was used to determine the correct folding of saglin. The surface plasmon resonance (SPR) technique will be further employed to examine the binding of saglin and SM1.

KEYWORDS: Saglin protein, SM1, salivary glands, *Plasmodium*, malaria

Cloning and transformation of group III ERF from mungbean into arabidopsis for increasing tolerant to abiotic stress

Supawadee Macharern
Department of Genetics, Faculty of Science, Kasetsert University, Bangkok, Thailand
supawadee.mac@ku.th

Piyada Juntawong*
Department of Genetics, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscipdj@ku.ac.th

Abstract

Global warming causes an increase in world average temperature resulting in global climate change. Global warming reduces crop productivity and causes economic disadvantages. Mung bean is a biennial legume crop that is commonly grown in tropical areas. It is fast growing and requires little amount of water to grow. Moreover, it helps fixing soil nitrogen by symbiosis with rhizobacteria. However, global warming can cause mung bean yield reduction. Therefore, improving mung bean growth under global warming is an important issue. This study focusing on cloning and overexpression of group III Ethylene Response Factor (ERF) transcription factor (*Vradi08g05240)*. The group III ERF transcription factor was found responding to multiple abiotic stresses. *Vradi08g05240* open reading frame was amplified from cDNA using gene specific primers and inserted into pCXSN Ti-binary vector by ligation independent cloning technique. Bacterial clones containing the recombinant plasmids were selected on kanamycin culture medium. Colony PCR was used to confirm the present of recombinant plasmid. Recombinant plasmid was extracted and checked by DNA sequencing. The selected recombinant plasmid was transformed into *Agrobacterium tumefaciens* by electroporation. The *A. tumefaciens* cultures were used for floral dipping in order to transform and express this gene in *Arabidopsis thaliana* plant. The Arabidopsis seeds will be selected in plant media containing hygromycin. The transgenic plants will be used for future phenotypic analysis in response to environmental stress.

Keywords: Global warming**,** Mung bean, Environmental stress**,** *Vradi08g05240*

Determination of *Plasmodium* gene expression levels at ookinete and oocyst stages

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

Anchanee Kubera
Department of Genetics, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fsciacs@ku.ac.th

Abstract

Malaria is an infectious disease that is transmitted by the *Anopheles* mosquitoes. The malaria transmission starts from the mosquito bite the infected human. The *Plasmodium* gametocytes travel to the midgut of the mosquito then develop to ookinetes, oocysts and sporozoites, respectively. The purpose of this study was to investigate the gene expression levels of the *P. vivax* at ookinete and oocyst stages. Ten candidate genes of the *P. vivax* were selected from the transcriptome results at 18 hours (ookinente stage) and 7 days (oocyst stage) post-infection to confirm the expression levels by quantitative real-time PCR (qRT-PCR). The total RNA was extracted from the *P. vivax*-infected *An. dirus* mosquitoes and converted to cDNA. The qRT-PCR was performed using *merozoite surface protein P41* gene as the internal control. The results showed that the expression levels of those ten candidate genes corresponded to the results of transcriptome. Four genes were found as stage specific genes. The ookinete specific genes were *SSU, acyl-CoA thioesterase* and the oocyst specific genes were *small subunit rRNA, ubiquitin-protein ligase 1*.

KEYWORDS: *Plasmodium vivax*, transcriptome analysis, *Anopheles* mosquitoes

Tissue culture and genetic transformation by *Agrobacterium tumefaciens* in potato

Sutthinee Lapchai
Department of Genetics, Faculty of Science, Kasetsart University,
Bangkok, Thailand
sutthinee.l@ku.th

Sompid Samipak*
Department of Genetics, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fscispsp@ku.ac.th

Abstract

Tissue culture is the cultivation of plant cells, tissues, organs or protoplast on specially formulated nutrient media under sterile conditions. This technique can be applied for various purposes such as plant propagation or plant improvement. The objectives of this study were to perform tissue culture and gene transformation processes on potato. The sodium hypochlorite-sterilized buds of potato were cultured on Murashige and Skoog (MS) medium. After 3-4 weeks, nodes of potatoes plantlet were used as explants for transformation by *Agrobacterium tumefaciens*. The transgene contained c-lysozyme gene (Lys) which encodes enzyme that can destroy peptidoglycan causes Gram-negative bacteria to die. Genetic transformation was carried out by Agrobacterum-cocultivation process. Putative transgenic plants are obtained and now are being tested by polymerase chain reaction for presence of the transgene.

Keywords: Potato, Tissue culture, *Agrobacterium tumefaciens*, c-lysozyme gene

Expression of Hsp22 family genes in wildtype and mutant defective in carotenoid synthesis in *Chlamydomonas reinhardtii*

Suwatcharaporn Hadradchai
Department of Genetics, Faculty of Science, Kasetsart University,
Bangkok, Thailand
Suwatcharaporn.h@ku.th

Anchalee Sirikhachornkit*
Department of Genetics, Faculty of Science, Kasetsart University,
Bangkok, Thailand
anchalee.s@ku.ac.th

Abstract

Heat shock protein 22 (Hsp22) in *Chlamydomonas reinhardtii* is a protein that is located in the cytosol where it is thought to interact with Photosystem II (PSII) during stress to protect the function of PSII and damage from light. In the *Chlamydomonas* genome, eight *hsp22* genes are found, namely *hsp22A-hsp22H*. To characterize the function of hsp22 proteins during heat and light stresses, we employed the use of a light sensitive mutant, *npq1lor1*, which is defective in the carotenoid synthesis. Phenotype during different stresses were tested and compared between the WT and mutant. Results showed that *npq1 lor1* is very sensitivity to high light and is mildly sensitive to heat. The expressions of all genes are being tested by semi-quantitative RT-PCR. Results from this study will be useful in engineering plants and algae with higher tolerance to heat and light stresses.

KEYWORDS: *Chlamydomonas*, heat shock protein 22 (Hsp22), carotenoid synthesis, *npq1lor1*

Assessment of Transformation Efficiency in Cucurbits Using Agrobacterium Floral Dip Method

Wantanaporn Martmek
Department of Genetics, Faculty of Science, Kasetsart University,
Bangkok, Thailand
wantanaporn.m@ku.th

Anongpat Suttangkakul*
Department of Genetics, Faculty of Science, Kasetsart University,
Bangkok, Thailand
anongpat.s@ku.th

Abstract

Cucurbits are important crops in Thailand and the breeding to increase its productivity is important for farmers. Plant improvements using genetic engineering methods often require efficient transformation. Agrobacterium transformation method is easy, conveniently and does not affect regeneration. Therefore, the objective of this study is to find the most effective stage for Agrobacterium transformation into the flowers of the Cucurbits using floral dip method. GUS reporter construct containing antibiotic resistance gene and GUS reporter gene were used for transforming Cucurbits flowers. Transformation efficiency are examined by GUS staining which can cause blue color in the flower tissue. The two factors tested for floral dip method are the stage of flower and the container used for dipping. Three species of Cucurbits including Cucumber (Cucumis Sativus Linn), Angled Loofah (Luffa acutangula L. Roxb) and Balsam Pear (Momordica charantia Linn) were studied. For Cucumber, male flower cannot be transformed and female cucumber flower can be transformed after yellow petals become visible. Blue color was detected in the seeds. However, after flower opening, only stigma became blue. For Angled Loofah, female flower cannot be tested. However, all stages of male flower can be transformed. For Balsam Pear, female cannot be transformed. However, before flower opening, male flower can be transformed. For the container, we compared between flask and plate. The result shows that more blue tissue is detected when using flask floral dipping. This could be because flower can soak up Agrobacterium solution better. In summary, all three species can be transformed and we still need to determine transformation efficiency by selecting seed, on antibiotics in the future.

Keywords: Cucurbits, Transformation, *Agrobacterium*, Floral Dip

Origin of ancient cows excavated from Ban Dung archaeological site

Yanika Piyasanti
Department of Genetics, Faculty of Science, Kasetsart University,
Bangkok, Thailand
yanika.pi@ku.ac.th

Wunrada Surat*
Department of Genetics, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fsciwrsd@ku.ac.th

Abstract

Cows are vertebrates ,breastfed chewing the hollow of the horns. There are 2 domestic cow species, namely *Bos indicus* and *Bos taurus*. *Bos indicus* have a hump, but *Bos taurus* doesn't have a hump.The aim of this study was to examine the origin of the ancient cows excavated from the archaeological site of Ban Dung Udon Thani Province dated approximately 2,800 - 1,800 years ago. I extracted DNA and determined the amount of DNA concentration and measured the quality of genetic material. To bring the results to analyze the sequence.In this research, the ancient DNA was extracted using 2 methods. The first method uses silica bead to capture DNA and the second method uses a column with silica membrane. From the extraction of DNA in both methods, it was found that in the Qubit® Flurometer measurement to determine the amount of DNA concentration, method 1 gave less amount of DNA than Method 2. The results of the DNA quality measured by Bioanalyzer showed no DNA. Therefore, DNA extraction is expected using the second method, which uses the silica membrane to extract more DNA than method 1.

Keywords: Ancient DNA, Cattle, Bone extract

Diversity and Properties of Yeast in Loogpang Khaomak

Chananchida Koekulras
Department of Microbiology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
chananchida.k@ku.th

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

Abstract

Loog-pang is a Thai term for dry form of “fermentation starter” for production of traditional fermented products from starchy raw materials, i.e., khaomak (alcoholic sweetened rice), lao (rice wine) and num som sai chu (vinegar). At present there are only two kinds of loogpang kaomak and loogpang lao. Loog-pang composed of mixed cultures of molds, yeasts and bacteria grown on rice or other cereals and sometime native herbs are added. Loogpang khaomak is used to produce khaomak, which is a low-alcoholic fermented food that made from glutinous rice. Until present, a few studies have been conducted on diversity of yeast in loogpang khaomak. Therefore, this work aimed to study the diversity of yeast in loogpang khaomak collected from various provinces in Thailand and Vientiane in Laos, based on culture-dependent approaches and molecular identification, and to investigate ethanol and amylase producing capabilities of the isolated yeasts. A total of 21 yeast strains were isolated by using dilution technique (n=14) and enrichment technique (n=7) from 19 loogpang khaomak samples. All yeasts were identified by sequence analysis of the internal transcribed spacer (ITS) region sequence similarity. The result revealed that all 21 strains were identified to be species in the phylum Ascomycota belonged to eight known species in six genera. They are included *Candida metapsilosis* (2 strains), *Kodamaea ohmeri* (1 strain), *Meyerozyma caribbica* (7 strains), *M. guilliermondii* (1 strain), *Saccharomyces cerevisiae* (1 strain), *Saccharomycopsis fibuligera* (1 strain), *Wickerhamomyces anomalus* (4 strains) and *W. edaphicus* (4 strains). The result of amylase producing capability tested on yeast extract malt extract starch (YMS) agar revealed that only *S. cerevisiae* and *Sac. fibuligera* produced amylase with the enzymatic activity index (EAI) of 1.95 and 2.74, respectively. Ethanol productions in yeast extract peptone (YP) broth containing 150 g/L sucrose or glucose were determined. All yeast strains produced ethanol from sucrose in the range of 10.7 – 61.5 g/L and *W. anomalus* DMKU-LD13 produced the highest ethanol concentration. The ethanol production in YP broth containing 150 g/L glucose will be reported in the presentation.

Keywords: Yeast, Loogpang, Ethanol, Amylase

Investigation of antioxidant and antimelanogenesis properties of edible mushroom extracts

Chatchanok Tongsai
Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
Chatchanok.tongsai@gmail.com

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

Abstract

Mushrooms are recognized as an important sources of natural bioactive compounds that are increasingly utilized as cosmeceutical ingredients. Many mushrooms occurring in Thailand still remain unexplored for their bioactive compounds. Antioxidants and anti-melanogenesis by tyrosinase inhibitors are very attractive as substances that can serve as protecting agents for skin aging and skin color. In the present study, the cosmeceutical potential of 15 species of edible mushrooms from Thailand were investigated in terms of anti-tyrosinase and antioxidant activities. Antioxidant activity was determined by the scavenging of DPPH and ABTS radicals and ferric reducing antioxidant power (FRAP). Two types of aqueous extracts, cold and boiling water extracts obtained from submerged culture mycelium of the mushrooms, were prepared to compare the bioactivities. Cold-water extracts of the mushroom mycelium exhibited greater anti-tyrosinase power. Cold-water mycelial extract of *Lentinus squarrosulus* (Mont.) displayed the highest anti-tyrosinase activity with a tyrosinase inhibition value of 53.4%. *Pleurotus ostreatus* (FR.) Guel and *Calocybe indica* could inhibit tyrosinase activity by 39% and 14%, respectively. The cold and boiling water extracts exhibited very similar antioxidant activities. The antioxidant activities measured by the above methods were observed in all mushroom extracts and the highest activity was observed in the extracts from *L. squarrosulus* (Mont.) and *Auricularia auricula-judae*. Moreover, ethanol and ethyl acetate mycelial extracts were also prepared for comparing and improving their activities. These findings suggest that, the mycelial extract of *L. squarrosulus* (Mont.) could be further studied and developed as a natural ingredient for the cosmeceutical industry.

Keywords: anti-melanogenesis, antioxidant, anti-tyrosinase, extract, mushroom

Collection of Data on Plant Growth Promoting Character in Bacteria Isolated from Plant and Soil Samples

Chutinun Posang
Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
b5810403123@ku.ac.th

Sakaoduoen Bunsangiam
Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
Sakaoduoen.bu@ku.th

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

Abstract

Plant growth promoting bacteria (PGPB), is a good choice to enhance the quality of agricultural crops due to its eco-friendly when compared with synthetic agrochemicals. The aim of this study was to investigate plant growth promoting characters of bacteria isolated from plant and soil samples kept in private collection in the Department of Microbiology, Faculty of Science, Kasetsart University. Four hundred and ninety three bacterial isolates were tested on their plant growth promoting characteristics. Bacterial strains were point inoculated onto PYDM agar, Chrome-Azurol S (CAS) agar, Long Ashton Decarboxylase (LAD) agar, Pikovskaya's agar, Zinc Oxide (ZnO) agar, to test for indole-3-acetic acid (IAA) production, siderophore production, polyamine production, phosphate solubilisation and zinc oxide solubilisation, respectively at 28 ± 2 °C for 16-18 h. Results showed that 415 isolates produced siderophore, 158 isolates produced polyamine, 55 isolates had phosphate solubilizing activity and 34 isolates had zinc oxide solubilizing activity. In addition, 34 isolates those showed will be further studied on IAA production in liquid medium and analysed IAA using Salkowski's reagent.

Keywords : Plant growth promoting bacteria (PGPB), Indole-3-acetic acid (IAA), Siderophore production, Polyamine production, Phosphate solubilization , Zinc oxide solubilization

Effect of Psychrotrophic Microorganisms on Quality and Shelf life of Raw Cow's Milk

Issalapap Kaothong
Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok,Thailand
Isarapab_925@live.com

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

Abstract

Cow's milks are rich source of carbohydrate, protein, lipid, minerals and growth factors which sufficiently support growth of microorganisms. Practically, harvested raw milk were stored at low temperature (<8°C) until transported to milk factory. At low temperature, psychrotrophic bacteria can develop and overgrown resulted in low quality of raw milk due to proteolytic and lipolytic enzymes. This study was aimed to compare the keeping time and temperature on quality and shelf life of raw milk. Total bacterial count (TBC) of raw milk incubated at 4, 10, 15 and 20°C were determined on Tryptic Soy Agar (TSA) at different keeping time from 0-14 days. The results showed that higher the temperature of milk keeping, higher the bacterial count obtained upon the increasing of keeping time. Keeping raw milk at 15°C for 2 days, TBC was increased from 5.38 to 8.24 log CFU/ml whereas at 20°C, the TBC was increased higher from 5.28 to 9.11 log CFU/ml. Higher the bacterial count of raw milk resulted in decreased of pH from 6.66 to 4.3 which lower the quality of raw milk. Heat treatment of raw milk by thermization and pasteurization temperature slightly decreased the TBC count. Initial count of TBC in raw milk was about 5.64 log CFU/ml. Thermization at 63°C for 15 sec reduced the TBC to 4.71 log CFU/ml whereas TBC of 3.08 and 4.24 log CFU/ml was noted for LTLT (63°C, 30 min) and HTST (72°C, 15 sec), respectively. These results indicated that pasteurization temperatures only destroy spoilage and pathogenic microorganisms hence low temperature should be corporate to control existing microorganisms. Random sampling of bacterial colony presented in raw milk was determined for morphological characteristics. Among 97 isolates obtained, 62% was accounted for Gram negative bacteria whereas 38% was accounted for Gram positive bacteria. Of 60 isolate of gram negative tested, 65% exhibited proteolytic activity at 4°C in which isolate no. 96 possessed strongest activities with clear zone of 1.6 cm. On the other hand, 40% expressed lipolytic activity at 4°C and isolate no. 18 showed highest activity with precipitate zone of 2.4 cm. These two isolates will be inoculated into sterile raw milk for further study on enzyme production which affected the quality and shelf life of milk.

Keywords : Psychrotrophics, Raw milk Quality, Shelflife.

Optimization of Docosahexaenoic Acid (DHA) Production from Microalga *Schizochytrium* sp. SMT9-30

Jaturong Thabpamong
Department of Microbiology, Faculty of Science, Kasetsart University,Bangkok, Thailand
Jaturong.th@ku.th

Wichien Yongmanitchai
Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fsciwcy@ku.ac.th

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

Abstract

Docosahexaenoic acid (DHA) is a polyunsaturated fatty acid in the ω-3 group that human cannot produce by themselves. It plays several important functions in heart and circulatory system, inflammatory responses, cancer behavior, hypertension, arteriosclerosis, thrombosis, depression, rheumatoid arthritis, asthma, dyslexia and stoke risk. In the past DHA was produced from fish. Today natural catches of fish in the oceans decreased dramatically thus affected the productivity of DHA. The quality of DHA depends on the kind of fish, season, location and environmental pollution. There are increasing demands of DHA due to health consciousness. Microbial source of DHA for industrial production gains a lot of interest because of its highs value. The aim of this study is to optimize the DHA production from a microalga, *Schizochytrium* sp. SMT9-30 by varying pH, aeration, salinity, temperature, carbon source and nitrogen source.

Keywords: Docosahexaenoic acid (DHA), *Schizochytrium* sp., Polyunsaturated fatty acid (PUFA), Omega-3

Optimization of bacterial nanocellulose production by the adapted strain of *Komagataeibacter xylinus* MSKU12 in coconut water

Jesada Juathaisong
Department of Microbiology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
jesada.ju@ku.th

Gunjana Theeragool*
Department of Microbiology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fscignt@ku.ac.th

Abstract

Komagataeibacter xylinus is an obligate aerobic acetic acid bacterium which is the most widely studied bacterial strain for nanocellulose (BNC)-production due to its relatively high BNC producing yield. Nowadays, BNC has been successfully used in various industries, including foods, cosmetics, textiles, paper, electronics, biomedical devices and nanocomposite materials. *K. xylinus* MSKU 12 is a thermotolerant strain isolated from rose apple in Thailand. It possesses the ability to produce high amount of BNC in HS-1A2E medium at high temperatures up to 37º C. Moreover, the adapted strains, C37-10, C30-20 and C30-30, were previously obtained by a repetitive static cultivation of MSKU 12 at 37ºC for 210 days in a low-nutrient condition, coconut water containing 1% acetic acid and 2% ethanol (CW-1A2E medium). In this study, three-dimensional structure of BNC fibrils in the adapted strains, C37-10, C30-20 and C30-30 were determined by scanning electron microscope and compared to the parental strain, MSKU12. The result showed that the finer fibril diameter with the narrowest range in width was observed in C 30-20 (60.72 ± 1.23 nm) than those in C30-30 (79.96 ±3.03 nm), MSKU 12 (84.5±2.18 nm) and C37-10 (87.06±0.45 nm). Thus, the adapted strain, C30-20, was selected for further study due to its attractive fibril structure which is applicable for further utilization. The statistic experimental designs were performed to evaluate the effect of various nutrients such as sucrose, acetic acid, ethanol and ammonium sulfate on BNC production yield in C30-20 strain at 37ºC. The optimization of parameters for improving BNC production in C30-20 is in progress.

Keywords: *Komagataeibacter xylinus*, thermotolerant acetic acid bacteria, bacterial nanocellulose, coconut water, scanning electron microscope

A study of straw mushroom in Thailand

Jiras Adthsutanan
Department of Microbiology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
jiras.a@ku.th

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

Abstract

Straw mushroom is the common name of *Volvariella* spp. This mushroom is a popular with consumers due to their unique taste, as well as many nutrients when consumed. But to grow this mushroom we need the suitable condition to get fruit bodies. Therefore, the aim of this study is to study the characteristic of straw mushroom strains found in Thailand. Nine straw mushroom strains were collected including; vol-01, vol-02, vol-03, vol-04, vol-05, vol-06, vol-07, vol-08 and vol-09. All nine strains were test for their ability to grow in various temperature: 15, 20, 25, 35, 37, 45 °C and room temperature and checked their mycelia growth rate for 14 days. From this study, we found that all straw mushroom strains grown well when incubated at 35 and 37°C. The growth was very slow at 15°C and no growth at 45°C. When incubated the mushrooms at 20 and 25°C the mushroom cultures were grown better than incubated at 15°C. The vol-09 strain shown the best growth rate in all temperature tested except for 45°C. From this result, vol-09 strain might be used for strain improvement in the future.

Key words: straw mushroom, temperature, growth rate

Study on antimicrobial activity of chitinase producing bacteria against plant pathogenic fungi

Kanit wongwiengkan
Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
Kanit.wo@ku.th

Patcharaporn Siwayaprahm*
Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscippsp@ku.ac.th

Abstract

Chitinolytic bacteria have preferable used as biological control to inhibit the growths of plant pathogenic fungi by decomposing chitin component. In this study, 11 strains of chitinolytic bacteria were isolated from shrimp shell fermented soil and observed fungal growth via dual culture method. The result found that these bacterial strains cannot be inhibited fungal growth of *Phytophthora palmivora*, *Colletotrichum capsici*, *Aspergillus niger*, *Aspergillus oryzae* and *Fusarium oxysporum*. However, the isolated strain No.2 showed the highest chitinase activity and identified by morphological tests and biochemical tests. It was gram-negative, facultative anaerobe, motile, and fermented glucose to acid without gas production. Therefore, chitinase activity of this selected strain was determined using agar well diffusion method. The relationship of growth and chitinase activity was found on 2nd day of culture incubation time and showed the highest value of protein content at 0.36 mg/ml. This finding can be suggested that the chitinase activity is relative to its growth.

Keywords: Chitinolytic bacteria, Chitinase enzymes, Plant pathogenic fungi

Isolation and Screening for Protease Producing Actinomycetes

Kodchakorn Vongkanjananan
Department of Microbiology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
kodchakorn.v@ku.th

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

Abstract

Proteases are enzymes that hydrolyze the peptide bond between amino acid and residues in a polypeptide chain. The enzymes are found in all organisms and are essential for cellular metabolism, growth and development. Microbial extracellular proteases are important because of its enormous commercial values and various industrial applications. Actinomycetes are known to produce a wide variety of extracellular enzymes that are potentially useful in industrial processes. In this study, actinomycetes were isolated from shrimp pond soil using starch casein agar after 2 week incubation at 28 °C and 45 °C. In total of 106 actinomycetes were isolated. Sixty-eight and 38 isolates actinomycetes were isolated at 28 ºC and 45 ºC, respectively. All isolates were tested for protease activity on skim milk agar. The results showed that 54 strains from 28 ºC showed proteolytic activity at 28 ºC while 30 strains from 45 ºC showed proteolytic activity at 45 ºC. Isolate SP2R7 that showed the highest proteolytic activity at 28 ºC and isolate SP1H6 that showed the highest proteolytic activity on skim milk agar at 45 ºC, were selected for protease production in liquid medium. The protease production in liquid medium was quantifiable and measured as an absorbance value on the spectrophotometer and protease activity was calculated from standard curve. The results showed that the protease activity of isolate SP2R7 was 45.7 unit/ml and of isolate SP1H6 was 29.5 unit/ml after shaking incubation for 7 days (28 ºC) and 6 days (45 ºC), respectively. In this study almost of the isolates showed proteolytic activity.

Keywords: Protease, Actinomycetes, Shrimp pond

Comparison of Methods for Microbial Detection in Food Processing Facilities

Makkawa Khorong
Department of Microbiology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
Makkawa.k@ku.th

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

Abstract

Human survival relies on food consumption, in which good quality of food is paramount. A good quality food is expectedly to be clean, safe and free from biological contamination caused either by microbes or parasites. In this regards, microbial contamination in food are often monitored to ensure food safety. The purpose of this study is to compare microbial detection approaches. Conventional method and a rapid method (Kikkoman® ATP detector A3) were employed to samples collected by swabs from tools involved in food processing. Surface sampling of the tools were carried out and swabs were suspended and serially diluted prior to spread plating. Microbial monitoring before and after cleaning process was carried out at three different food processing facilities, namely soybean tofu factory, bread factory and shrimp food factory. Swab samples from soybean tofu factory and bread factory were plated on potato dextrose agar, plate count agar and Baird Parker agar to enumerate fungi, bacteria and *Staphylococci* contaminants, respectively, Results showed that the cleaning process was not sufficient as microbial contaminants were observed on the tested plates. Swab samples from shrimp food factory were plated on PCA and xylose lysine deoxycholate agar (XLD, selective for *Salmonella* detection). Coliform count by most probable number (MPN) was also carried out on samples collected from shrimp food factory. Results showed that cleaning process was sufficient as enumerated count was reduced. Furthermore, no detection of *Salmonella* on XLD agar and MPN test is <1100, which is below threshold. Comparatively, the culturable results showed general agreement with results obtained from rapid method.

Keywords: ATP detection device, Conventional method, Rapid method, Monitoring

Ability of Lactic Acid Bacteria Producing Antifugal Substances and Degrade Mycotoxins.

Metinee Sonthiwong
Department of Microbiology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
matinee.so@ku.th

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

Abstract

Grains or grain products are widely distributed as the main staple food worldwide. However, contamination and development of spoilage filamentous fungi had led to huge economic loss of grain products. In addition, fungi have high capability to produce mycotoxins, such as aflatoxins and ochratoxins, which are a large group of highly toxic, mutagenic and carcinogenic compounds resulted in unsafe foods. In this study, 50 isolates of lactic acid bacteria (LAB), isolated from Thai fermented fish, were screened for antifungal activities. Morphological determination showed that all isolates were gram positive, catalase negative and homofermentative carbohydrate fermentation. Among these, 86% were bacilli shape while only 14% were cocci shape. For antifungal activity, preliminary study by overlay technique was conducted against aflatoxin B1 (AFB1) producing *Aspergillus flavus* CH461 and ochratoxin A (OTA) producing *A. carbonarius* AG112. Results showed that only 18 isolates exhibited antifungal activities against both fungi where isolate A27 representative of bacilli LAB and isolate A29 representative of cocci LAB possessed highest antifungal activity with inhibition zone about 2.0-3.0 cm (diameter). In order to assess that antifungal was due to organic acid produced, the LAB supernatant was adjusted to neutral pH before evaluate by agar well diffusion assay. None of the isolates showed antifungal activity, suggesting that organic acid mainly contributed to hyphal growth inhibition. Therefore, isolate A27 and isolate A29 were chosen for further study on mycotoxin degradation. *Aspergillus flavus* CH461 and *A. carbonarius* AG112 were grown in Czapek broth until reach stationary phase then AFB1 and OTA were quantified by TLC and HPLC analysis. Then, LAB supernatant and cell pellet were added to preform toxin and degradation of mycotoxin was compared.

Keywords : lactic acid bacteria, mycotoxins, aflatoxin B1, ochratoxin A

Isolation and Screening for Lipase Producing Actinomycetes from Shrimp Pond and Grease Trap – Well

Nareerat Rattanachaya
Department of Microbiology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
nareerat.ra@ku.th

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

Abstract

Lipase is a hydrolase that can catalyze the hydrolysis of triglycerides into diglycerides, monoglycerides, fatty acids and glycerol. Additionally, lipase can synthesize ester-form from glycerol and long-chain fatty acids. The most significant industrial applications of lipases are mainly found in the food, detergent, and pharmaceutical sector. Lipase producing microorganisms can be found in diverse habitats, such as industrial wastes, vegetable oil, dairies, soil contaminated with oil, oilseed and decaying food. Lipase producing microorganisms belong to bacteria, fungi, yeasts and actinomycetes. Actinomycetes are considered to be potential microorganisms capable of producing antibiotics including hydrolytic enzymes. Currently, discovery of few lipase producing actinomycetes have led to this research. In this study, eight soil samples from shrimp pond and grease trap-well were collected for isolation of actinomycetes. The samples were serialy diluted and pre-treated before spread on starch casein agar plates were then inoculated at 28 and 45ºC for 2 weeks. In total, 111 actinomycetes were isolated from these samples. Sixty-eight isolates and 43 isolates were recovered at 28 ºC and 45 ºC, respectively. Preliminary screening of lipase activity was determined by using Tween 80 agar plate. The formation of opaque zones around the colonies is an indication of lipase production. The results showed that 63 and 25 isolates had lipolytic activity at 28 and 45 ºC, respectively. Isolate SP1R-3 showed the highest lipolytic activity on Tween 80 agar. Enzymatic activity of isolate SP1R-3 was then quantified by using the surfactant Tween 80 as substrate in lipase production liquid medium and the enzymatic activity was determined by titrimetric method. The lipase activity was determined after 48, 72 and 96 hours after inoculation. The results revealed that the lipase activity of strain SP1R-3 was 2.17 Unit/ml after incubation at 28ºC for 3 days.

Keywords: Lipase, Actinomycetes, Shrimp pond, Grease trap

Production of Leather-Like Materials from Mushroom Mycelia

Nattinee Look-in
Department of Microbiology, Faculty of Science, Kasetsart University,
Bangkok, Thailand.
nattinee.l@ku.th

Chetsada Pothiratana *
Department of Microbiology, Faculty of Science, Kasetsart University,
Bangkok, Thailand.
fscicsd@ku.ac.th*
*: Corresponding author

Abstract

Aim of this study was to produce leather-like materials from mushroom mycelial sheet by selection of mushroom species and cultivated substrates as well as optimization of growth conditions. Mushrooms were classified as higher fungi forming fruiting bodies called basidiocarp. Mushrooms usually possess hydrophobic surfaces with tightly hyphal arrangements which were attractive for this study. In this study, mushrooms used were Spilt gill (*Schizophyllum commune*), Jew's ear mushroom (*Auricularia polytricha*) and Lingzhi mushroom (*Ganoderma lucidum*). Cultivated substrates were three agricultural wastes: coffee grounds, sawdust and crushed corncobs. The growth of the mushroom colonies on agricultural wastes were determined by measuring a diameter of colony during incubation period. The type of inoculum between mushroom mycelia cultured on PDA (Potato Dextrose Agar) and soghum were compared as well. The results showed that Spilt gill (*Schizophyllum commune*) and Lingzhi mushroom (*Ganoderma lucidum*) grown in soghum showed a higher growth on all substrates used than those of PDA. However, mushroom mycelia on sawdust and crushed corncobs showed loose colonies character. Lingzhi mushroom mycelia (*Ganoderma lucidum*) grown on sorghum as inoculum and coffee grounds as cultivated substrate were selected to study the effect of growth conditions, such as temperature, light, moisture, size of inoculum and nutritional supplement, on the appearance of mycelial sheet harvested.

Keywords: *Ganoderma lucidum*, mushroom mycelia, coffee grounds, leather sheets

Isolation and Proteolytic Enzyme Production of *Bacillus* from Termite Guts for Improving the Nutritional Value of Fermented Soybean Meal in Animal Diets

Noppawan Suttisak, Maneeploy Nualkul and Pinsurang Deevong*
Department of Microbiology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fsciprd@ku.ac.th

Bundit Yuangsoi
Department of Fisheries, Faculty of Agriculture, Khon Kaen University,
Khon Kaen, Thailand

Abstract

Soybean meal is an important and cheap protein source. It has high protein content which is suitable for animals, and popularly used as an ingredient in animal feed. This study investigated an ability of proteolytic enzyme production of *Bacillus* from termite guts for improving the nutritional value of soybean meal in animal feed. Bacteria were isolated from whole guts of the wood-feeding termite *Microcerotermes* sp. using heat shock and conventional methods. Based on the morphological characterizations using macroscopic and microscopic studies, 48 isolates of the endospore forming Gram positive rod were selected for next step. All isolates were tested their abilities to produce proteolytic enzymes on nutrient agar (NA) supplemented with soy milk, skimmed milk and gelatin, and also tested the ability of cellulolytic enzyme production to digest carboxymethyl cellulose (CMC). After the screening step, 12 potential isolates with high abilities of enzyme productions were selected and tested the enzyme activity on Berg's agar added with soy milk, and the results showed their high proteolytic activity. Then, the selected isolates were used for digestion of soybean meal by solid state fermentation and their growth potential was investigated using serial dilution and plate count methods. This study showed that, the termite gut isolates produced high active proteolytic enzymes useful for improving the nutritional value of fermented soybean meal for animal feed industry. Moreover, the isolates have high ability to digest cellulose which is a high component in the soybean meal and other plant materials in animal feed.

Keywords: *Bacillus*, Proteolytic enzyme, Soybean meal, Termite gut

Isolation and Physiological Characterization of Yeasts Isolated from Solar Salterns in Samut Songkhram Province

Nutthacha worasiri
Department of Microbiology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
Nutthacha.w@ku.th

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

Abstract

Salt production in solar saltern used sea water as a raw material. Therefore, solar saltern is usually located near the coast. There are quite limited reports about microorganisms in the solar saltern. Therefore, this research project aims to study and characterize yeasts in solar saltern area after salt is harvested. Eighty-four soil samples from 4 ponds with different salinity were randomly collected for yeast isolation using Yeast Extract Peptone Dextrose broth supplemented with 0.025 % chloramphenicol and 0.02 % sodium propionate in the presence or absence of 3 % sodium chloride, at 30 °C and 37 °C. A total of 30 yeast isolates was obtained. Of these, 8 isolates showed red colonies. Cell morphology and budding type of yeast isolates were mostly round shape and multilateral budding, respectively. On the basis of sequence analysis of the D1/D2 region of the large subunit (LSU) rRNA gene, 7 out of 8 red pigment-producing microbes were identified as *Coniochaeta luteorubra* (2 isolates) and the other five isolates are possibly new species in the genus *Coniochaeta.* This result indicates that the solar saltern area is one of valuable bioresource to study and discover new microorganisms.

Keywords: yeast, solar saltern, yeast diversity, sea water

Selection of Antagonistic Yeasts from Yeasts Isolated from Plant Leaves for Controlling of Fungal Rice Rot Diseases

Panchaporn Attharat
Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
panchaporn.a@ku.th

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

Abstract

Rice rot disease caused by pathogenic fungi namely *Curvularia lunata* and *Helminthosporium oryzae* is one of the most important rice diseases. The fungi infect rice in young seedlings, show brownish discoloration and seedlings will die rapidly after emergence form soil. Although some seedlings survive but they usually lack vigor. They show yellow or pale green color and cannot grow well, which is resulted in reduction of seedling productivity. Currently, the synthetically chemical fungicides are using for controlling of rice rot diseases. However, the use of synthetically chemical fungicides is toxic to human and environment. Using antagonistic microorganisms including yeasts to control fungal plant diseases become an interesting alternative way. The aimed of this study were to select for antagonistic yeast strains based on growth inhibition of pathogenic fungi (*C. lunata* DOAC 2313 and *H. oryzae* DOAC 2293) causing of rice rot disease and to evaluate of rice rot disease control in greenhouse by the selected antagonistic yeast strains. A total of 46 phylloplane yeast strains, which were isolated from surface of rice (twenty-seven strains), corn (twelve strains), and sugarcane (seven strains) leaves, were tested for their antagonistic activities against *C. lunata* DOAC 2313 and *H. oryzae* DOAC 2293 by dual cultivation on potato dextrose agar (PDA). Eleven strains could inhibit the fungal pathogen. Three antagonistic yeast strains inhibited growth of both fungal pathogens, whereas the others eight strains inhibited only one pathogenic fungus. Eight yeast strains inhibited growth of *C. lunata* DOAC 2313 and the most effective strain was *Hannaella sinensis* YE-19 with 49.6 % of inhibition. Six antagonists inhibited growth of *H. oryzae* DOAC 2293 and the most effective strain was *Rhodotorula mucilaginosa* YE-171 (47.5%). From these resulted ten strains were selected for evaluation of rice rot disease control in rice seedling in greenhouse compared with the two chemical fungicides namely Mancozeb and Carbendazim and the result will be reported and discuss in the presentation.

Keywords: Biocontrol, Rice rot disease, Antagonistic yeasts

Isolation and Screening of Microalgae for Arachidonic Acid Production

Piyawan kunriya
Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
piyawan.farrfeen@gmail.com

Wichien Yongmanitchai
Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fsciwcy@ku.ac.th

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

Abstract

Arachidonic acid (ARA) is an omega-6 polyunsaturated fatty acid. Its structure consists of 20 carbon atoms with four double bonds. ARA is an essential fatty acid that plays an important role in the development of nervous system and optic system. Moreover, it also reduces cholesterol levels thus reduces the risk of heart disease. ARA is the precursor of various important substances in the form of neurotransmitter molecules, such as Prostaglandins, Prostacyclins, Leukotrienes and Thromboxanes. Humans need to receive them from outside source. In general, ARA derived mainly from sea fish but the supply is insufficient. There are reports showed that microalgae could produce this fatty acid. The objective of this research was to isolate and screen ARA producing microalgae. The plant specimens were collected from various parks and waterfalls in the east and south region of Thailand. Then isolation of microalgae was carried out on C-medium supplemented with anti-microbial substances, i.e. nardixic acid, cefotaxaime, ampicillin, chloramphenicol, thiabendazole to inhibit undesired microorganisms. The pure cultures were them cultivated in the same medium and incubated in an incubator shaker with shaking speed120 rpm, at 25°C, lighting intensity 2,000 lux. lighting: dark period at 16: 8 hours for 14 days. The algal cells were analyzed for their fatty acid contents by using gas chromatography. The results showed that some microalgae isolates produce ARA. In the next step, the candidate strains will be compare to find the species that can produce the highest amount of arachidonic acid.

Keywords : microalgae, arachidonic acid, ARA, polyunsaturated fatty acid, Thailand

Improvement of Superfine Bacterial Nanocellulose Production by the Revertant Strain of *Komagataeibacter oboediens* MSKU 3

Prapawadee Mutcharglam
Department of Microbiology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
prapawadee.m@ku.th

Gunjana Theeragool*
Department of Microbiology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fscignt@ku.ac.th

Abstract

The genus *Komagataeibacter* is well known as a model microorganism for bacterial nanocellulose (BNC) production. BNC has several unique physicochemical and mechanical properties, including an ultrafine fiber network, high purity, high crystallinity and high degree of polymerization. Thus, it has been widely used in various fields of commercial applications such as food, cosmetics and biomedical devices. However, industrial BNC applications are still limited due to high-cost and low-yield production. The ethanol-adapted strain, E3 strain, was isolated as non BNC-producing strain from thermotolerant *K. oboediens* MSKU 3, which was repeatedly cultivated in high ethanol concentration and shaking condition. Furthermore, the BNC production ability in the revertant R37-9 strain was recovered from E3 strain by repeatedly cultivated under static condition at 37ºC. Interestingly, the R37-9 strain exhibited the BNC with the superfine fibrils in narrowest range of width that is a superior property to be useful for BNC application. In this study, to overcome limitation related to high-cost and low-yield BNC production, the R37-9 strain was further improved for the BNC productivity by repetitive cultivation at 30ºC in a low-cost medium, coconut water, containing 1.0% acetic acid and 2.0% ethanol (CW1A2E). The adapted strains, C15, C15-0.5S and C15-0.5S0.5N were obtained from 15-times cultivation in CW1A2E, CW1A2E0.5S (added 0.5% sucrose) and CW1A2E0.5S0.5N (added 0.5% sucrose and 0.5% ammonium sulfate), respectively. Then, the BNC produced by three adapted strains was compared to MSKU 3 and R37-9 strains in CW1A2E, CW1A2E0.5S and CW1A2E0.5S0.5N at 30ºC for 7 days. The result showed that higher amounts of BNC were obtained in C15 and C15-0.5S strains than those in MSKU 3, R37-9 and C15-0.5S0.5N under all tested conditions. The BNC fibril structure was further visualized by scanning electron microscopy. This study indicated that we successfully obtained the potential strains having ability to produce superfine fibrils from low-cost materials for industrial application.

Keywords: *Komagataeibacter oboediens,* bacterial nanocellulose, superfine fibrils, coconut water, low-nutrient adaptation

Cultivation of *Auricularia auricula-judae* and *Schizophyllum commune* Mycelia for Hydrophobin Extraction to Examine Antitumor Activity on Lung Cancer Cells and Liver Cancer Cells

Punploy klawkla
Department of Microbiology, Faculty of Science, Kasetsart University,
Bangkok, Thailand.
punploy.k@ku.th

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

Chetsada Pothiratana*
Department of Microbiology, Faculty of Science, Kasetsart University,
Bangkok, Thailand.
fscicsd@ku.ac.th*
*: Corresponding author

Abstract

Aims of this study were to cultivate *Auricularia auricula-judae* and *Schizophyllum commune* mycelia for hydrophobin extraction and study of antitumor activity against lung and liver cancer cells. Hydrophobins are small secreated proteins produced during fungal growth and development. Molecular weight of hydrophobins is about 7 -15 kDa. They were possessed an ability of self-assemble at hydrophobic/hydrophilic interfaces. In previous research, hydrophobin SC3 from *Schizophyllum commune* has showed an antitumor activity against sarcoma and melanoma. In this study, *Auricularia auricula-judae and Schizophyllum commune* were cultured on Potato dextrose agar (PDA) or in Potato dextrose broth (PDB) in static condition incubated at 27-29^{o}C under light condition. The result showed that colony growth rate of *Auricularia auricula-judae* and *Schizophyllum commune* mycelia were 12.99 and 15.06 mm/day and dried weight of *Auricularia auricula-judae* and *Schizophyllum commune* mycelia were 0.449 and 0.558 g/flask, at 25 and 20 days of cultivation, respectively. Crude hydrophobin of *Auricularia auricula-judae* and *Schizophyllum commune* extracted using trifluoroacetic acid (TFA) were 449.82 and 201.79 µg/ml in 60% ethanol and % yield of hydrophobin were 4.50 and 2.52 µg/mg of dried weight, respectively. They were subjected to investigate their antitumor activity against lung and liver cancer cells. The lung and liver cancer cells were cultured in a 96-well plate at the initial concentration of 3,000 cells per well. The MTS assay was used to determine the growth of lung and liver cancer cells after 24, 48, and 72 hours of incubation.

Keywords: *Auricularia auricula-judae* mycelia, *Schizophyllum commune* mycelia, Hydrophobin, Cancer cells

Study on the Effect of Extracts from *Ganoderma lucidum* and *Lentinus squarrosulus* on HEK293T Cells and Fibroblast Cells

Putsawee Tomtong
Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
putsawee.t@ku.th

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

Abstract

Mushrooms are source of natural protein food. Mushrooms have low level of sugar and salt. Their chemical compositions are able to stimulate the body's immune system. *Ganoderma lucidum* has shown to nourish the body, strengthen the immunity, anti-inflammatory and anti-cancer. *Lentinus squarrosulus* has properties such as antioxidants, cancer prevention and inhibition, diabetes prevention, maintaining normal cholesterol and glucose levels. The similar benefits were also available from *Ganoderma lucidum*. Therefore, most research is related to test of the beneficial effect of mushroom extract against diseases. Moreover, few studies on the effects of mushroom extracts on normal cells could be found. Hence, the purpose of this research is to study the effects of *Ganoderma lucidum* and *Lentinus squarrosulus* extracts in increasing the number of normal cells including HEK293T and fibroblasts cells lines by testing the extracts at different concentrations (62.5, 125, 250, 500, 1000, 2000 and 4000 µg/ml) and in the period of 24, 48 and 72 hours. The viable cells were quantified by MTS cell proliferation assay. The results showed that *Ganoderma lucidum* and *Lentinus squarrosulus* extracts affect the increase in the number of HEK293T cells in the period of 24 hours, but the number of cells decreased when tested at 48 and 72 hours. The effects of *Ganoderma lucidum* and *Lentinus squarrosulus* extracts on fibroblasts showed that the number of surviving cells decreased at a concentration of 125 and 250 µg/ml, but increased when tested at concentrations of 500, 1000, 2000 and 4000 µg/ml. This research suggests that the extracts from *Ganoderma lucidum* and *Lentinus squarrosulus* have the effect on the increase of normal cells depending on the time and concentration of the tested substances.

Keywords: Normal cells, *Ganoderma lucidum*, *Lentinus squarrosulu*, MTS cell proliferation

Study on Antibacterial Activity of Edible Mushroom Extracts in Thailand Against Acne-Causing Bacteria

Rakwaree Sriharat
Department of Microbiology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
Rakwaree.s@ku.th

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

Abstract

Novel acne treatments are in high demand to overcome drug resistant pathogens and discovering new natural sources of anti-acne agents could contribute to develop effective acne treatments. Edible mushrooms can be used as a source of cosmeceutical ingredients due to their rich bioactive compounds including antibacterial substances. The aims of this research were to investigate anti-acne efficiency of 16 species of edible mushrooms from Thailand in term of antibacterial activity against an acne-causing bacteria as *Cutibacterium acenes*, *Staphylococcus epidermidis* and *S. aureus*. The bacterial strains used in this study were a clindamycin resistant strains. Anti-acne activities of boiling and cold water extracts obtained from submerged culture mycelium of the mushrooms as well as culture supernatants were comparatively determined by agar well diffusion method. Moreover, different solvent mycelial extracts were also prepared for improving the activities. Minimal inhibitory concentration (MIC) and minimal bactericidal concentration (MBC) values were evaluated by broth dilution method. The mycelial extracts of *Auricularia auricula-judae*, *Calocybe indica*, *Ganoderma lucidum*, *Lentinus squarrosulus* (Mont.) and *L. polychrous* Lev. displayed antibacterial activity against the bacterial strains. The images, studied through using scanning electron microscopy (SEM), revealed that the extracts inhibited the bacterial growth by disrupting cell wall of the bacteria.

Keywords: acne-causing bacteria, antibacterial activity, *Cutibacterium acenes*, extract, mushroom

Isolation of Lactic acid bacteria from chicken intestines, fermented food and flower

Ratthanaporn Palad
Department of Microbiology, Faculty of Science, Kasetsart university,
Bangkok , Thailand
Ratthanaporn.p@ku.th

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

Abstract

Lactic acid bacteria (LAB) are the bacteria that take an important role in the production of fermented foods, dairy products and food preservation processes. In addition, lactic acid bacteria can produce bacteriocin, which can inhibit the growth of microorganisms. In this study, fermented food products such as pickled cabbage, pickled fish, pickled shells, sour pork, Isaan sausage and chicken intestine, were used for lactic acid bacteria isolation by dilution plate technique using MRS agar containing bromocresol purple as pH indicator and incubate at semi-aerobic condition. The isolated stains were tested by gram staining and catalase enzyme testing. The result shown that, the isolated stains were gram positive and non-catalase enzymes production which indicated that they are lactic acid bacteria. A total 16 isolates of LAB were isolated from various samples that are 3 isolates from female chicken intestines, 4 isolates from fermented food products, 5 isolates from Isaan sausage and 4 isolates from Chorm chilli sauce sample.

Key word: lactic acid bacteria, fermented food , chicken intestine

Cultivation of *Ganoderma lucidum* and *Lentinus sajor-caju* for Hydrophobin Extraction to Study Antitumor Activity on Lung Cancer and Liver Cancer Cells

Sasipreeya Kullarit
Department of Microbiology, Faculty of Science, Kasetsart University,
Bangkok, Thailand.
sasipreeya.k@ku.th

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

Chetsada Pothiratana*
Department of Microbiology, Faculty of Science, Kasetsart University,
Bangkok, Thailand.
fscicsd@ku.ac.th*
*: Corresponding author

Abstract

The objectives of this study were to cultivate *Ganoderma lucidum* and *Lentinus sajor-caju* mycelia and extract their hydrophobins to evaluate the antitumor activity against lung and liver cancer cells. Hydrophobins are small proteins produced only in mushrooms and filamentous fungi. They are able to self-assembly into amphipathic monolayer at hydrophobic/hydrophilic interfaces. The optimal conditions for the cultivation of *Ganoderma lucidum* and *Lentinus sajor-caju* mycelia were studied by measuring size of fungal colony on Potato dextrose agar (PDA) and the dried weight of mycelia from static cultivation in Potato dextrose broth (PDB) incubated at room temperature under dark condition. The result showed that the fungal growth rate of *Ganoderma lucidum* and *Lentinus sajor-caju* mycelia were 20.3 and 32.9 mm/day on PDA, respectively and the highest dried weight of *Ganoderma lucidum* and *Lentinus sajor-caju* mycelia were 0.39 and 0.29 g/flask in PDB for 25 and 20 days of cultivation, respectively. Extraction of crude hydrophobins from *Ganoderma lucidum* and *Lentinus sajor-caju* using trifluoroacetic acid (TFA) obtained % yield of hydrophobin at 1.432 and 0.537 µg/mg of dried weight, respectively. Extraction of crude hydrophobins was performed and evaluated the antitumor activity against lung and liver cancer cells. The cancer cells were cultured in a 96-well plate at the initial cell concentration of 3,000 cells per well. Effect of antitumor activity against lung and liver cancer cells by crude hydrophobins was evaluated by MTS assay at 24, 48 and 72 hours of incubation.

Keywords: *Ganoderma lucidum* mycelia, *Lentinus sajor-caju* mycelia, Hydrophobin, Liver cancer cells, Lung cancer cells

Studies on the Effect of Monkey Head Mushroom and White Jelly Mushroom Extracts Against Cell Lines (HEK293T cell - Fibroblast cell)

Siriwan Chaleaw
Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
siriwan.chal@ku.th

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

Abstract

Hericium erinaceus, or commonly known as monkey head mushroom are known for their bioactivities to stimulate the immune system, reduce cholesterol level, treat ulcer and prevent the development of cancer cells. *Tremella fuciformis*, or white jelly mushroom has been known for their abilities to inhibit growth of cancer cells, have anti-oxidant properties as well as beneficial properties towards brain and digestive systems. However, limited informations are available on mushroom extracts on healthy cells. Therefore, this research aimed to study the effect of *H. erinaceus* and *T. fuciformis* extracts on normal cell lines. Both mushrooms were extracted with ethanol and dried in a vacuum evaporator. The ethanolic extracts were then tested on the normal cell lines. In this study, two cell lines (HEK293T and fibroblast cells) were cultured in 96-well culture plate with different concentrations (62.5, 125, 250, 500, 1000, 2000 and 4000 µg/ml) of ethanolic extract. Cell cultures were then incubated for 24, 48 and 72 hours. The MTS assay was performed to detect cell proliferation. The results showed that at low concentrations of monkey head mushroom extract (62.5 and 125 µg/ml) can increase the growth rate of both cell lines at 24 hours. On the other hand, high concentrations of white jelly mushroom extract (2000 and 4000 µg/ml) increase the growth of HEK293T cells. Therefore, this study demonstrated that both mushrooms were able to increase the growth rate of HEK293T and fibroblast cells depending on time and concentrations of mushroom extracts.

Keywords: Cell lines, *Hericium erinaceus*, *Tremella fuciformis*, Mushroom extracts

Agricultural Waste Biodegradabilities of *Bacillus* and *Paenibacillus* isolated from Termite Guts for Production of Bioethanol Fermentation Substrates

Supharada Hemwiangchan, Maneeploy Nualkul and Jira Sakolvaree
Department of Microbiology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
supharada.h@ku.th

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

Abstract

There are a large amount of agricultural wastes in Thailand in each year. These lignocellulosic materials are cheap. To increase the value and reduce the amount of agricultural wastes, this study aimed to investigate the abilities of enzyme production and agricultural waste degradation of the bacteria isolated from the guts of five termite species (*Microcerotermes crassus*, Mc; *Globitermes sulphureus*, Gs; *Pericapritermes semarangi*, Ps; *Termes propinquus*, Tp; *Hospitalitermes* sp., Hs) collected from Sakaerat Environment Research Station, Wang Nam Kiew, Nakhon Ratchasima. Seven selected isolates were related to the genus *Bacillus* and *Paenibacillus* based on molecular identification of 16S rRNA gene. Six isolates were related to *Bacillus toyonensis* strain BCT-7112 (isolate Mc-17-2 and Gs-4-1), *B. cereus* strain ATCC 14579 (isolate Ps-10-3), *B. methylotrophic* strain CBMB205 (isolate Tp-8-1), *B. amyloliquefaciens* subsp. Plantarum strain FZB42 (isolate Hs-4-5 and Tp-6-2) and only the isolate Ps-10-2 was related to *Paenibacillus taichungensis* strain BCRC 17757. The isolates were tested their abilities to produce various hydrolytic enzymes on nutrient agar (NA) and Berg's agar supplemented with 0.5% (w/v) of Carboxymethyl cellulose (CMC), Beechwood xylan, Soluble starch and Citrus peel pectin. The results of enzyme production testes of some isolates on NA and Berg's agar were different. The amount of isolates produced cellulase, xylanase, amylase and pectinase on NA were 7, 0, 7, 7 isolates, respectively and on Berg's agar were 6, 4, 7, 4 isolates, respectively. Four isolates including Ps-10-2, Tp-6-2, Tp-8-1 and Hs-4-5 showed activities of all enzymes on Berg's agar. The cellulase producing bacteria including Mc-17-2, Gs-4-1, Ps-10-2, Tp-6-2, Tp-8-1 and Hs-4-5 showed their cellulase activity on CMC adding Berg's agar and their results of relative cellulolytic activity index were 1.5, 1.8, 4.6, 4.7, 3.9 and 4.5, respectively. Furthermore, the selected isolates were detected the degradabilities and growth potential on five agricultural wastes including rice straw, bagasse, cassava residue, coffee residue and sawdust for a period of 7 days. The production of cellulase (CMCase) and amount of reducing sugar were measured by dinitrosalicylic acid (DNS) method. This study showed that, the isolates related with *Bacillus* and *Paenibacillus* from termite guts showed cellulase activity and biodegradabilities on various agricultural wastes in Thailand. Their products were benefit for bioethanol production.

Keywords: Agricultural waste, *Bacillus*, Cellulase, Hydrolytic enzyme, *Paenibacillus*

Isolation of lactic acid bacteria from fruits

Supichaya Tuntiwong
Department of Microbiology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
Supichaya.tu@ku.th

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

Abstract

Lactic acid bacteria (LAB) play an important role in the food industry, especially fermented foods. Many substances produced by LAB can inhibit the growth of pathogenic bacteria contaminated in food. Therefore being used as a probiotic in humans. The purpose of this study is to isolation and collect LAB from various kinds of fresh fruits. In this study, a total of 11 samples were used to isolated the lactic acid bacteria by using the spread plate method on De Man Rogosa and Sharpe (MRS) agar. The lactic acid bacteria (LAB) could be observed by the color of the medium was changed to yellow or clear zone produced around the colonies on MRS agar supplemented with 0.4% bromocresol purple or MRS agar containing 1% $CaCO_3$, respectively. Lactic acid bacteria isolated from fruit samples were studied for their morphology, gram staining, oxidase test, catalase test. The result shown that a total of 23 isolates, only 7 isolates had no catalase and oxidase formation. A result of gram stain indicated that all these 7 isolates are gram positive with bacilli and coccobacilli shape revealed that all these 7 isolates are lactic acid bacteria. The antibacterial activity against *Escherichia coli*, *Staphylococcus aureus*, and *Bacillus* sp. will be perform.

Keywords : Lactic acid bacteria, Fruits, Antibacterial activity

Characterization of Microalgae *Schizochytrium* sp. for DHA production

TanachatAriyamongkol
Department of Microbiology, Faculty of Science, Kasertsart University,
Bangkok, Thailand
bleachbenza2540@hotmail.com

Wichien Yongmanitchai
Department of Microbiology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fsciwcy@ku.ac.th

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

Abstract

Schizochytrium species is one of the most studied microalgae for production of docosahexaenoic acid (DHA) which is an omega-3 fatty acid with positive effects for human health. In this study the purpose is to characterize the microalga, *Schizochytrium* sp. for high DHA production. *Schizochytrium* sp. was obtained from 9 different mangrove forests at Eastern region of Thailand. There were 573 isolates *Schizochytrium* sp. collected. The algae were cultivated in GYP broth containing 3% glucose, 1% peptone and 1% yeast extract, and incubated in an orbital shaker at 25ºC for 48 hours. Cell suspensions were collected and determined for their growth by optical density (OD). Fatty acid contents were analyzed by gas chromatography. The results revealed that some *Schizochytrium* sp. produced high amount of DHA.

Keyword: docosahexaenoic acid, DHA, *Schizochytrium* sp., microalgae

Application of Heavy Metal Resistant Bacteria Isolated from Zinc Mine for Petroleum Oil Degradation and Toxic Substance Reduction

Thansamorn Khamcharoen and Namfon Bunraksa
Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
zyetsmkcr@gmail.com

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

Abstract

The aims of this study are to investigate petroleum oil degradation and toxic substance reduction of the heavy metal resistant bacteria from a zinc mine soil in Mae sot, Tak. Bacterial isolation was performed using a Bushnell Haas (BH) medium enriched by addition of high density of the hydrocarbon sources, engine oil and diesel fuel (10% v/v). In the total number, 6 and 6 isolates were derived from the enrichments by engine oil and diesel fuel, respectively. All isolates were tested their heavy metal resistance on solid medium and in liquid medium. The results showed that, their maximum resistances to Zn^{2+}, Cd^{2+} and Cu^{2+} on nutrient agar (NA) were 105.0, 3.0 and 4.4 mM, respectively and those in nutrient broth (NB) were also high as 125.0, 6.0 and 5.0 mM, respectively. The potential isolates were further studied for growth in BH broth with various types of engine oil and measured turbidity at 600 nm by spectrophotometer at every 3-6 hours for 48 hours. Viable cells were enumerated using serial dilution and plate count methods on NA. The engine oil degraded by the isolate was characterized. The potential isolates were selected for identification based on nucleotide sequence of 16S rRNA gene. The molecular identification exposed that, the isolates with high heavy metal resistance were related to *Serratia* sp. This study showed that, the isolates from zinc mine soil in Thailand were useful for petroleum oil degradation and toxic substance reduction, and can be applied in biological treatment in the future.

Keywords: Engine oil, Heavy metal resistant bacteria, Petroleum oil degradation, Zinc mine

Microbiological Air Quality of Canteens in Kasetsart University, Bangkhen Campus

Tipkarnda Dechdecha
Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
Tkd.deer@gmail.com

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

Abstract

Airborne microorganisms including bacteria, yeast and mold may cause health risk and diseases such as respiratory tract infection. The research objective was to study the microbiological air quality of canteens within Kasetsart University, Bangkhen campus. Air sampling was conducted by impaction method (*Thermo* Scientific Air Sampler, Oxoid) from three canteens including SciKU Food Court, Central Food Center 1 and Central Food Center 2. Air sampling was conducted thrice a day for the duration of a month. The total plate count of bacteria and fungi were enumerated on plate count agar and potato dextrose agar, respectively. The results showed that air-borne bacterial colony forming unit (CFU) counts in Central Food Center 2, SciKU Food Court and Central Food Center 1 was 1.88, 1.49 and 1.03 CFU/litres of air, respectively. The fungi colony forming unit (CFU) counts in SciKU Food Court, Central Food Center 2 and Central Food Center 1 was 1.07, 0.70 และ 0.39 cfu/ litres of air, respectively.Most of bacteria isolated were classified as bacilli and cocci shaped Gram-positive bacteria and most of the fungi isolated were identified as *Rhizopus* sp., *Penicillium* sp., *Aspergillus* sp. and *Cladosporium* sp. The airborne microbial count in canteens are influenced by various factors including ventilation systems, temperature, relative humidity, air movement and season.

Keywords: Airborne microorganism, Bacteria, Mold

Study on Antimicrobial Efficiency of Galangal Rhizome Crude Extracts

Wannarumon Kongpeng
Department of Microbiology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
wannarumon.k@ku.th

Patcharaporn Siwayaprahm*
Department of Microbiology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fscippsp@ku.ac.th

Abstract

In this study, crude ethanolic extracts from galangal rhizome were tested for their antimicrobial efficiency against six food-borne bacteria (*Bacillus cereus*, *Escherichia coli*, *Listeria monocytogenes*, *Proteus mirabilis*, *Salmonella* Typhimurium and *Staphylococcus aureus*), two drug-resistant bacteria (*Klebsiella pneumoniae* and *Pseudomonas aeruginosa*), one plant pathogenic bacteria (*Xanthomonas campestris*, pv.campestris) and two plant pathogenic fungi (*Colletotrichum capsici* and *Phytophthora palmivora*). The result revealed that crude extract from galangal rhizome proved most active against *L. monocytogenes* and *S. aureus* using disc agar diffusion method with inhibition zones 13.67 mm and 35.17 mm, respectively. The minimum inhibitory concentration (MIC) of 3,125 ppm and the minimum bactericidal concentration (MBC) of 6,250 ppm were observed for *L. monocytogenes* and *S. aureus*. The scanning electron microscope (SEM) was used to study the antibacterial activity of crude extract from galangal rhizome. It observed that the bacterial cell wall was disrupted and made morphological change. However, crude extract cannot inhibit drug-resistant bacteria and plant pathogenic bacteria. The crude extract from galangal rhizome showed significant antifungal activity by using poisoned food method. The crude extract from galangal rhizome have ability to inhibit some bacteria and fungi. It may be used as other way to help reduce the use of chemicals in the future.

Keywords: Antimicrobial activity, Galangal rhizome crude extracts

Inhibition of *Phytophthora palmivora* that causes root rot in durian using crude extracts from *Piper spp.*

Watayagorn Thapsawat
Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
watayagorn.t@ku.th

Prissana Wiriyajitsomboon*
Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscipnw@ku.ac.th

Abstract

Phytophthora palmivora, a fungal-like organism, is the causal agent of root rot disease on durian. Abundant synthetic pesticides are used to control the disease, thus excessive chemical residuals can remained in the environmental area and produces, and effect to farmers and consumers' health. In this study, we examined the efficiency of crude extracts from *Piper* species for controlling the root rot disease on durian. Twenty one crude extracts were screened using disc diffusion method, and eleven samples, showing inhibition zone were recorded and further examined on the cultivar Monthong. Preliminary study of applicable sample concentration was conducted on the fruit shell. The results showed that eight crude extracts (P8, P20, P38, P51, P56, P81, P83 and P173) could completely inhibit the development of lesion caused by *P. palmivora* then the crude extracts showing positive result were examined their inhibition ability on the fruits. The results showed that all eight samples at the concentration of 50,000 ppm completely inhibited the lesion expansion when fruits were inoculated with *P. palmivora*. All lower concentrations, P38 showed the greatest disease reduction on both fruit and stem, and was significantly different from the uninoculated untreated controls. Based on the results, the activity of Piperaceous plant extracts against *P. palmivora* may be useful at controlling root and fruit rot of durian production without chemical use.

Keywords: *Phytophthora palmivora*, crude extract, Piperaceae family

Antigenic sensitivity comparison of lipopolysaccharide (LPS) and culture filtrate antigen (CFA) derived from *Burkholderia pseudomallei* for developing ELISA diagnostic test

Watsaphon Charoenwai
Department of Microbiology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
watsaphon.c@ku.th

Kreeson Packthongsuk*
National Institute of Animal Health, Department of Livestock Development,
Bangkok, Thailand
kreesonpackthongsuk@gmail.com

Patcharaporn Siwayaprahm*
Department of Microbiology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fscippsp@ku.ac.th

Abstract

Burkholderia pseudomallei (*B. pseudomallei*), a gram-negative bacteria is a causative agent of Melioidosis, a fatal zoonotic disease. It is a relatively rare infectious disease that is more commonly reported from tropical countries, particularly in the Southeast Asian. Currently, isolation and identification of the *B. pseudomallei* from clinical specimens is the only conclusive evidence of melioidosis. However, the bacteriological method is time consuming and may provide results too late for effective therapy. The serological tests for the detection of antibodies to *B. pseudomallei* have been developed for the diagnosis of melioidosis that it provide screening cost effective test in livestocks. ELISA, one of the high sensitivity and specificity immunoassays has been reported as the confirmation method for serological test of melioidosis. High sensitivity ELISA test beneficial for detection of early infection is supportive efficiently of prevention and control of disease outbreak. The present project is to compare ELISA-based antigenic sensitivity of the surface and secreted antigens; lipopolysaccharide (LPS) and culture filtrate antigen (CFA) of *B. pseudomallei* that they are initially exposed to the host immunity response after infection. *B. psedomallei* LPS showing ladder pattern in SDS-PAGE analysis was extracted by hot water phenol method. According to KDO assay and spectrophotometer analysis, the crude aqueous fraction extract contained 0.37% of LPS with 0.05% DNA contamination and without protein detected. One hundred and thirty microgram of CFA or secreted protein obtained from 15 ml of *B. pseudomallei* culture medium incubated for 16 hours showed two major dense bands ranging between 10-15 kDa and 25-37 kDa after running of SDS-PAGE. One microgram of LPS and CFA coated on micro-plate wells illustrated 1:xxx and 1:xxx sensitivity to the *B. pseudomallei* positive goat serum after comparing to the normal goat serum. The higher sensitivity of (LPS, CFA) for detection of positive serum is probably worthy to use it as a coated antigen of ELISA for early serological diagnosis of melioidosis in livestock.

Keyword: *Burkholderia pseudomallei*, Lipopolysaccharide, Culture filtrate antigen, ELISA

Selection of lipase-producing yeasts and study on factors affecting lipase production

Wirasinee Kanbuakaew
Department of Microbiology, Faculty of Science, Kasetsart University, Bangkok, Thailand
wirasinee.k@ku.th

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

Abstract

Lipases catalyze the hydrolysis and esterification of oil and fat. They have potential for industrial applications such as in livestock industry. Lipases are found in microorganisms in addition to plants and animals. Lipase-producing yeasts have industrial potential due to ease of cultivation, maintenance and production. This research aims to screen for effective lipase-producing yeasts. Sixty-one lipase-producing yeasts, which were previously isolated from soil samples collected in the peat swamp forest, Narathiwat province, Thailand, were tested using soy oil as an inducer. *Candida* sp. DMKU-WBL1-3 was used as a reference. The results showed that 19 yeast strains were found to have lipase activity higher than those found in the reference strain (148.33-266.67 units/mL). The 19 yeast strains were previously identified as *Rhodotorula mucilaginosa* (6 strains), *Debaryomyces fabryi* (3 strains), *Schwanniomyces polymorphus* (3 strains), *Papiliotrema laurentii* (1 strain), *Cutaneotrichosporon mucoides* (1 strain) and *Cyberlindnera subsufficiens* (1 strain). The *Rhodotorula mucilaginosa* Y34-C produced the highest lipase activity and was selected for further experiment. There are several factors that affect lipase production, such as carbon source, nitrogen source, inducer and pH. In order to enhance the lipase production by the strain Y34-C, various carbon sources, such as glucose, sucrose, cellobiose, xylose and glycerol, were investigated and glycerol seems to be the best for lipase production by the strain Y34-C. Other factors are now being tested. This preliminary result suggests that optimization of these factors is useful if improvement of lipase production is targeted.

Keywords : lipase-producing yeasts, peat swamp forest, lipase production

Digestive Enzymes Characteristics During Larval Development of the Black Soldier Fly, *Hermetia illucens* (Diptera: Stratiomyidae)

Dhinna Intayung
Department of Zoology, Faculty of Science, Kasetsart University, Bangkok, Thailand
dhinna.i@ku.th

Pipatpong Chandang
Department of Physiology, Faculty of Veterinary Medicine, Bangkok, Thailand
pichandang@gmail.com

Attawit Kovitvadhi*
Department of Physiology, Faculty of Veterinary Medicine, Bangkok, Thailand
fvetawk@ku.ac.th

Sunyanee Srikachar
Plant Protection Research and Development Office,
Department of Agriculture, Ministry of Agriculture and Cooperatives, Bangkok, Thailand
sunyaneesrikachar@gmail.com

Uthaiwan Kovitvadhi*
Department of Zoology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fsciutk@ku.ac.th

Abstract

This research aims to study the digestive enzymes characteristics include amylase, trehalase, cellulase, trypsin, chymotrypsin and lipase from black soldier fly larvae (*Hermetia illucens*) at 6, 12 and 18 days old by analyzing each enzyme activity at different pH (3-11) and temperature (25-80°C). The results shown, the optimum pH and temperature for amylase activity was 3-5 and 30-60°C, trehalase at pH 5-6 and 30-55°C, cellulase at pH 10 and 45-50,75°C, trypsin at pH 7, 10 and 80°C, chymotrypsin at pH 5, 9-11 and 30-75°C and lipase at pH 11 and 45, 70-75°C. The digestive enzyme activity of the black soldier fly larvae at 12 days old has the highest value comparing to 6 and 18 days old with great statistically significant difference ($P<0.01$) except lipase activity that was not statistically significant difference ($P>0.05$). In addition, statistically significant difference of the interaction between the study factors (age with pH and age with temperature) was observed ($P<0.01$) except lipase activity with pH ($P>0.05$). The knowledge from the results in this study could apply to formulate an appropriate diets with age specific for black soldier fly larvae. Moreover, these information can be used as a guideline for black soldier fly larvae production in industrial scale to serve as a high quality protein source with environmentally friendly and promoting a sustainable livestock production.

Keywords: Black soldier fly, *Hermetia illucens*, Digestive enzymes

Efficacy of the fluid from banana pseudo-stem on bacterial growth inhibition

Kanchana Wannaphoom
Department of Zoology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
kanchana.wa@ku.th

Win Chaeychomsri
Department of Zoology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fsciwcc@ku.ac.th

Jindawan Siruntawineti*
Department of Zoology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fscijws@ku.ac.th

Abstract

The banana (*Musa sapientum* Linn.) is one of Thailand economic fruits. It is easy to grow and can be used its parts for cooking and therefore it is popularly planted by households. But after each harvest, the stem must be cut off without using. The aim of this study was on bacterial growth inhibition of the banana fluid part that may useful and made value added in banana. Banana pseudo-stem samples, the fluid, were collected by stabbed a spoon into the pseudo-stem and waited until the desired volume. The fluid part was filtered using millipore membrane filter, 0.45 micrometer pore size, for elimination of bacteria that may contaminate during sample collection. *Salmonella enterica* serotype Enteritidis and *Bacillus cereus* were used to study antibacterial growth. Ten-fold dilution technique was performed for dilution of *Salmonella enterica* and *Bacillus cereus* to 10^{-7} and 10^{-4} dilutions, respectively. After dilution, the diluted bacteria were mixed with the banana fluid, and incubated them at room temperature for 0, 3, 6, 12, 18 and 24 hours. Then, the mixtures were spread to bacterial culture plates and incubated them at room temperature for 24 hours. Results demonstrated the *Salmonella enterica* was not inhibited growth activities. Colony counts at 0, 3, 6, 12, 18 and 24 hours were 157±6.08, 284±27.71, 209±109.14, 276.33±22.59, >300 and >300 CFU/ml, respectively. In contrast, the *Bacillus cereus* growth was prohibited and colony counts at 0, 3, 6, 12, 18 and 24 hours were 34.33±0.57, 26.33±7.64, 29.67±3.79, 19.33±7.37, 12.67±3.79 and 9.33±1.53 CFU/ml, respectively. These data revealed the fluid part of banana pseudo-stem had inhibition performance on bacterial growth of gram-positive bacteria (*Bacillus cereus*), but not in gram-negative bacteria (*Salmonella enterica*). However, this was basic data on antibacterial growth in the fluid part of banana pseudo-stem. In order to obtain more clear data, further studies should be conducted on other bacteria.

Keywords: Banana, Antibacterial growth, *Bacillus cereus*, *Salmonella enterica*

Inhibitory effect of the golden apple snail's digestive gland extract on *P.acnes* bacteria

Kavisara Deemak
Department of Zoology, Faculty of Science, Kasetsart University, Bangkok, Thailand
Kavisara.d@ku.ac.th

Teerasak E-kobon
Department of Genetics, Faculty of Science, Kasetsart University, Bangkok, Thailand
teerasak.e@ku.th

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

Abstract

Golden apple snail (*Pomacea canaliculata*) is a common freshwater snail that can be found in most freshwater areas including rice field. This alien species has been causing serious damage on agricultural products due to their high plant consumption and reproduction rates. Although many researchers have proposed several solutions to eliminate and utilize this snail pest, the study of the inhibitory effect of this snail extract the snail on the acne-causing bacteria (*Propionibacterium acnes*) has never been reported before. The purpose of this study was to study the antibacterial effect of *P. canaliculata* digestive glands (PCDG) extracts against *P. acnes*. The digestive gland was collected from the snails preserved in 95% ethanol and the aqueous extraction was performed by food blender/extractor machine using deionized distilled water as a solvent. Then, the aqueous extract was dried to be powder by freeze-drying method. The serial dilutions of crude PCDG extract (0-10 mg/ml) were prepared in brain heart infusion broth and tested on 6 isolates of *P. acnes* bacteria with 3 different clindamycin resistant levels (high, medium and low). All bacterial isolates were incubated with different concentrations of PCDG extracts for 72 h and performed in biological triplicates in 96-well microplates. Growth rate of *P. acnes* was daily observed through the light absorbance at 600 nm using microplate reader. According to the antibacterial assay results, PCDF extract at maximum concentration (10 mg/ml) could inhibit 174.02% of *P. acnes* growth. Our finding can be useful and applicable for medical and cosmeceutical benefits and sustainably reduce the agricultural pests at the same time.

Keyword: golden apple snail, digestive gland, snail extract, *P. acnes*

Study on the nutrition fact of freeze-dried mangosteen endocarp powder

Korn Khaola-or
Department of Zoology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
korn.kh@ku.th

Win Chaeychomsri
Department of Zoology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fsciwcc@ku.ac.th

Jindawan Siruntawineti*
Department of Zoology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fscijws@ku.ac.th

Abstract

The mangosteen (*Garcinia mangostana*) is a native tropical fruit of Southeast Asia and has long been reported to contain multiple health promoting properties. It is important economic fruit of Thailand. The endocarp is the white part of the fruit containing a mild flavor that makes the fruit popular for eating. Various parts of the mangosteen have a history of use in traditional medicine, mostly in Southeast Asia; it may have been used to treat skin infections, wounds, dysentery, urinary tract infections, and gastrointestinal complaints, although there is no high-quality clinical evidence for any of these effects. The aim of this project was to study on the nutrition fact of freeze-dried mangosteen endocarp powder by using Freeze-drying process. The result showed that 100 g of endocarp has 89.08 g of Carbohydrate, 78.57 g of Sugar, 3.84 g of Fiber, 48.12 mg of Calcium, 1.28 mg of Vitamin C and 0.18 mg of Collagen. This data revealed that the preservation of mangosteen endocarp by freeze-drying process can remain some nutritional aspect and be basic information for further industrial applying.

Keyword: Mangosteen, Mangosteen powder, Freeze-drying, Nutrition fact

A comparative study of factors affecting on cordycepin extraction from *Cordyceps militaris* powder

Natsaran Meprayoonwong
Department of Zoology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
natsaran.m@ku.th

Wasinee Khuntawee
Department of Physics, Faculty of Science, Kasetsart University,
Bangkok, Thailand
w.khuntawee@gmail.com

Jirasak Wong-ekkabut
Department of Physics, Faculty of Science, Kasetsart University,
Bangkok, Thailand
jirasak.w@ku.ac.th

Wanwipa Vongsangnak*
Department of Zoology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fsciwpv@ku.ac.th

Abstract

Cordyceps militaris is an entomopathogenic fungi belonging to the family Cordycipitaceae. It has a major bioactive compound called cordycepin (3'-deoxyadenosine). The ultrasonic assisted extraction (UAE) is one of the most widely used methods for cordycepin extraction. However, the study on extraction efficiency improvement is insufficient. In this study, we therefore investigated the effect of various factors, i.e. sonication time, sonication temperature, amount and particle size of *C. militaris* powder on the extraction yield of cordycepin from *C. militaris* powder. Moreover, the physical properties of *C. militaris* powder were afterwards studied. The results showed that the *C. militaris* powder amount and type of solvent influenced on the cordycepin extraction efficiency. On the contrary, it had no significant effects of sonication time, sonication temperature, and particle size of *C. militaris* powder on cordycepin yield. Interestingly, the addition of stabilizer agent as beta cyclodextrin in the *C. militaris* powder preparation by ball milling could increase cordycepin yield by 3.7%, compared to *C. militaris* powder without stabilizer agent. The obtained information is useful for the improvement of cordycepin extraction in the future.

Keywords: *Cordyceps militaris*, Cordycepin, Ultrasonic assisted extraction

Effect of betalains on anxiety and brain oxidative status in trimethyltin induced neurodegeneration mice.

Nattakan Klomkleaw
Department of Zoology, Faculty of Science, Kasetsart University, Bangkok, Thailand
nattakan.klo@ku.th

Wachiryah Thong-asa*
Department of Zoology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fsciwyth@ku.ac.th

Abstract

This study investigated the effect of betalain (BL) on anxiety-like behavior and brain oxidative status in neurodegenerative mice model that was induced by trimethyltin (TMT) injection. Thirty six male ICR mice were randomly divided into 4 groups of Sham-veh, TMT-veh, TMT-BL50 and TMT-BL100. One time intraperitoneal injection of TMT 2.6 mg/kg was given in TMT groups. Twenty four hours after TMT injection, BL 50 mg/kg and 100 mg/kg were given to BL groups and continue for 10 consecutive days. Anxiety-like behavior performance in elevate plus maze (EPM) was done every 48 hrs. Brains were collected for biochemical analysis of oxidative status after finishing of all behavioral tests. The result revealed that TMT significantly induce anxiety-like behavior along with brain oxidative stress by the reduction of catalase (CAT) and superoxide dismutase (SOD) levels. BL 100 mg/kg significantly depicted anxiolytic effect and amelioration of brain oxidative stress by the increase of CAT, SOD and Glutathione (GSH). This study concluded that anxiolytic effect of BL involve antioxidation properties in mice with TMT induced brain neurodegeneration.

Keywords: Betalains, Antioxidant, Trimethyltin, Neurodegeneration

Evaluation of paraquat toxicity on hematology of Nile tilapia *(Oreochromis niloticus)*

Nawaphas Chanthanapaiboon
Department of Zoology, Faculty of Science, Kasetsart University, Bangkok, Thailand
nawaphas.c@ku.th

Thularath Toommakorn*
Department of Zoology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscitrk@ku.ac.th

Abstract

Paraquat is an effective and widely used herbicide and it has high toxicity. When paraquat was released into the environment, contaminating water sources. It can transfer to human and organisms via food chain. Including Nile tilapia, *Oreochromis niloticus*, is a well-known freshwater fish and popularly consumed. That may be affected by paraquat-contaminated water. This study investigated the hematological values of 11-16 centimeters of Nile tilapia and 14-60 grams of weight treated with paraquat. The fish were divided into 5 groups treated with a different concentration level of paraquat; 0.001, 0.05, 0.1, 1 and 2 ppm for 7 days. The blood samples were collected from an unconscious fish. These blood samples were used for the measurement of hematocrit and hemoglobin. The results showed that the control group had the highest percentage of hematocrit, 34.70 ± 2.46%, Which were significantly different from groups that treated with 1 and 2 ppm of paraquat. However, hemoglobin levels were not significantly different between the control group and the 5 experimental groups. This study provides safety information for paraquat users and aquatic animals including organisms and environments that may be affected by paraquat.

Keywords: Paraquat, *Oreochromis niloticus*, Hematology, Toxicity

Effect of betalain against hippocampal neurodegeneration induced by trimethyltin in mice

Nutnicha Thongwan
Department of Zoology, Faculty of Science, Kasetsart University, Bangkok, Thailand
Nutnicha.th@ku.th

Wachiryah Thong-asa*
Department of Zoology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fsciwyth@ku.ac.th

Abstract

Dementia is associated with vulnerable brain damage and resulting in variety of symptoms include memory loss and difficulties with thinking, problem-solving or language. The vulnerable brain region responsible for function–of those behavioral abilities is the hippocampus. This study investigated the effect of betalain (BL) on hippocampal neuropathology in neurodegenerative mice model that was induced by trimethyltin (TMT) injection. Twenty male ICR mice were randomly divided into 4 groups of Sham-veh, TMT-veh, TMT-BL50 and TMT-BL100. One time intraperitoneal injection of TMT 2.6 mg/kg was given in TMT groups. Twenty four hours after TMT injection, BL 50 mg/kg and 100 mg/kg were given to BL groups and continue for 2 weeks. After that brains were collected for histological analysis by using 0.1% cresyl violet staining. Hippocampal viable and degenerating cells were counted by using NIH ImageJ. Results revealed that betalain significantly prevent the degeneration of hippocampal neurons that was induced by TMT ($p < 0.05$). This study demonstrated the neuroprotective effect of betalain in mice model of neurodegeneration induced by TMT.

Keywords: dementia, betalain, hippocampus, neuropathology

Process development of mangosteen powder production

Onusa Suksumitr
Department of Zoology, Faculty of Science, Kasetsart University, Bangkok, Thailand
onusa.s@ku.th

Win Chaeychomsri
Department of Zoology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fsciwcc@ku.ac.th

Jindawan Siruntawineti*
Department of Zoology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscijws@ku.ac.th

Abstract

Mangosteen (*Garcinia mangostana* Linn.), family Clusiaceae, is considered one of the most delicious fruits of Thailand with high export potential. In order to have supply of this fruit between harvest seasons, which ranges from two to four months depending on local production, it is necessary to use freeze-dry technique for preservation of the endocarp quality and extension shelf life. However, mangosteen is a seasonal fruit and has short shelf life. It will loose quality, and values when its overproduction. This study aimed to develop mangosteen endocarp powder production by freeze–dry method, which is the most efficient way to preserve the quality. Freeze-dried mangosteen endocarp powder product was determined chemical analyses which including the detections of Lead (Pb) and Arsenic (As), and microbiological determinations of *Escherichia coli, Staphylococcus aureus, Clostridium* spp. and *Salmonella* spp. The results from this research showed that Lead and Arsenic were less than 0.10 mg/kg. The number of *E. coli* was less than 3 MPN/g, and the *S. aureus, Clostridium* spp. and *Salmonella* spp. were not detected. These results were in the standard criteria according to the Ministry of Public Health Notification (No. 293) B.E. 2548 (2005) Re: Food Supplement. This study showed suitable process for mangosteen endocarp powder production. These will be beneficial for the production of mangosteen endocarp powder products in the industry further.

Keywords: Mangosteen, Mangosteen powder, Freeze-dry

Using of golden apple snail extract as a nitrogen source for *Cordyceps militalis* cultivation

Pannathorn Boonkerd
Department of Zoology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
Pannathorn.b@ku.th

Pramote Chumnanpuen*
Department of Zoology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fsciptch@ku.ac.th

Abstract

Golden Apple Snail (*Pomacea canaliculata*) is an alien species that seriously causes damage to agricultural products since it can rapidly spread out in Thailand. Having high protein content in their meat, they have been used as nitrogen source for animal feed supplement and composed fertilizer. However, the using of apple snail extract as ingredient of microbial culture medium has never been reported before. More importantly, C*ordycep militalis* is recognized as valuable and the demand in the food-industry since it can produce the bioactive compound "cordycepin". Therefore, this study aimed to formulate the culture medium for cordycepin production of *C. militalis* using golden apple snail extract (GASE) as a nitrogen source which could replace the expensive commercial nitrogen sources i.e. peptone and yeast extract. To explore the cellular responses underlying in *C. militaris* strain CMRU01, a comparative study of the biomass and cordycepins production on different nitrogen sources i.e. 1) GASE as a soul nitrogen sources, 2) GASE+peptone, and 3) GASE+yeast extract. Theses media formulas were compared to the regular culture medium having peptone and yeast extract as the soul nitrogen source. All the experiment were performed in triplicates of surface liquid cultivation mode. The aqueous extract of GASE was prepared from the foot and mantle tissue and frozen dried to be powder. The result indicated that *C. militaris* can grow well in all recipes. The best formula was GASE+yeast extract reaching 12.87 g/L *C. militalis* mycelium biomass and 345.17 mg/L cordycepin production in liquid media. However, the cordycepin content in mycelium was found the highest in GASE+peptone formula reaching 11.00 mg/liter cordycepin. This research showed that GASE can be used as nitrogen source for cordycepin production media for *C. militalis* which can turn the snail pest into benefit and reduce the medium cost at the same time. This could provide the products that meet the consumers that are health conscious and looking for the organic *C. militalis* cultured by natural nitrogen sources.

Keyword: *Pomacea canaliculata*, C*ordycep militalis*, golden apple snail extract, nitrogen source

Acute Toxicity Study of Myrothecium roridum in Wistar Rat Lung

Patsara Siriwiboonpol
Department of Zoology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
patsara.si@ku.th

Thularath Toommakorn*
Department of Zoology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fscitrk@ku.ac.th

Abstract

Myrothecium roridum is a soil fungal plant pathogen that was found in worldwide, especially in tropics and subtropics. *M. roridum* has been reported that can cause leaf blight disease in water hyacinth so it was currently used for biocontrol agent to eliminate water hyacinth as mycoherbicide. However, safety for using this fungus is an important factor. The aim of this study was to examine acute toxicity of *M. roridum* in Wistar rat lung. Rats were received distilled water in control group and the experimental group were received a single dose of differential concentrated solution of *M. roridum* 5×10^5, 5×10^6, 5×10^7, 5×10^8 and 10×10^8 spore/ml/kg.bw. by oral. After 7 days, lung tissue were collected to histological study through H&E staining, inflamatory areas and dead areas were count. The study was found that no significant difference between groups. In comparison between male and female, it was statistically significant only in 5×10^6 spore/ml/kg.bw. group. Similar statistic of control and experimental groups indicated that the increase of fungal concentrated solution has no effect in rat lung cells. The fungal concentrated solution at 10×10^8 spore/ml/kg.bw. has no acute toxicity and specificity in pathogenesis in rat lung.

Keyword: *Myrothecium roridum*, mycoherbicide, rat lung

Development of low cost artificial diet for young silkworm larvae

Pattapon Injan
Department of Zoology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
pattapon.i@ku.th

Amornrat Promboon
Department of Biochemistry, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fsciarp@ku.ac.th

Apisit Thipaksorn*
Department of Zoology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fsciast@ku.ac.th

Abstract

The silkworm, *Bombyx mori*, is a popular moth which belongs to the order Lepidoptera. This moth is remarkable in producing silk which is used in producing cloths. The rearing of silkworms consists of several steps which includes the planting of mulberry plants, supplying of mulberry leaves to growing silkworm larvae, cleaning of the rearing rooms, mounting of the larvae so that they will spin cocoons and collection of cocoons. Silkworm rearing requires relatively high temperatures (26-28 °C) and high humidity (75%-80%). Our previous study was successfully developed a suitable artificial diet for young silkworm containing 40 % mulberry leaves powder. In this report, we aim to produce low cost artificial diet by reducing mulberry leaves and supplement diet with other available commercial nutrients to balance diets into the same nutrition and energy. Young local silkworms were reared with 5 artificial diets (40, 30, 20, 10 and 0 mulberry leaves %) and late *age silkworm*s were reared with fresh mulberry leaves. Silkworm accepted all of diets except 0% diet. All of silkworms reared with artificial diets had lower larval body weight and longer silkworm period when compared with the silkworm reared with mulberry leaves.

Keyword: domestic silkworm, young silkworm, artificial diet, low cost, mulberry leaves

Development of nano-delivery system for disease control in Nile tilapia (*Oreochromis niloticus*)

Pattaraporn Chaokasem
Department of Zoology, Faculty of Science, Kasetsart University, Bangkok, Thailand
Pattaraporn.chao@ku.th

Mesayamas Kongsema
Department of Zoology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscimmk@ku.ac.th

Sasimanas Unajak
Department of Biochemistry, Faculty of Science, Kasetsart University,Bangkok, Thailand
fscissmn@ku.ac.th

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

Abstract

Controlling of streptococcosis disease in Nile tilapia is important for sustaining aquaculture in Thailand. Currently, the application of vaccine in fish is administered mainly by injection method which is difficult to deal with. In this study, we aim to enhance efficiency of the vaccine application to fish by using drug delivery system based on a carbon nanotube delivery system harboring subunit vaccine specific to *Streptococcus agalactiae*. Recombinant vaccine was produced in bacterially expression system and purified by Fast protein liquid chromatography (FPLC) using HiPrep Sephacryl S-300 High resolution column. Purified recombinant vaccine with approximately 68 kDa in size and specific reacted with ani-His antibody. To develop vaccine delivery system, nanoclay was used by treating their surface with aminopropyltriethoxysilane (APTES) and modified with chitosan (CS). Thermogravimetric analysis (TGA) indicated that nanoclay-APTES had an additional step weight loss at 200-350℃ and nanoclay-CS had a weight loss at 250-400℃. Fourier-transform infrared spectroscopy (FTIR) demonstrated that nanoclay has modified by CS. Moreover, a result from energy dispersive X-ray Spectrometer (EDS) showed the spectrum of elemental C and N which appeared in the modified nanoclay which confirming a successful CS grafting. Morphological features of nanoclay and modified nanoclay was determined using scanning electron microscope (SEM) shown that nanoclay exhibited a hollow nanotubular structure as similar as morphology of modified nanoclay. Therefore, it is suggested that modification of nanoclay with APTES and CS was not destroyed its structure. Immobilizing with purified recombinant vaccine was performed and demonstrated that modified nanoclay was successfully immobilized by recombinant vaccine. This result demonstrated that the potential vaccine delivery system to control streptococcosis in Nile tilapia was developed. The efficacy of this delivery system will be tested against *S. agalactiae* infection.

Keywords: Nanoclay, Chitosan, Vaccine

Acute Toxicity Evaluation of Paraquat on *Moina macrocopa*

Pichanun Homtua
Department of Zoology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
Pichanan.ho@ku.th

Thularath Toommakorn*
Department of Zoology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fscitrk@ku.ac.th

Abstract

Paraquat is a chemical that farmers was used widely as herbicide which may contaminated into aquatic environment. *Moina macrocopa* is a small animal that is important in aquatic ecosystem food chain. The aim of this study was to investigate the toxicity of paraquat on *M. macrocopa*. Animals were divided into 2 groups, control group was cultured with dechlorinated water while the experimental group was exposed to paraquat concentrated solution of 0.001, 0.05, 0.5, 1 and 2 ppm. The results were observed every 2 hours for 24 hours. The experiment was done in triplicate. Mortality percentage showed 0, 5, 11.66, 15, 20 and 38.33 percent respectively. Summary, the concentration of paraquat at 2 ppm which has rapidly effected to the mortality of *M. macrocopa*. In addition, the pH level in experiment groups were significantly increased when compared to control group.

Keyword: Paraquat, *Moina macrocopa*

Efficacy of elephant placenta on bacterial growth inhibition

Sintwo Wongthongdee
Department of Zoology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
sintwo.w@ku.th

Win Chaeychomsri
Department of Zoology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fsciwcc@ku.ac.th

Jindawan Siruntawineti*
Department of Zoology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fscijws@ku.ac.th

Abstract

Placenta is used for biomedical benefits. Captive elephants in Thailand have gave birth increasingly, but their placenta are usually eradicated and no usage. For determination of important substances in elephant placenta which support to increase placenta value, so we studied on bacterial growth inhibition. Placenta samples were collected from elephants captived at Ayutthaya Elephant Palace & Royal Kraal, Ayutthaya. These were preserved at freezing temperature. In this study, the fluid part of placenta was collected after thawing at 4 degree Celsius. For separation of bacteria that may contaminate during the collection, this fluid part sample was filtrated via millipore filter membrane, pore size 0.45 micrometer. *Bacillus cereus* and *Salmonella enterica* serotype Enteritidis were used to study antibacterial growth activities. We used ten-fold dilution technique to dilute *B. cereus* and *S. enterica* to 10^{-4} and 10^{-7} dilutions, respectively. After dilution, we mixed them with the fluid part sample of placenta and incubated them at 37 degree Celsius for 0, 3, 6, 12, 18 and 24 hours. The mixtures were spread in plate and incubated these plates at 37 degree Celsius for 24 hours. The number of bacterial colonies was counted. The results showed that since 12 hours, the growth of *B. cereus* was inhibited. Colonies count data at 0, 3, 6, 12, 18 and 24 hours were 55.33±52.58, 125.67±24.19, more than 300, 90.67±32.02, 27.67±19.73 and 17.33±22.68 CFU/ml, respectively. In contrast, the growth of *S. enterica* was not inhibited, colonies count at 0 and 3 hours were 19.00±10.44 and 146.00±90.09 CFU/ml, respectively. Moreover, since 6 hours of mixture, colonies count was more than 300 CFU/ml. This research data indicated that Asian elephant placenta has some substances which can inhibit gram-positive bacteria (*B. cereus*) growth, but it could not inhibit bacterial growth of gram-negative bacteria (*S. enterica*). However, this study is basis study on antibacterial growth activity of Asian elephant placenta, more studies should performed in other bacteria.

Keywords: Placenta, Asian elephant, Antibacterial growth activity, Growth inhibition

Efficacy of Asian elephant serum in bacterial growth inhibition

Sirimon Kongruen
Department of Zoology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
Sirimon.ko@ku.th

Win Chaeychomsri
Department of Zoology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fsciwcc@ku.ac.th

Jindawan Siruntawineti*
Department of Zoology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fscijws@ku.ac.th

Abstract

Asian elephant (*Elephas maximus*) is the largest living land mammals and distributed throughout the Asia. Recently, the captive Asian elephants has been increase in number at many cultured place. Their health is depended on many factors. The one of important factors is substances in the elephant blood that can inhibit the growth of bacteria, which is part of innate immune system. The aim of this study was to examine efficacy on the bacterial growth inhibition in elephant blood. Elephant blood samples were provided after annual examination of elephants health of the Ayutthaya Elephant Palace & Royal Kraal, Ayutthaya. Then, the elephant blood was separated by centrifugation and collected blood serum. We used *Bacillus cereus* and *Salmonella* sp. to assess bacterial inhibition. Ten-fold dilution technique was conducted to dilute *B. cereus* and *Salmonella* sp. 10^{-4} and 10^{-7} dilution, respectively. After dilution, the diluted bacteria were mixed with serum samples and incubated at 37 degree Celsius for 0, 3, 6, 12, 18 and 24 hours. The mixtures were spread in plates and incubated at 37 Celsius degree for 24 hours, then counted number of bacterial colonies and recorded data. The mixtures of serum and *Salmonella* sp. demonstrated colonies data count according to the incubated times as 85.67±31.66, 10.33±7.02, 3±1.73, 25.33±9.29, >300 and >300 CFU/ml, respectively. In the mixtures of serum and *B. cereus*, colonies showed as 28±3.6, 70.67±5.13, 119±32.70, >300, >300 and >300 CFU/ml, respectively. This research data indicated that elephant serum can inhibit *Salmonella* sp. growth at 3, 6 and 12 hours and can inhibit *B. cereus* growth at 0 hours. However, this study is basic study on antibacterial growth of Asian elephant serum. In order to obtain more clear information, further studies should be conducted on other bacteria.

Keywords: Asian elephant, Serum, Blood, Antibacterial growth

Screening of anti-breast cancer cell proliferation activity of *Piper* crude extracts

Suchanya Suporn
Department of Zoology, Faculty of Science, Kasetsart University, Bangkok, Thailand
suchanya.sup@ku.th

Vasakorn Bullangpoti
Department of Zoology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscivkb@ku.ac.th

Chalermpol Suwanphakdee
Department of Botany, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscicps@ku.ac.th

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

Kamonporn Masawang*
Department of Zoology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscikpm@ku.ac.th

Abstract

Piperaceous plants are well-known the medicinal plants and has been reported the widely used, including medicine and supplement properties. Due to an obstacle for species identification, biological activities of them were focused on only well-known species. Therefore, the objective of this research is to screen an antiproliferative activity of crude extracts of twelve species of Thai *Piper* against breast cancer cell line, the most common cancer type in Thai women. Moreover, breast cancer incidence and mortality rates have continuously increased worldwide. Regarding the experiments, leaves or stems of twelve species were extracted by soaking in three solvents; Hexane, Ethyl acetate, and 95% Ethanol, respectively. Then forty two crude extracts were tested for their cytotoxicity by the protein-binding dye Sulforhodamine B (SRB) assay on human tumor cell line namely MCF-7 (breast adenocarcinoma). The study found that forty two crude extracts exhibited growth inhibitory effects on breast cancer MCF-7 cells with values of GI_{50} of 3.447 - 474.577 μg/ml. Among them, ethanol crude extracts of *P. suipigua* and *P. umbellatum* leaves showed strong activity with GI_{50} values of 3.447 μg/ml and 8.131 μg/ml, respectively. Concerning the extraction of *P. suipigua*, the results revealed that percentage yield of leaf crude extracts were higher than those of stem using the same solvent. Furthermore, ethanol was suitable solvent for leaf extraction of this species.The present study is the first report on crude extraction and anti-cancer cell proliferation activity of *P. suipigua*, which is interesting to further study for anticancer compound development.

Keyword: *Piper*, crude extract, antiproliferative activity, breast cancer

Effect of betalain on cognitive function in trimethyltin-induced neurodegeneration mice

Supakorn Prasartsri
Department of Zoology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
supakorn.prasa@ku.th

Wachiryah Thong-asa*
Department of Zoology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fsciwyth@ku.ac.th

Abstract

Neuronal degeneration in the hippocampus leads to a reduction in the ability of the brain to learn and memorize is associated with dementia, which often occurs in the elderly people. Cognitive deficits in dementia are continuously and be still unable to retard the disease's symptoms. This study investigated the effect of betalain (BL) on cognitive function in neurodegenerative mice that were induced by trimethyltin (TMT). Thirty-six male ICR mice were divided randomly into 4 groups of SHAM-veh, TMT-veh, TMT-BL50 and TMT-BL100. The TMT groups were injected of TMT 2.6 mg/kg and the BL groups were given betalain 50 mg/kg and 100 mg/kg, respectively via gavage feeding for two weeks, along with **spatial learning and memory** ability assessments in the **Morris water maze.** Results showed that betalain 50 mg/kg can reduce learning and memory deficit in TMT induced mice. The escape latency significantly reduced in TMT-BL50 along with increased of time spent in the target quadrant when compared to TMT-veh ($p < 0.05$). This study imply about improving effect of betalain against TMT induced cognitive impairments in mice.

Keyword: Cognitive impairment, trimethyltin, betalain, water maze, escape latency.

The Effect of Synthesized Artemisinin Derivatives against Breast Cancer (MCF-7) Cell Proliferation

Supannee Lanamwong
Department of Zoology, Faculty of Science, Kasetsart University, Bangkok, Thailand
supannee.l@ku.th

Mesayamas Kongsema*
Department of Zoology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscimmk@ku.ac.th

Abstract

Breast cancer is the most common cancer found in women in Thailand and worldwide. There are various treatments that are commonly used as a combination for breast cancer therapy. Presently, adjuvant therapies has been reported to increase effectiveness of chemotherapy treatment. Reported in previous research, the anti-cancer effect of Artemisinin derivatives, the important compound isolated from Chinese herb called Qinghao (*Artemisia annua*) can inhibit cell proliferation in many types of cancer. The purpose of this study was to investigate the cytotoxicity effect of synthesized Artemisinin derivatives (restructured in laboratory) on breast cancer cell line. MCF-7 cell was used as a model study. The cytotoxicity was evaluated by MTT assay after the cells were exposed to the various concentrations (0, 6.25, 12.5, 25, 50 and 100 µM) for duration 24, 48 and 72 hours. The experiment was conducted with 13 compounds. The result revealed that Artemisinin (the original compound from Qinghao) has no cytotoxic effect on MCF-7 cells. The 4 effective compounds were NS-098, NS-109, NS-088 and NS-152 which had the 24 hours the lowest IC_{50} (Inhibitory Concentration 50) at 29.9764, 34.4867, 46.4676 and 49.4774 µM, respectively. In addition, the results suggested that the effect of the compound were in a dose- and time-dependent manner. The cytotoxic effect of the compound to the normal cells was also evaluated by Vero cells to ensure the safety of the compounds. In conclusion, this study indicates that some of the restructured synthesized Artemisinin derivatives have more effectiveness of breast cancer cells growth inhibition and the best compound may reconstruct for better efficiency. However, activity and mechanism of these synthesized compounds still required further evaluation.

Keyword: Artemisinin, Artemisinin derivative, Breast cancer, Cytotoxicity

Protein composition of placenta from Asian elephant (*Elephas maximus*)

Thanawan Lehuasra
Department of Zoology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
thanawan.le@ku.th

Win Chaeychomsri
Department of Zoology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fsciwcc@ku.ac.th

Jindawan Siruntawineti*
Department of Zoology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fscijws@ku.ac.th

Abstract

The placenta is an organ that was created during the mother's pregnancy. There is an important part in the creation of living cells to raise the larvae to grow and also have the duty to create immunity for the embryos. It is reported that mammal placentas such as sheep placenta, horse placenta are rich in minerals and bio-nutrients that are beneficial. However, It is no reports of elephant placenta. Thus, this study on protein composition of placenta from Asian elephant (*Elephas maximus*) was performed that examined according to molecular weights and presented protein bands by principle of electrophoresis. Placenta samples were collected from captive elephants at Ayutthaya Elephant Palace & Royal Kraal, Ayutthaya those were preserved at – 20^{o}C. In this study, after placenta samples thawing at 4^{o}C, the samples were separated in 2 parts (the membranous part and the fluid part of placenta). Then, these placenta samples were protein pattern examination by 10% sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-PAGE) technique in non-reducing condition. The optimum of separating gel was 10% W/ V). The results presented 6 protein bands at 22, 33, 47, 58, 104 and 115 KDas. However, this study is basis study on protein in Asian elephant placenta that may be useful as introductory for product development to add value to the elephant placenta.

Keywords: Placenta, Asian elephant, Protein analysis, SDS-PAGE

Culture medium from rice on growth and cordycepin production of *Cordyceps militaris*

Thanawat Kengchaiyaphum
Department of Zoology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
thanawat.k@ku.th

Prisana Suwannaporn
Department of Food Science and Technology, Faculty of Agro-Industry, Kasetsart University,
Bangkok, Thailand
prisana.s@ku.ac.th

Wanwipa Vongsangnak*
Department of Zoology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fsciwpv@ku.ac.th

Abstract

Cordyceps militaris, an entomopathogenic fungi, is a species of Cordyceps group which can produce different bioactive compounds, especially cordycepin. So far, rice has been used as a culture medium for *C. militaris* cultivation, however no investigation on the effect of different kinds of rice on *C. militaris* growth and cordycepin production. This study thus tried to compare culture medium with various parts of rice, such as rice straw, rice germ, and brown rice flour on growth of *C. militaris*, altogether with its cordycepin production comparing with control medium. Results showed that the best culture medium formula for *C. militaris* biomass production (17.52 g/L) was from brown rice flour comparing with control medium (6.46 g/L). Alternatively, the best culture medium formula for cordycepin production (764.90 mg/L) was rice germ formula in comparison with control medium (686.88 g/L). This study showed that different rice components had different effects on growth and cordycepin production of *C. militaris* which could be used in industrial scale cultivation of this species.

Keywords: *Cordyceps militaris*, cordycepin, biomass, rice germ, brown rice flour, rice straw

Toxicity Evaluation of Paraquat on Nile Tilapia (*Oreochromis niloticus*) using Micronucleus Assay

Tharntip Tukarn
Department of Zoology, Faculty of Science, Kasetsart University, Bangkok, Thailand
thantip.tu@ku.th

Thularath Toommakorn*
Department of Zoology, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscitrk@ku.ac.th

Abstract

Paraquat is a herbicide in the bipyridinium group. It is widely used in Thai farmers. The purpose of this research was to examine the abnormalities of the nucleus in Nile Tilapia erythrocytes and investigate the concentration of paraquat that cause micronucleus (MN) formation. The experimental fish were divided into 2 groups, control group was cultured in dechlorinated water and the experimental groups were exposed to 0.001, 0.05, 0.5, 1 and 2 ppm of paraquat for 1 week. All fish were anaesthetized with clove oil. Blood samples were collected and fixed with absolute methanol. Blood film slides were stained with Wright-Giemsa. MN frequencies were counted and statistically tested. The results showed number of micronucleus 0.60±0.16, 0.70±0.26, 0.60±0.22, 2.80±0.24, 5.20±0.55 and 10.00±0.90 respectively. In conclusion, the concentrations of paraquat at 0.5, 1 and 2 ppm can induce micronucleus formation these were significantly different when compared to control group.

Keywords: Paraquat, *Oreochromis niloticus*, Micronucleus, Toxicity

Inhibitory effect of the golden apple snail's foot part extract on *P.acnes* bacteria

Wasunun Thananurukkul
Department of Zoology, Faculty of Science, Kasetsart University, Bangkok, Thailand
wasunun.t@ku.ac.th

Teerasak E-kobon
Department of Genetics, Faculty of Science, Kasetsart University, Bangkok, Thailand
teerasak.e@ku.th

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

Abstract

The golden apple snail (*Pomacea canaliculata*) is an alien species that can rapidly reproduce and causes serious damage to agricultural products. Although there were several reports on the antimicrobial activity of snail mucus and their extracts but their inhibitory effect of the *P. canaliculata* foot part (PCF) extract on *Propionibacterium acnes* bacteria has never been studied. This research project aimed to investigate the antibacterial effect of the PCF extract on *P. acnes*. The golden snail's foot part had preserved in 95% ethyl alcohol and the aqueous extract was prepared by food blender and extractor using ultrapure water as a solvent. The powder of crude extract was prepared by freeze drying method. The serial dilutions of crude PCF extract (0-10 mg/ml) were prepared in brain heart infusion broth and tested on 6 isolates of *P. acnes* bacteria with 3 different clindamycin resistant levels (high, medium and low). All bacterial isolates were incubated with different concentrations of PCF extracts for 72 h and performed in biological triplicates in 96-well microplates. Growth rate of *P. acnes* was daily observed through the light absorbance at 600 nm using microplate reader. According to the antibacterial assay results, PCF extract at maximum concentration (10 mg/ml) could inhibit 52.35% of *P. acnes* growth. Our finding can be useful and applicable for medical and cosmeceutical benefits and sustainably reduce the agricultural pests at the same time.

Keyword: golden apple snail, snail extract, snail foot, *P. acnes*

Potential of scaffold from *Cordyceps militaris* mycelium on Chondrocyte culture

Worapitcha Wu
Department of Zoology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
worapitcha.w@ku.th

Pramote Chumnanpuen*
Department of Zoology, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fsciptch@ku.ac.th

Abstract

Cordyceps militaris is an entomopathogenic fungus that can produce bioactive compounds with various biological and pharmacological activities such as anticancer and antimicrobial effect etc. The process of extracting bioactive compounds leaves a lot of mycelium, and because of the current scaffold used in cell culture is made by natural biomaterials such as gelatin, silk, and chitosan. To study the potential of scaffold that obtained from *C. militaris* mycelium, three types of the scaffold were made include gelatin-chitin scaffold, gelatin-mycelium scaffold and gelatin-polysaccharide scaffold with a freeze-drying method, then culture the cartilage cells for 3 days. To validate the effects of each scaffold type made of different material contents, histochemistry and microanatomy structure analysis will be further performed. This information could be useful and applicable for biomaterial innovation and other medical benefits.

Keywords: scaffold, *Cordyceps militaris* mycelium, chondrocyte, iomaterial

Potential Use of Wudani Leaf (*Quisqualis indica Linn)* As an Herbal Anthelmintic for *Fasciola gigantica*

Adinda Rana Fauziah*
Department of Veterinary Medicine, Faculty of Veterinary Medicine, IPB University, Bogor, Indonesia
rana_adinda@apps.ipb.ac.id ; rana.adinda@gmail.com

Almira Azmi Sabila
Department of Community Nutrition, Faculty of Human Ecology, IPB University, Bogor, Indonesia
sabilaalmira@gmail.com ; almira_sabila@apps.ipb.ac.id

Lalu Faris Naufal Makhroja
Department of Veterinary Medicine, Faculty of Veterinary Medicine, IPB University, Bogor, Indonesia
faris_naufal@apps.ipb.ac.id ; farisnaufal14@gmail.com

Abstract

Indonesia is a country with a relatively high humidity. In this environment many microorganisms reproduce rapidly, including parasites. Fasciolosis is a zoonotic parasitic worm infection whose main hosts are ruminants, including cattle and sheep. Fasciolosis is caused by the common liver fluke *Fasciola hepatica* along with *Fasciola gigantica.* The infestations of *Fasciola* sp. in cattle and sheep lead to reductions in wool and milk production. Moreover, it leads to heart engraving with resultant mortality. In Indonesia Fasciolosis is present in up to 90% of ruminants. The purpose of this research is the collection and analysis of information relating to the use of wudani leaf extract, as both a preventative and treatment for fasciolosis resulting from the parasite *Fasciola gigantica*. The research methodology is meta-analysis of existing data from books, documents, and journal articles available online. Wudani leaf contains alkaloids, flavonoids, saponins, phenol, steroids, and tannins as active ingredients which are used as an anthelmintic. The primary alkaloid substances contained in wudani leaf are the inhibitors to acetylcholinesterase enzyme work which causes paralysis in worm muscle tissues. The study shows the possible efficacy of wudani leaf as an herbal anthelmintic for the prevention and treatment of fasciolosis.

Keywords: anthelmintic, *Fasciola gigantica*, fascioliasis, *Quisqualis indica Linn*

Modification of Lysozyme Antibacterial Activity of Local Chicken Egg White From Livestock Research Institute Bogor Indonesia by Heat, Low pH, and Enzymatic Treatment

Syahrizal Nasution[1*], Harsi D Kusumaningrum[1], Didah N Faridah, Eni Kusumaningtyas[2]
[1]Department of Food Science and Technology, Faculty of Agricultural Technology, Bogor Agricultural University, Bogor, Indonesia
[2]Center for Veterinary Research, Bogor, Indonesia
[*]syahrizalnast@gmail.com

Abstract

Lysozyme is a hydrolase enzyme that has an antibacterial activities through the hydrolysis the peptidoglycan cell wall of Gram-positive bacteria. The native lysozyme isolated from chicken egg white is more effective to hydrolyze the cell wall of Gram-positive bacteria. The aim of this study was to increase the spectrum of lysozyme antibacterial activity and to observe its effect on MIC (*Minimum Inhibition Concentration*) from Sentul chicken eggs white that obtained from Livestock Research Institute. The research is carried out through lysozyme egg white isolation using Amberlite FPC3500 resin (ion-exchange method); lysozyme modification by heat treatment (60, 75, 90°C) for 20 minutes in pH 7, low pH incubation treatment (1.5, 37°) for 1 hour & enzymatic incubation treatment using pepsin at pH 1.5 (37°) for 1 hour; antibacterial activity testing by microdilution method; and characterization of isolated lysozyme by SDS-PAGE method (*Sodium Dodecyl Polyacrylamide Gel Electrophoresis*) and RP-HPLC (*Revered Phase High-Performance Liquid Chromatography*) method. The results showed that lysozyme can be isolated from Sentul chicken egg white which was confirmed by SDS-PAGE. Antibacterial activity testing showed that the isolated lysozyme was able to inhibit the four tests bacteria that have the lowest lysozyme MIC value (3 mg/ml) in each bacterium. *Staphylococcus aureus* ATCC 25923 at 75 & 90°C heat treatment, pepsin & pH incubation treatment; *Bacillus cereus* ATCC 10876 at 90°C heat treatment, pepsin & pH incubation treatments; *Escherichia Coli* ATCC 25922 in all treatments except pepsin treatment; and *Salmonella Typhimurium* ATCC 14028 at low pH incubation treatment. The characterization of lysozyme using SDS-PAGE showed that isolated lysozyme has the same molecular weight as commercial lysozyme, the heat treatment (90°C) changed some of the lysozymes to be dimers form, and the pepsin treatment hydrolyzed the lysozyme to be a smaller size. The RP-HPLC also confirm that commercial lysozyme has the same retention time as isolated lysozyme. Based on the research, it can be concluded that heat, low pH and enzymatic treatment can modify the lysozyme to increase antibacterial activity from Sentul chicken egg white.

Keywords: Antibacterial activity, MIC, Lysozyme, Local chicken egg white

The Effect of Egg Consumption as Lipid Source on Blood Lipid Profile

Almira Azmi Sabila*
Department of Community Nutrition, Faculty of Human Ecology, IPB University, Bogor, Indonesia
almira_sabila@apps.ipb.ac.id ; almira.azsabila@gmail.com

Adinda Rana Fauziah
Department of Veterinary Medicine, Faculty of Veterinary Medicine, IPB University, Bogor, Indonesia
rana_adinda@apps.ipb.ac.id ; rana.adinda@gmail.com

Lalu Faris Naufal Makhroja
Department of Veterinary Medicine, Faculty of Veterinary Medicine, IPB University, Bogor, Indonesia
faris_naufal@apps.ipb.ac.id ; farisnaufal14@gmail.com

Muhammad Aries
Department of Community Nutrition, Faculty of Human Ecology, IPB University, Bogor, Indonesia
ariesulaeman@ipb.ac.id ; ariesulaeman@gmail.com

Abstract

Lipid profiles in the human body are strongly influenced by food consumption and lipid metabolism in the body. The objective of this study was to analyze the effect of lipid source food (boiled egg) consumption on lipid profiles (triglyceride, cholesterol, and HDL-cholesterol) in the body. This study was conducted on February 2019 at the Laboratory of Nutritional Biochemistry, Department of Community Nutrition, Faculty of Human Ecology, IPB University. Quasi experimental with pre and post-test design was applied for this study. The study was conducted on 20 people aged 18-20 with average weight of 58.9. The lipid profiles of each subject was analyzed beforehand. Colorimetric enzymatic test was used to measure the lipid profiles. All of the subjects were given two boiled eggs per day for 10 days of period. Analysis of normality and paired T-test was performed to assess the effect of intervention. The result of this study showed the average changes of TGA, cholesterol, and HDL-cholesterol were 3.5 ± 9.3 mg/dL; 14.4 ± 8.3 mg/dL; and 1.2 ± 2.5 mg/dL respectively. After the intervention, generally there were slightly increasing of lipid profile both on male and female subjects. Results of paired T-test on the level of TGA, cholesterol, and HDL-cholesterol showed the p-value were 0.715; 0.098; and 0.632 respectively. Therefore, those changes were not significantly different. According to the study result, the addition of lipid source food (two boiled eggs per day) would not change the lipid profile in the body.

Keywords: Egg consumption, lipid source food, blood lipid profile

Abundance, Habitat Use and Daily Activity of Asiatic Jackal (*Canis aureus*) in Huai Kha Khaeng Wildlife Sanctuary

Andaman Chankhao
Department of Forest Biology, Faculty of Forestry, Kasetsart University,
Bankkok, Thailand
andaman.c@ku.th

Ronglarp Sukmasuang
Department of Forest Biology, Faculty of Forestry, Kasetsart University,
Bankkok, Thailand
fforrls@ku.ac.th

Abstract

Study of abundance, habitat use and daily activities of Asiatic jackal was conducted in Huai Kha Khaeng Wildlife Sanctuary during November 2017 and November 2018, by camera trap techniques. Sixty-five camera traps were used covering an area of approximately 100 km^2. The results showed that relative abundance based on all year round data was. 0.19. During the dry season, the abundance index was 0.24 during the wet season was 0.05. When compared with the camera trap data in the same area, in the year 1999, there was a value of 0.027 in 2014, with a value of 0.021 in 2015, with a value of 0.047 that showed increasing of the RA. The frequency of appearances on the average camera was not statistically significant between the dry deciduous forest and the mixed deciduous forest. Whereas the result showed significant difference between the dry dipterocarp forest and the dry evergreen forest. While the appearance of the species in the mixed deciduous forests and dry evergreen forests was no significant different. The animal showed the most day-to-day activities at 20.00 - 22.00 hrs. and the least during 14.00-15.00 hrs. The animal showed active time started from 6:00 pm onwards and the most before midnight. Decreased in the early morning and increased in the period sunrise and decreased after 6.00 until the lowest in the afternoon. The species showed a spatial relationship with the leopard, tiger, large Indian civet and common palm civet determined by pooled data. During the wet season found that the species had a spatial relationship with dholes, large Indian civet, wild boar significantly. Population estimation by factors that lead to the model of occupying the area that can best predict the jackal population was distance from the road. The occupancy of the species was 63.11 % of the area; the density was to 0.05-0.358 individuals/km^2. The population estimation in the study area was 65-95 individuals.

Keyword: Asiatic Jackal, Huai Kha Khaeng Wildlife Sanctuary, Abundance, Habitat Use, Daily activity

Monitoring Habitat Suitability of Asia Wild Elephant (*Elephas maximus*) in Eastern Thung Yai Naresuarn Wildlife Sanctuary, Tak Province

Norrawith Damrongtawat[1], Aingorn Chaiyes[2], Nantachai Pongpattananurak[1], Ponrawee Buchakiat[3] and Prateep Duengkae[1,*]
[1]Department of Forest Biology, Faculty of Forestry, Kasetsart University. 50 Ngamwongwan Rd., Chatuchak, Bangkok 10900, Thailand
Tel. +66-2-579-0176, Fax +66-2942-8107 [*]email: prateep.du@ku.ac.th
[2]School of Agriculture and Cooperatives. Sukhothai Thammathirat Open University.
[3]Eastern Thung Yai Naresuarn Wildlife Sanctuary, Tak province 63170, Thailand

Abstract

Asian wild elephant *(Elephas maximus*) is largest terrestrial mammal in Asia and identified as umbrella species in tropical forest. Then, they are consequently highly dependent of habitat suitability. Eastern Thung Yai Naresuarn Wildlife Sanctuary, a part of world heritage site, was harbor of Asian wild elephant in Thailand but still lack of habitat evaluated. This study aim to evaluate habitat suitability map (HSM) for the Asian wild elephant base on Spatial Monitoring And Reporting Tool (SMART patrol) data locations and Maximum Entropy model (MaxEnt) to create yearly HSM from 2008 to 2016. *All* environmental variables with 30-m resolution were used to produce a HSM. The result showed model's accuracy with area under curve (AUC) is 0.885 (high accuracy) and average HSM of Asian wild elephant area in nine years was 386.7 km^2 (only 24.32% of total area). And also we found that HSM had effected by village location (35.96%), ranger station (27.27%) and unpaved road (14.02%). Our results can be applied to create suitable action plan for *umbrella species* management in this area.

Key word: Elephant, Habitat suitability, MaxEnt

Diversity, abundance and Distribution of Wildlife Around Constructing Corridor Between Tap Lan and Khao Yai National Parks

Poommipat Janpian, Ronglarp Sukmasuang, Khwanrutai Charaspet, Tarapone Panganta, Mananya Plara-ard, and Noraset Khioewsree

Abstract

Study of species diversity, abundance and distribution of wildlife around the area of the construction site of the World Heritage Forest Corridor Project that located on the Highway No. 304, during 26 – 29 th kilometer, that plan to conjugate the area of Khao Yai National Park (KYNP) and Tap Lan National Park (TLNP) together, this study was conducted during October 2017 and August 2018, 11 months totally that covered an area in the both side of the 3 km along corridor of 6 km^2 approximately. This study was procedured between November 2017 and November 2018, 13 months totally, by using a camera trap that placed 500-meter interval. Twenty-two camera trap locations were placed. The total number of 6,562 wildlife pictures were recorded. Total number of 39 wildlife species were identified. The important species such as hog badger (*Arctonyx collaris*), gaur (*Bos gauras*), sambar deer (*Cervus unicolor*) Asiatic jackal (*Canis aureus*), Serow (*Capricornis sumatraensis*), dhole (*Cuon alpinus*), Small Indian mongoose (*Herpestes javanicus*), Malayan porcupine (*Hystrix brachyura*), pig-tailed Macaque (*Macaca nemestrina*), Java pangolin (*Manis javanica*), Asian black tortoise (*Manouria emys*), red muntjak (*Muntiacus muntjac*), common palm civet (*Paradoxurus hermaphroditus*), common Pitta (*Pitta moluccensis*), leopard cat (*Prionailurus bengalensis*), small Indian civet (*Viverra indica*), large-spotted civet (*Viverra megaspila*), large Indian civet (*Viverra zibetha*). The results found that sambar deer had the highest diversity index of (0.367), followed by wild boar (0.246), pig tailed macaques (0.211). Asian black tortoise, Bengal monitor, Chestnut bush warbler, large tailed nightjar, Shikra falcon and water monitor had diversity index of 0.004. In the case of abundance in KYNP, it is found that pig-tailed macaques showed the highest % RA (9.25%), followed by Siamese fireback (6.19%), wild boar (5.57%), red muntjac (5.46%), Shikra falcon, Chestnut bush warbler, large tailed nightjar, dhole, domestic dog, forest crested lizard, Asian black tortoise and water monitor (0.08%). In case of TLNP, % RA of sambar deer was the highest abundance (66.20%), followed by wild boar (13.57%) and red muntjac (5.62%), gaur and water monitor showed the lowest value of % RA (0.08%). Distribution characteristics of the species based on % RF, of KYNP found that the highest % relative frequency value was red muntjac (90.91%) followed by wild boar (81.82%), pig-tailed macaque and rats (72.73%), and the smallest is Shikra falcons, sambar deer, dhole, Asian black tortoise, Bengal monitor, Chestnut bush warbler and large tailed nightjar (9.0%). The results in the area of TLNP found that the relative frequency of Sambar deer was 90.91% that was the highest value compared to other species, followed by wild boar (72.73%), red muntjac, common palm civet and small Indian civet (63.64%), pig-tailed macaque (45.45%), and the smallest %RA of which are gaur, Asiatic jackal, Malaysian night heron, Java pangolin and water monitor (9.09%).

Keyword: Diversity, Relative abundance, Wildlife corridor, Khao Yai and Tap Lan National Park

Consequences of Forest Fire on The Population Dynamics of Hill Blue Flycatcher (*Cyornis banyumas*) in The Hill Evergreen Forest, Mae Sa-Kog Ma Biosphere Reserve, Chiang Mai Province

Paanwaris Paansri[1], Supalak Siri[1], Yuwadee Ponpithuk[1], Mongkol Safoowong[2], Wimonmart Nuipakdee[3] and Prateep Duengkae[1,*]

Abstract

This study, estimating the population of the Hill Blue Flycatcher (*Cyornis banyumas*) in hill evergreen forest, Mae Sa-Kog Ma Biosphere Reserve, Chiang Mai Province, was conducted monthly from October 2015 to December 2018. The objective was to estimate population of the Hill Blue Flycatcher using mist nets and bird-banding techniques under a capture-recapture protocol. Mist nets were set monthly for three consecutive days from 06:00 to 16:00. The estimated population assessment of the Hill Blue Flycatcher (mean±SE) over the 51- month period period were 145 Individuals, resulted in a total estimated population size of 587±56.66, with 365±43.77 males, 194±27.88 females, 477±51.99 adults and 26±11.53 juveniles. Annual population estimates of birds from the year 2015 through 2018 were 67±13.41, 108±17.07, 181±21.86 and 131±18.31 respectively. Our results indicated that montane species worldwide are shifting upslope in response to recent temperature increases. These upslope shifts are predicted to lead to mountaintop extinctions of species that live only near mountain summits. Therefore, variation in population size was interannual fluctuations, and this project is the first report of long-term estimated population size for the Hill Blue Flycatcher in Thailand. This information is significant for the support and management of wild bird populations and habitats in this area.

Key Words: *Cyornis bunyamus*; Forest Fire; The Population Dynamics; Capture-Recapture; Mae Sa-Kog Ma Biosphere Reserve

[1,*]Department Of Forest Biology, Faculty of Forestry, Kasetsart University *E-mail : prateep.du@ku.ac.th
[2] Doi Chiang Dao Wildlife Research Station, Chiang Mai Province
[3] Mae Sa-Kog Ma Biosphere Reserve, Chiang Mai Province

The abundance and time overlap of the Dhole (*Cuon alpines*) and their prey in Khao Ang Rue Nai wildlife sanctuary, Chachoengsao Province

Warin Poolsang, Ronglarp Sukmasuang

Abstract

Abundance of dhole and their prey and also time overlapping of dhole and their prey was studied in Khao Ang Rue Nai Wildlife Sanctuary, Chachoengsao Province during March 2017 and February 2018 by using a camera trap method. Based on 58 camera trap locations, 4,463 trap nights found 35 species of wildlife species. There were 14 species of the carnivorous species. There were Asiatic jackal (*Canis aureus*), dhole (*Cuon alpinus*) , Asiatic black bear, (*Ursus thibetanus*) , Mayayan sunbear (*Ursus malayanus*), yellow throated marten (*Martes flavigula*), hog badger (*Arctonyx collaris*), small Indian civet (*Viverricula indica*) , large Indian civet (*Viverra zibetha*) , large spotted civet (*Viverra megaspila*) , Asian palm civet (*Paradoxurus hermaphroditus*) , small Indian mongoose (*Herpestes javanicus*), crab eating mongoose (*Herpestes urva*), leopard cat (*Prionailurus bengalensis*) and clouded leopard (*Neofelis nebulosa*) . Twenty-one species of herbivorous mammal species, some species of reptile and rodent species were also recorded. Percentage relative abundance of the dhole was 1.97%. Five main prey species of the dhole were gaur, banteng, sambar deer, wild boar and red muntjac with the %RA of 5.97%, 6.42%, 10.92%, 14.83% and 3.38% respectively. The result found that dhole had almost 24 hours of activity during the day. Most of them had mostly diurnal activity during the daytime, which was 76.77% during the day. The night time was 23.23% . The most active time of the dhole occurred during 06.00-08.00 hrs. There were no the dhole photos recorded during 00.00-02.00 hrs. The active time of the dhole had positive correlation significantly with pig-tailed macaques, lesser mouse deer, wild boar and red muntjac whereas the active time had negative correlation significantly with some species of rodent, sambar deer and gaur. The results showed that Khao Ang Rue Nai Wildlife Sanctuary is an important habitat of the dhole and their prey and also other carnivorous mammal therefore the management for conservation should focus on the protection of the area. Habitat management, including water resources, grasslands improvement, to increase wildlife populations should be promoted. Further study should be concentrated on monitoring of the population. Ecological study of the dhole and other wild animals also should be procedured continuously in the area.

Keywords: Relative abundance, time overlap, Dhole, prey species, Khao Ang Rue Nai wildlife sanctuary

Sexual body size dimorphism of *Fejervarya limnocharis* in Thailand

Rangsima Sermpanich[1], Yodchaiy Chuaynkern[2] and Prateep Duengkae[1],*
[1]Department of Forest Biology, Faculty of Forestry, Kasetsart University *
email: prateep.du@ku.ac.th
[2]Department of Biology, Faculty of Science, Khonkaen University

Abstract

The study of Sexual body size dimorphism of *Fejervarya limnocharis* in Thailand was studied from *F. limnocharis* preserved specimens of the Natural History Museum. The objective is to study the sexual body size dimorphism of *F. limnocharis* in Thailand. And to compare the similarities between *F. limnocharis* and new species of genus *Fejervarya.* Study period from September to November 2018 by using 34 body size measurement methods and then analyzed using R programming. The results of the study, a total of 391 preserved specimens, 95 male and 296 females from 42 provinces. From 34 characteristics, 20 characteristics with statistically significant differences which accounted for 59%, and 1 4 characteristics with statistically not significant differences which accounted for 41%. Classify cluster of *F. limnocharis* from 6 regions using 34 characteristics, found that there are 4 regions, Eastern, Northeastern, Northern and Southern regions that divide the group of sex, the other two regions are the Central and Western regions that cannot be divided into groups of sexes. From comparison between *F. limnocharis* and new species of genus *Fejervarya* 3 species. It was found that the *F. limnocharis* and *F. triora* were different in all characteristics from 8 characteristics. *F. limnocharis* and *F. chiangmaiensis* from a total of 11 characteristics, with 4 characteristics that are no different. And *F. limnocharis* and *F. muangkanensis* from a total of 11 characteristics, there are 5 characteristics in males that are not different. In females, there are 5 characteristics that are no different. If the initial classification of these four species of frogs should be measured, the different characteristics. For accuracy, additional DNA studies should be conducted.

Key words: Sexual dimorphism; measurement; *Fejervarya limnocharis*

Population Status of Pangolin (*Manis javanica*) in Thailand based on camera trap data

Warunsiri Utaramat[1], Ronglarp Sukmasuang[1], Khwanrutai Charaspet[1], Mananya Plara-ard[1], Noraset Khioewsree[1] and Tarapon Panganta[1]

Abstract

Java pangolin is a wild mammal species with a reptile-like scales. The conservation status of the animal is a critically endangered according to IUCN red list and also is classified as a species in the appendix 1 according to the *Convention on International Trade* in *Endangered Species of Wild* Fauna and Flora (CITES). Due to the ongoing smuggling of wildlife from the past to the present, Thailand has been considered as a country of passage through the illegal trade of the species from Indonesia and Malaysia to forward to Laos, Vietnam and China. At present, there has never been a study on the status of the population of Java pangolin in natural condition of Thailand. The study of the status of Java pangolin population was carried out by studying the data collected from cameras trapping of wild animals in 3 forests complex of Thailand during 2012 - 2018. There is (1) Western forest Complex, studied in Huai Kha Khaeng and Salak Pra Wildlife Sanctuaries and Chaloem Rattanakosin National Park (2) Dong Phayayen-Khao Yai Forest Complex that studied in the area of limestone mountain in Kaeng khoi District, Sara Buri Province, Khao Yai and Tap Lan National Parks (3) Eastern Forest Complex that studied in Khao Ang Rue Nai Wildlife Sanctuary. Based on 421 of the camera locations, 19,454 trap nigh totally. The percentage of relative abundance of the wild species photo by the camera trap was 12.52% . There was 0.08 % RA of Java pangolin that were found in 2 study areas, 3 photos of Java pangolin within 2 camera locations in Tap Lan National Park, 13 photos within 13 camera trap locations in Khao Ang Rue Nai Wildlife Sanctuary. The encounter rate of Java pangolin based on the camera trap data was 0.00082 (16/19545). The mean group size of the species ranges 1-5 individuals (n=16, mean=1.6, SE=0.36). 93.75% (15/16) of the photos were recorded in the dry evergreen forest. Most of the pictures, 62.50% (10/16) were recorded at night time. Furthermore, photos of the Java pangolin were also recorded occasionally during 2012 to present. Thus based on this study can conclude that Java pangolin population in natural conditions of Thailand still was in 3 forest complexes. The important protected area of the species was Khao Ang Rue Nai Wildlife Sanctuary. Recommendation for further studies and the species conservation were proposed in this study.

Keywords: Java pangolin, Camera trap, Relative abundance

Behaviors of Adolescent White-handed Gibbon (*Hylobates lar)* in Khao Yai National Park

Nithiporn Wongbundit[1], Chanpen Saralamba[2], Khanchit Srinopawan[3] and Prateep Duengkae[1,*]
[1]Department of Forest Biology, Faculty of Forestry, Kasetsart University [*]email: prateep.du@ku.ac.th
[2]Conservation Biology Program, Mahidol University Kanchanaburi Campus
[3]Khao Yai National Park, Nakorn Ratchasima Province

Abstract

According to the long term study of white-handed gibbon (*Hylobates lar*) in Khao Yai National Park, it is a great opportunity to study the behaviors of the different age class such as adolescence. Since most research have reported the adult behaviors in gibbon. So, we aims to study the daily behaviors of adolescent white-handed gibbon and to compare behavior between adolescent and juvenile white-handed gibbons. Five adolescent gibbon's data were recorded by focal sampling method with 5 minute time interval between July and November 2018.

The results showed that adolescent gibbon performed different behavior daily. They showed the highest feeding 37.02%, followed by locomotion 27.04%, resting 23.96% grooming 5.13% playing 5.05%, while the least expressed behavior is defecate and vocal duet 1.03%. However. There was no significant difference of daily behavior between adolescent and juvenile white-handed gibbons. This study is the first report adolescent behaviors on white-handed gibbons study in Thailand. Our recommendation is that behaviors of gibbons in all ages and seasons should be continuously monitored in the further study.

Key Words: *Hylobates lar*; White-handed gibbon; Wildlife's behaviors; Focal sampling method; Khao Yai National Park reserve

Combination of *nrLSU, nrSSU and ITS2* phylogenetics analysis to support identification of *Cantharellus minor* (Basidiomycota, *Cantharellaceae*) from Central highland, Vietnam

Tai Van Ngo
Faculty of Biotechnology, Ho Chi Minh City Open University, Ho Chi Minh City, Vietnam
ngovantai1996@gmail.com

Nghia Trong K'
Faculty of Biotechnology, Ho Chi Minh City Open University, Ho Chi Minh City, Vietnam
newseed97@gmail.com

Anh Quynh Nguyen
Faculty of Biotechnology, Ho Chi Minh City Open University, Ho Chi Minh City, Vietnam
quynhanh200597@gmail.com

Thuan Duc Lao
1Faculty of Biotechnology, Ho Chi Minh City Open University, Ho Chi Minh City, Vietnam
Faculty of Biology and Biotechnology, Ho Chi Minh City University of Science, Vietnam.
thuan.ld@ou.edu.vn

Thuy Ai Huyen Le
Faculty of Biotechnology, Ho Chi Minh City Open University, Ho Chi Minh City, Vietnam
thuy.lha@ou.edu.vn

During our expedition to validate the fungal diversity in the Pine forest (*Pinus kesiya* Royle ex Gordon), Xuan Tho Commune, Da Lat, Lam Dong Province, Vietnam, sample XC02 which belong to the *Cantharellus* genus (*Cantharellaceae*), was collected. based on the observation of morphology and *nrLSU* phylogeny analysis, XC02 was identified as Cantharlluss minor. Up to date, genetics sequences of multiple genes are becoming increasingly common for phylogenetic analysis of mushroom. With the aims to providing the multiple gene phylogenetic analysis to strengthen the identification of XC02 as *Cantharellus minor* as well as providing the dataset onto further analysis of samples that we collected in the Central Highlands, Vietnam. The genomic DNA was extracted by phenol/chloroform method. Then, PCR assay was carried out to amplify *nrLSU, nrSSU, ITS2*. The amplified target sequences were examined by the phylogenetic analysis, which were constructed, based on the neighbor-joining (NJ) and maximum parsimony (MP) maximum likelihood (ML) methods, by using Molecular Evolutionary Genetics Analysis (MEGA) version 6.0. Additionally, the best evolution model was predicted by using jModelTest. As the result, the data set consists of 14 sequences (*nrSSU*) 52 sequences (*ITS2*) and 84 sequences (*nrLSU*) consisting of sequences representing more than 10 *Cantharellus* species (*Cantharellales, Cantharellaceae*), 2 species of *Craterellus* (*Cantharellales, Cantharellaceae*). and 1 species of *Hydnum* (*Cantharellales, Hydnum*). Additionally, for the XC02 sample, in genotypes based on the first, second, third, fourth and fifth datasets (*nrLSU, nrSSU, ITS2, nrLSU-nrSSU, nrLSU-ITS2*) and the morphological analysis, reported in our previous study, strongly confirmed the XC02 as *Cantharellus minor*. Moreover, species of *Cantharellus* are morphologically distinguished by unique combinations of characters, such as the presence of a pink pileal coating, pileus and hymenophore colour when young, and in some cases, the mean spore length and ecology. In conlusion, the combination between the morphological analysis and phylogenetic analysis is confirmed as the best approach to make the progress applied in the identification of, in general, Cantharellus, and other mushroom species that we collected in the Central Highlands, Vietnam.

Keywords: *Cantharellus minor, nrSSU, nrLSU, ITS2.*

IDENTIFICATION OF THE FUNGI SAMPLES C002, C007 IN LAM DONG PROVINCE, VIET NAM BY MOLECULAR PHYLOGENETIC ANALYSES OF A PORTION OF THE *NUCLEAR LARGE RIBOSOMAL UNIT* (*nrLSU*)

Anh Quynh Thi Nguyen
Faculty of Biotechnology, Ho Chi Minh City Open University, Ho Chi Minh City, Vietnam
quynhanh200597@gmail.com

Tai Van Ngo
Faculty of Biotechnology, Ho Chi Minh City Open University, Ho Chi Minh City, Vietnam
ngovantai1996@gmail.com

Nghia Trong K'
Faculty of Biotechnology, Ho Chi Minh City Open University, Ho Chi Minh City, Vietnam
newseed97@gmail.com

Thuan Duc Lao
1Faculty of Biotechnology, Ho Chi Minh City Open University, Ho Chi Minh City, Vietnam
Faculty of Biology and Biotechnology, Ho Chi Minh City University of Science, Vietnam.
thuan.ld@ou.edu.vn

Thuy Ai Huyen Le
Faculty of Biotechnology, Ho Chi Minh City Open University, Ho Chi Minh City, Vietnam
thuy.lha@ou.edu.vn

The sample C002, C007, belonged to *Cantharellus*, were collected in the Central Highland, Vietnam, where was reported to be rich in biodiversity, especially in fungi. Recently, besides the morphology-based identification, phylogenetic analysis based on the *nuclear ribosomal large subunit gene (nrLSU)* has been considered as the powerful method to support the identification. With the aim to support the identification the *Cantharellus*, in current study, the sample C002 and C007, the phylogeny analysis was conducted based on the construction of *nrLSU* databases. The genomic DNA was extracted from C002 and C007 by phenol/chloroform method. The polymerase chain reaction (PCR) - sequencing assay was carried out to amplify *nrLSU* gene. Additionally, *nrLSU* database was collected from species belonged to *Cantharellus* through Genbank (NCBI). The phylogenetic trees were constructed based on the neighbor-joining (NJ) and maximum parsimony (MP) maximum likelihood (ML) methods, by using Molecular Evolutionary Genetics Analysis (MEGA) version 6.0 with the best evolution model was predicted by using jModelTest. As the result, the dataset consists of 80 sequences of *Cantharellus* species and 1 sequence belonging to *Craterellus* (outgroup), was constructed. Moreover, based on the phylogeny analysis, the similar topologies were observed on NJ, ML, MP phylogeny analysis. Thus, the sample C002, C007 were identified as *Cantharellus appalachiensis*, and *Cantharellus cibarius*, respectively. In summary, we successfully establish the *nrLSU* phylogeny analysis on identification of, in general *Cantharellus*, particularly C002, C007.

Keywords*:* *Cantharellus, Large ribosomal unit (nrLSU), Identification, molecular phylogeny.*

Isolation and identification of the albino-mutant strain of jelly-ear mushroom (*Auricularia delicata*) from cultivation

Bui Hoang Thiem
Department of Biotechnology, Nong Lam University, Ho Chi Minh City, Vietnam
thiembh@gmail.com

Le XuanTham
thambitotech@yahoo.com
Department of Science and Technology, Lam Dong Province, Vietnam.

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

Abstract

Jelly-ear mushroom (*Auricularia delicata*) has been found and cultivated in both tropical and sub-tropical countries. Kobayashi et al (1981) indicated that there are two forms of *Auricularia delicata* including purple (original color) and albino observed in nature. Currently, we already collected some wildtype strains of *Auricularia delicata* in the forests of Lam Dong and Dong Nai province, Vietnam for domesticating and developing commercial strains. During mushroom cultivations, albino mutant strains of *Auricularia delicata* were found and successfully isolated. Morphological and molecular analyses indicated that collected albino mutant strains were *Auricularia delicata.* The role of cultivation conditions producing albino *Auricularia delicata* will be evaluated and discussed in this study.

Keywords: Jelly-ear mushroom, *Auricularia delicata*, albino, cultivation, segregation.

Characteristic of *Colletotrichum* fungi Causing Anthranose Disease on Chili (*Capsicum annuum* L.)

Dao Uyen Tran Da
Research Institute for Biotechnology and Environment, Nong Lam University, Ho Chi Minh City, Vietnam
daouyentranda@gmail.com

Le Dinh Don
Research Institute for Biotechnology and Environment, Nong Lam University, Ho Chi Minh City, Vietnam
ledinhdon@hcmuaf.edu.vn

Abstract

Anthranose disease found leaves, fruits and flowers on many crop plants on the world. Objective of this study was pathogenic characteristics of *Colletotrichum* fungi caused on chilli. In, addition, climatic conditions in the regions also affect the harmful toxicity of *Colletotrichu*m fungi. Cross (leaves, fruits and stem) inoculation tests indicated that most isolates (Dong Thap, Lam Dong provinces and Ho Chi Minh city, Viet Nam) were attacked on the leaves and fruits but there were a few on the stems of chili. The results was suggesting that pathogenicity of *Colletotrichum* isolates should be evaluated on fruit, leaf, and stem, and that resistance of chili varieties to *Colletotrichum* should be tested on stem together with on leaf and fruit.

Keywords: Anthracnose, colletotrichum

Development of polymerase chain reaction (PCR) assay for differentiation and identification of *Bacillus* species

Nguyen Thi Hong Nhung
Research Institute of Biotechnology and Environment, Nong Lam University, Ho Chi Minh City, Vietnam.
15126105@st.hcmuaf.edu.vn

Nguyen Doan Nguyen Phuong
Research Institute of Biotechnology and Environment, Nong Lam University, Ho Chi Minh City, Vietnam.
nguyendoannguyenphuong@gmail.com

Nguyen Ngoc Bao Chau
Faculty of Biotechnology, Ho Chi Minh City Open University, Ho Chi Minh City, Vietnam.
chau.nnb@ou.edu.vn

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

Abstract

Bacteria belonging to the *Bacillus* genus are always considered gram-positive, rod-shaped bacteria and the members of Firmicutes. *Bacillus* species may be anaerobic or aerobic group and normally provide positive results for catalase enzymes. They are often ubiquitous in nature and include species that live freely and cause diseases. It also includes many important industrial species with a history of safe use in both food and industry. Some *Bacillus* species provide some advantages in industrial applications and agricultural biotechnology as well. Currently, identification of *Bacillus* species has been done based on morphological, physiological and biochemical analyses of bacterial species. However, these conventional methods are time-consuming, costly, and labour. Therefore, a reliable, rapid, sensitive, specific method developed to identify and differentiate *Bacillus* species is desirable and necessary. Using bioinformatics tools and PCR based technique, many PCR primer sets were developed to identify and differentiate various *Bacillus* species such as *Bacillus subtilis*, *Bacillus licheniformis*, *Bacillus megaterium*, *Bacillus amyloliquefaciens*, *Bacillus infantis*, and *Bacillus megaterium* indicating potential application in practice.

Keywords: PCR. Bacillus species, bioinformatics, primer, bacteria

ISOLATE AND SELECTING THE BACTERIA METABOLIZE AMMONIA FROM LOBSTER FARMING AREA IN VINH XUAN DAI, PHU YEN

Truong Phuoc Thien Hoang*
Research Institute for Biotechnology and Environment, Nong Lam University
Ho Chi Minh, Vietnam
hoangtp@hcmuaf.edu.vn

Nguyen Phu Hoa
Faculty of Fisheries, Nong Lam University
Ho Chi Minh, Vietnam
Phuhoa@gmail.com

Abstract

In wastewater treatment, the elimination of nitrogen compounds can be accomplished by the combination of nitrification (oxidation of ammonia to nitrate) and reduction of nitrate (reduction of nitrate to N2O or N2). This requires the co-ordinate or sequential action of different groups of microorganisms, especially nitrifying bacteria and nitrate-reducing bacteria. Subjects was conducted to isolate and selecting the bacteria metabolize ammonia capable of handling ammonia with 6 different experiments; include: NT 01: Additional environmental strains on S16. NT 02: Additional environmental strains on S19. NT 03: Additional environmental strains on S27. NT 04: Additional environmental strains on S43. NT 05: Additional environmental strains on S47. NTDC: no additional bacteria. Each treatment was repeated 5 times. After 5 days of the experiment, the results showed meaningful difference statistically ($P < 0.05$) in the ammonia metabolism among treatments. In particular, treatments NT 01, NT 02, NT 04 achieved the highest effective. Besides, isolated 35 strains metabolize ammonia, which has five lines (S16, S19, S27, S43, S47) is capable of handling ammonia in laboratory conditions. In addition, five strains capable of handling ammonia are identified by PCR and is searchable on BLAST has identified the strain on the *Providencia stuartii, Alcaligenes faecalis, Massilia aurea, Sphingoacterium multivorum, Micrococus luteus*.

Keywords: nitrogen, ammoniac, nitrite, nitrate, metabolize ammonia

Relationship between tree root exudation and fine root traits under four coniferous forests in Japan

Maiko Akatsuki
Environmental Sciences Unit, Science Division, Department of Science, Graduate School of Science and Technology, Shinshu University, Matsumoto, Japan
m.akatsuki030@gmail.com

Abstract

Plant roots have the function of releasing organic compounds to the soil. Their function is useful for plant survival to affect the degradation of microorganisms around the roots and to enhance allelopathy against other plant invasions. In this study, we developed a method to collect exudative carbon content of fine tree roots at fine scales. We quantified the root exudation rates in four conifers and the relation between exudation rate and morphology or chemical composition. The study was conducted in a cool temperate forest in Nagano Prefecture. Target species with mature trees were red pine (*Pinus densiflora*), larch (*Larix kaemoferi*), Japanese cedar (*Cryptomeria japonica*) and cypress (*Chamaecyparis obtusa*) (n=10). Intact root systems were exposed from the soil without any disturbance. The root system was divided into three diameter classes (<0.5, 0.5-1.0, 1.0-2.5 mm), and the exudate from the root system was adsorbed on a 25 mm diameter glass fiber filters. The amount of carbon adsorbed on the filters was measured with CN analyzer. The root samples were evaluated as root traits; diameter, specific root length (m g-1), specific root area (cm^2 g-1), root tissue density (g cm-3), nitrogen concentration (%), CN ratio. Then, the amount of exudation per root dry-weight was calculated. As a result, the root exudation rate was the highest in cedar among the four tree species in the diameter class of 0.5-1.0 mm, and there was no difference among the four tree species in the diameter class of <0.5mm and 1.0-2.5mm. The exudation rate increased with decreasing diameter in all species. Exudation rate and specific root length was positive correlated. Exudation rate and root tissue density was negatively correlated. These results suggest that small diameter, high physiological activity and weak root system has high C release due to the high exudation rates.

Keywords: Carbon flux, Secondary metabolite, Tree fine root, Rhizodeposition

Induction of Nitrogen-acquiring Enzyme Production in Highly Nitrogen-limited Soil

Yukino Nameki
Environmental Sciences Unit, Science Division, Department of Science, Graduate School of Science and Technology, Shinshu University, Matsumoto, Japan
19ss606j@shinshu-u.ac.jp

Abstract

In recent years, excessive fertilizer application has caused serious environmental problems all over the world. In order to reduce nitrogen loading on the environment, it is essential to conduct appropriate fertilization management based on the precise evaluation of the nitrogen availability in soil. In this study, we evaluated the applicability of the resource allocation model for production of nitrogen-acquiring enzymes for evaluating nitrogen availability in soil. 16 soils with different nitrogen availability were used in this study. We examined five nitrogen-acquiring enzymes, arylamidase, *N*-acetyl-β-glucosaminidase, L-asparaginase, urease and protease, and a C-acquiring enzyme, β-D-glucosidase. The result suggested that the nitrogen-acquiring enzymes were classified into two types: one was produced in large amounts in highly nitrogen-limited soil, and the other one was not. Production of L-asparaginase, urease and arylamidase was well induced by nitrogen limitation, which was compatible with the resource allocation model. Therefore, production of L-asparaginase and urease seems to reflect the nitrogen limitation, and the resource allocation model for these enzymes may be useful for assessing the nitrogen availability in soil.

Keywords: L-asparaginase, urease, nitrogen-acquiring enzymes

Bioconversion of AHX to AOH by resting cell of *Buttiauxella* sp. A111

Apirati Sukprasitchai
Department of Agriculture, Faculty of Agriculture, Shizuoka University
Shizuoka, Japan
apiratitamp@hotmail.com

Jae-Hoon Choi, Hirokazu Kawagishi and Shinji Tokuyama*
Department of Agriculture, Faculty of Agriculture, Shizuoka University
Shizuoka, Japan
tokuyama.shinji@shizuoka.ac.jp

Abstract

Fairy chemicals compose of Imidazole-4-carboxamide (ICA), 2-zahypoxanthine (AHX) and 2-Aza-8-oxohypoxanthine(AOH) are compounds responsible for fairy ring phenomenon, zone of stimulated grass growth due to interaction between fungus and plant, and also can regulated plant growth. AHX and AOH showed plant growth promoting activity, moreover AOH encouraged a plant to survive in various stress condition. Nowadays the only way to synthesis AOH is enzymatic conversion of AHX by Xanthine oxidase (XOD) or Xanthine dehydrogenase (XDH). Since commercial XOD is very expensive, AOH bioconversion by bacterial resting cell was interested. Our group isolated *Burkholderia contaminans* CH-1 that showed AOH bioconversion activity but in low level. So, our new candidate was *Buttiauxella* sp. A111 that showed higher activity. For large-scale AOH preparation (100g) 10.9 L of culture media (TSB) for *Buttiauxella* sp. A111 was need. Therefore, in this study we optimized both AOH bioconversion condition and culture condition for improve A111 AOH bioconversion activity and to reduce a volume of culture media for resting cell preparation. The result showed that optimum pH for AOH bioconversion is pH 6 by using Sodium-phosphate buffer without saline. Suitable Condition for culture high AOH bioconversion A111 resting cell was 1% of A111 inoculated in modified Luria-Bertani broth (LB+P) for 16 hrs. at 30°C,150 rpm. Moreover, we studied on the characters of A111 resting cell. We found that A111 resting cell were stable up to 40 °C , AOH bioconversion activity was loss after resting cell disruption and some possibility that AOH conversion enzyme from A111 will be Xanthine oxidase due to Nitro blue Tetrazolium (NBT) assay result. Finally we applied an optimal reaction condition and culture condition to large-scale AOH preparation, we can reduce volume of culture media for A111 resting cell preparation from 10.9 L to 1.0 L.

Keywords: Bioconversion, Fairy chemicals, *Buttiauxella* sp., Plant-growth regulator

Biocontrolling to Pathogent of Root Rot (*Ganoderma* sp) in *Acasia crassicarpa* used Isolates of Endophytic Bakteria from Palm Oil

Hidayatul Fitri
University of Riau
Hidayatulfitri1997@gmail.com

Abstract

Acacia crassicarpa is the one of favorite types of plants in HTI, but in its growth often occurs root rot disease caused by *Ganoderma* sp. Control can use biological agents such as endophytic bacteria. This study aims to determine the power antagonists and get the best endophytic bacteria isolates from palm oil to control root rot by *Ganoderma* sp in vitro method. Consist of physiologi and biochemistry of isolates endophytic bakteria. Antagonists test against *Ganoderma* sp endophytic bacteria consist of 4 from root (EBR) , steam (EBS), leaf (EBL) and midrib (EBM). Each treatment was placed in conjuction with *Ganoderma* sp on top of thePSA. An antagonistic test was performed with a completely randmized design pattern. Each treatment was repeated 3 times so that there were 15 experemintal units. The result of antagonistic test inhibitory test of endophytic bacteria against *Ganoderma* sp show a different percentage inhibition. The percentage of inhibition on EBR treatment was 73,28%. , EBS was 77%, EBL was 20,6% and EBM was 60%. The result of varience analysis showed the treatment of isolates endophytic bakteria.

Keyword : *Acacia crassicarpa, GanodermaI* sp, in vitron, endophytic bacteria

Philippine Stingless Bee Propolis and Its Antifungal Effect on Postharvest Fungi Causing Anthracnose and Crown Rot In Cavendish Banana (*Musa acuminata* Colla)

Deborah Anne C. Dimayacyac
Institute of Weed Science, Entomology, and Plant Pathology, College of Agriculture and Food Science, University of the Philippines Los Baños College, Laguna, Philippines
dcdimayacyac@up.edu.ph

Teresita U. Dalisay*
Institute of Weed Science, Entomology, and Plant Pathology, College of Agriculture and Food Science, University of the Philippines Los Baños College, Laguna, Philippines
tudalisay_d1760@yahoo.com

Aimee Lynn Barrion-Dupo*
Institute of Biological Sciences, College of Arts and Sciences, University of the Philippines Los Baños College, Laguna, Philippines
abdupo@up.edu.ph

Raw propolis obtained from the UPLB Bee Program, produced by Stingless Bees (*Tetragonula biroi* Friese) has been purified through Ethanolic extraction using Heidolph's Apparatus in order to separate the active substances and compounds of propolis from external plant resins, buds, exudates, which the bees primarily incorporate alongside with its beeswax and salivary enzymes mixed by the bees with the raw propolis. Ethanolic Extract of Propolis (EEP) were then adjusted to the following concentrations of 25%, 50%, 75%, and 90%. Each concentration was then evaluated for its antifungal activity against the two postharvest diseases of banana cv. Cavendish prevalent in the Philippines. Each concentration was tested through *in vitro* and *in vivo* assays against *Colletotrichum musae*, the causal pathogen of anthracnose, and *Lasiodiplodia theobromae* and *Fusarium* sp., the associated causal pathogens of crown rot. At 95% confidence level, the *in vitro* antifungal assays, particularly in the Poisoned Food Technique, had shown significant results on the sensitivity of *C. musae* and *Fusarium* sp. at the lowest concentration of EEP (25% EEP). For *L. theobromae,* significant reduction in mycelial gowth was observed at the higher concentration (75% EEP). All measurements were done with regards to the measure of Colony Diameter and Percent Inhibition on Radial Growth (PIRG) per test pathogen. Another assay to show the performance of Propolis was the Cavity Slide Assay, measuring the spore germination of the test pathogens with the certain amounts of each of the EEP concentrations. Results likewise supported the trend in the Poisoned Food Technique Assay, with *C. musae* and *Fusarium* sp. showing to have 50% less germination percentage at 50% EEP and 25% EEP, respectively. The *in vitro* antifungal assays strongly provided a concrete support on the fungal suppressing effect of EEP as its concentration was increased. For the *in vivo* antifungal assays, with the 20%, 50%, 75%, and 90% EEP applied through dip coating, it was found out that as the application of EEP concentration was increased, symptom development of the postharvest diseases was seen to be heldback. The Ethanolic Extract of Propolis provided an effective coat against postharvest pathogens, hence, delaying the respiratory rate and ripening process of the fruit. This resulted to a delay of the infection process of the pathogens. Furthermore, antifungal activity of EEP may be attributed to its chemical composition, which mainly targets the disruption of fungal cell membrane due to the increase in volume and thus cause inhibition of mycelial growth and hampered spore germination.

Keywords: Ethanolic Extract of Propolis, Cavendish banana, Anthracnose, Crown Rot

MACROFUNGI AND MYXOMYCETES DIVERSITY AT THE UPPER RAINFOREST OF MOUNT MAKILING FOREST RESERVE (MMFR)

Jestoni O. Gaylo
Institute of Weed Science, Entomology and Plant Pathology,
College of Agriculture and Food Science, University of the Philippines,
Los Baños, College, Laguna, Philippines
jogaylo@up.edu.ph

Teresita U. Dalisay*
Institute of Weed Science, Entomology and Plant Pathology,
College of Agriculture and Food Science, University of the Philippines,
Los Baños, College, Laguna, Philippines
tudalisay_d1760@yahoo.com

Nelson M. Pampolina*
Department of Forest Biological Sciences,
College of Forestry and Natural Resources, University of the Philippines,
Los Baños, College, Laguna, Philippines
nmpampolina@up.edu.ph

Studies on macrofungi and myxomycetes are gaining importance as they are facing threat of extinction due to habitat destruction, anthropogenic factors and some other reasons. Moreover, their studies have been an area of importance because of their role in human welfare, food industry, medicines, and biodegradation. Macrofungi and myxomycetes were studied at the upper montane rainforest of Mount Makiling Forest Reserve (MMFR), Los Baños, Laguna, Philippines. A combination of quadrat method and opportunistic or purposive sampling methods was used in collecting the specimen. Samples were collected during wet (October to December, 2018) and dry (February and April, 2019) seasons along the 1km transect line and 3mx3m quadrats. Collected samples were characterized based on their macroscopic and microscopic morphology and their diversity was assessed using different ecological parameters. A total of 1,095 samples of myxomycetes and macrofungi comprising of 99 individual species were collected in the area. Majority of the samples collected were Basidiomycetes (83%) comprising of 9 orders and 24 families with a total of 57 identified at genus level and 24 identified at order level. This was followed by Ascomycetes (9%) with 3 order, 5 families, 9 individual species. Myxomycetes (8%) were also present with 5 orders, 6 families, and 8 individual species. Their diversity were determined using Shannon-Weiner index and was found to be very high at 4.17 with evenness of 0.908. Majority of the macrofungi were saprotroph (85%) which is responsible for decomposition and nutrient cycling in the area, some were ectomycorrhizal species (13%) which form symbiotic relationship to various plant species and few were parasitic to plants (2%). This is the first effort to study the macrofungal population at the upper montane rainforest situated near the peak of the mountain. This study of biodiversity has provided baseline information for the profile of macrofungi and myxomycetes population at the upper montane rainforest and this will contribute to the understanding of macrofungal distribution in Mount Makiling Forest Reserve (MMFR) as a whole. Moreover, this assessment of macrofungal and myxomycetes diversity will provide framework for their conservation and in forest ecosystem management.

Keywords: Macrofungi, Myxomycetes, Biodiversity, Mount Makiling

Toxicity of CuO and ZnO Nanoparticles and their Bulk Counterparts on selected Soil-Borne Fungi

Jonathan Jaime G. Guerrero*
Graduate School
University of the Philippines – Los Baños, Laguna, Philippines
Bicol University College of Science Department of Biology, Legazpi City, Philippines
jonathanjaime.g.guerrero@gmail.com

Pattavipha Songkumarn, Ph.D.
Faculty of Agriculture Department of Plant Pathology, Kasetsart University
Bangkok, Thailand
fgrpps@ku.th

Teresita U. Dalisay, Ph.D.
Institute of Weed Science, Entomology and Plant Pathology
University of the Philippines – Los Baños, Laguna, Philippines
tudalisay_d1760@yahoo.com

Ireneo B. Pangga, Ph.D.
Institute of Weed Science, Entomology and Plant Pathology
University of the Philippines – Los Baños, Laguna, Philippines
ibpangga@gmail.com

Nolissa D. Organo
Agricultural Systems Institute, Division of Soil Science
University of the Philippines – Los Baños, Laguna, Philippines
ndorgano@up.edu.ph

The antifungal effects of copper oxide and zinc oxide in bulk and nano forms were tested *in vitro* against important soil-borne fungi and one fungal-like oomycete. Potato dextrose agar were amended with 500, 1000 and 1500 ppm of either metal oxides and inoculated with seven-day old fungi. Percent inhibition was recorded after seven days. Similarly, potato dextrose broth was treated with either metal oxides and inoculated with fungal mycelial discs. Biomass was measured after seven days. Mycelial alterations and cell membrane damage were recorded through scanning electron microscopy and fluorescent microscopy. Protein leaked out of the cell and the organic acid produced were determined using UV-vis spectrophotometry and gas chromatography, respectively. Results showed that most test fungi were susceptible to CuO in both forms than to ZnO through reduction of growth. Exposure to CuO and ZnO resulted to possible rupture of the cell membrane in *Rhizoctonia solani*, *Sclerotium rolfsii*, *Fusarium oxysporum* f.sp. *lycopersici* (*Fol*) and *Phytophthora palmivora*. Significant change in acetic acid production was likewise observed in *Fol*. Shriveling of mycelia were observed at varying degrees among the test fungi, mostly due to CuO exposure. Compound properties, not size, was the main cause of toxicity to fungi tested. Exposure along with concentration were vital in the metal oxide toxicity mechanism. It is recommended that a range of sizes be used and that the use of nanoparticles in relation to their bulk counterparts be thoroughly reviewed.

Keywords: Acetic Acid, *Rhizoctonia solani*, Scanning electron microscopy, *Fusarium oxysporum*

Ethanolic Extract of Philippine Propolis Produced by Stingless Bees (*Tetragonula biroi* Friese) as an Alternative Control for Anthracnose and Stem End Rot of 'Carabao' Mango (*Mangifera indica* L.)

Catherine D. Masacayan
Institute of Weed Science, Entomology, and Plant Pathology
University of the Philippines Los Baños,
College, Los Baños, Laguna
cdmasacayan@up.edu.ph

Teresita U. Dalisay
Institute of Weed Science, Entomology, and Plant Pathology
University of the Philippines Los Baños,
College, Los Baños, Laguna
tudalisay_d1760@yahoo.com

Mango (*Mangifera indica* L.), a fruit tree from the family Anacardiaceae, is known to be one of the early domesticated fruits in India and other tropical countries like the Philippines (Litz, 2009). In the Philippines, mango is one of the major fruit crops and with the growth of mango industry, different diseases are of great threat. Among all fungal diseases, two of the most important postharvest diseases of mango fruits include anthracnose and stem end rot resulting to application of different management strategies primarily chemical control. However, toxic effects of excessive use of chemical fungicides can be hazardous to the environment that's why alternative control using natural organic compounds was further explored. In this study, the antifungal activity of ethanolic extract of Philippine propolis (EEP) produced by stingless bees were evaluated using four different concentrations (25%, 50%, 75%, 90%) for both *in vitro* and *in vivo* assays against *Colletotrichum gloeosporioides* and *Lasiodiplodia theobromae* causing mango anthracnose and stem end rot, respectively. *In vitro* tests namely agar dilution assay and agar-well dilution method were utilized with percent inhibition of radial growth (PIRG) and mycelial colony diameter as parameters. Between two assays, agar dilution method better exhibited the inhibitory effect of EEP starting at 25% compared to 75% concentration in agar-well technique. Even at lowest EEP concentration, the mycelial growth diameter of *C. gloeosporioides* was significantly lower compared to control setup. Highest PIRG was computed at 90% EEP with 83.2% followed by 82.6% of 75% EEP. On the other hand, only the 75% and 90% EEP resulted to significantly lower diameter of mycelia for *L. theobromae.* For agar-well dilution method, both 75% and 90% EEP rendered significantly different zone of inhibition for both isolates tested compared to control setup. Generally, inverse relationship between EEP concentration and diameter of fungal growth was noticed which was attributed to higher composition of organic compounds present in material used. The higher the concentration of the propolis extract was diluted to the agar, the greater inhibition of mycelial growth were observed. For the *in vivo* assay, protectant and eradicative setups were performed using percent disease incidence and severity as parameters. Using EEP as protective coating for mango fruits resulted to significantly lower percent disease incidence at 75% and 90% EEP concentrations. Delay of disease incidence was only observed using 90% EEP in the eradicative setup. EEP as protective material was found ineffective, however, 90% EEP exhibited eradicative ability in reducing anthracnose severity. Impressive performance of 75% and 90% EEP as protectant was exhibited on the management of stem end rot disease of mangoes tested while unsuccessful in eradicating *L. theobromae.*

Keywords: anthracnose, stem end rot, propolis

ASINS (Hepatitis Prevention Drinks) As a Healthy Drink Product Innovation to Prevent Hepatitis from Princess Malu (Mimosa pudica) which is Practical and Economical

Arif Hidayat
Department of Communication Science, Faculty of Social Science, Yogyakarta State University, Yogyakarta, Indonesia
Arifh1077@gmail.com

Dewi Eka Wulandari*
Department of Economic Education, Faculty of Economics, Yogyakarta State University, Yogyakarta, Indonesia
Dewiekawulandari2@gmail.com

Indonesia is a country with high Hepatitis B endemicity, the second largest in the Southeast Asia Region (SEAR) after Myanmar. Hepatitis is a liver disorder in the form of inflammation (cells) of the liver. Based on the results of Riskesdas, research and PMI donor blood screening tests, it is estimated that among 100 Indonesians, 10 of them have been infected with Hepatitis B or C. So currently there are around 28 million Indonesians infected with Hepatitis B and C, of which 14 million potentially become chronic, and from chronic 1.4 million people have the potential to suffer from liver cancer. The magnitude of the problem will certainly have a major impact on public health issues, productivity, life expectancy, and other socio-economic impacts. According to Riskesdas (2013), the number of people diagnosed with hepatitis in health care facilities based on existing symptoms showed a two-fold increase compared to 2007 and 2013 data. And from the Riskesdas data in 2013 showed data on Hepatitis Prevalence by Provinces in 2007 and 2013, which in 2007 five provinces with the highest prevalence of hepatitis were NTT, Central Sulawesi, Aceh, Gorontalo and West Papua, while in 2013 five provinces with the highest prevalence were NTT, Papua, South Sulawesi, Central Sulawesi, and North Maluku. In 2013 there were 13 provinces that had prevalence rates above the national average. Putri Malu or the scientific term is Mimosa pudica. This plant grows wild on the side of the road, the field, and open space, causing a large number of shy daughter availability. Mimosoa pudica also has a large content in healing various diseases. Suwariyani (2006), Content that is owned include alkaloid compounds, saponins, flavonoids, tannins, and phenolics. Therefore we made new innovations by utilizing girls who are embarrassed by combining them in the form of healthy drinks to prevent hepatitis and also ASINS (Hepatitis Prevention Drinks) is not only for hepatitis sufferers but the whole community can also enjoy this drink, because besides girls who are shy, this drink is also combined with flavor variants that can be beneficial for the health of the body. And also in the production of ASIN, Quality control will be carried out so that the ASINS product will be maintained and of high quality. Promotions carried out by this product are offline and online. With 3 productions in the first 4 months of production producing 16 ASINS, the second production is 25 ASINS, and the third production is 34 ASINS. For 1 ASINS the price is IDR 25,000 per bottle. The ASINS drug beverage business has the potential to continue because of easy access to raw materials because these plants are wild plants or weeds among the people, practical and environmentally friendly, able to prevent Hepatitis, easy to carry everywhere, and so on.

Keywords: Hepatitis, Princess Malu, ASINS, Healthy Drinks Product

Synthesis of Graphene Oxide for Adsorption of Radioactive Iodine-131

Atitiya Rittinak
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University,
Bangkok, Thailand
atitiya.r@ku.th

Wanwisa Sudprasert*
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fsciwasu@ku.ac.th

Abstract

Iodine-131 is frequently used in therapeutic application. It is mainly excreted out through urine. If it is discharged untreated into the environment, it can pose a serious threat to the ecosystem. Graphene oxide (GO), an oxidized form of graphene, is successfully used as an adsorbent for different pollutants. This research aimed to assess the ability of GO as an adsorbent for removal of radioactive iodine-131 from aqueous solutions. The GO was prepared from pure graphite powder using modified Hummers method. The iodine-131 adsorptions were investigated by varying the amount of GO suspension while radioactivity of I-131 was kept constant, measured by gamma spectroscopy. The results show that the maximum adsorption capacity of I-131 by GO was 1366.1 $Bq \cdot mL^{-1}$ or 56.2 $Bq \cdot mg^{-1}$ under the ambient temperature at pH 6.5 - 7.0 over 24 hours adsorption time. Due to its low cost, compared with other commercial adsorbents, the synthesized GO should be developed to be used as an alternative adsorbent for removing iodine-131 contaminants in wastewater.

Keywords: graphene oxide, radioactive iodine-131, adsorption

Study of Process Synthesis for Plastic Scintillator Based on Styrene

Banyapha Ubonsa-ard
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
banyapha.u@ku.th

A-mila Rattanasri
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
amila.r@ku.th

Manit Jitpukdee *
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
manit.j@ku.ac.th

Abstract

In this research, we focus on the synthesis of plastic scintillator. Plastic scintillators of 1-inch diameter were synthesized by the polymerization process of the liquid styrene monomer and 2,5-diphenyloxazole (PPO). The styrene monomer and PPO were mixed in a 1-inch diameter test tube without secondary scintillator. The test tube was placed in an electric furnace to induce the polymerization reaction. For complete dissolution, the temperature of the furnace had to be maintained at 100ºC for 2 hours. After this procedure, the temperature of the furnace was heat-up to 120ºC and maintained for 48 hours to complete the polymerization reaction of plastic scintillator. After the polymerization reaction had ended, the synthesized plastic scintillator was cool down to room temperature for 1 hour. The plastic scintillator was cut and polished to make clear surfaces on the top and bottom for increasing efficiency of light transparent. The plastic scintillators were irradiated with Sr-90 β-ray for evaluating detection efficiency. The result showed the detection efficiency of synthesized plastic scintillator was 15.14%. This plastic scintillator could be developed for use as a scintillation detector in a laboratory.

Keywords: Plastic scintillator, polymerization, styrene

Measurement of Radon in groundwater from the agricultural areas at Thong-En Sub-district, Inburi District, Singburi Province

Chayanid Pimsawha
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
chayanid.pim@ku.th

Chanis Pornnumpa*
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscicnp@ku.ac.th

Abstract

Radon (^{222}Rn) is a noble gas that occurs naturally from radioactive decay of radium isotopes and accumulate in various areas in the environment, including water, soil, rock, vegetation, and food. Measuring radon in groundwater for agriculture consumption is used as an indicator for safety in water containing radon. Radon can be entered to the body by inhalation and deposits on the surface of lung, which alpha particles emitted can interact with lung cells and destroy tissues of respiratory system. In addition, people who consume radium-containing water may risk from bone cancer because radium can accumulate in the bones. In this study, nine samples of groundwater were collected from the agricultural areas at Thong-En sub-district, Inburi district, Singburi province during February - April 2019. The samples were measured by the RAD7, a radon detector with RAD H_2O technique. The results show that the lowest of radon concentration was 1.916 Bq/L, the highest of radon concentration was 13.255 Bq/L and the average values of radon concentration was 7.675 Bq/L. Thus, the average value of radon in groundwater was lower than the recommended values which was announced by the United States Environmental Protection Agency (US EPA) at 150 Bq/L.

Keywords: Radon (^{222}Rn), Groundwater, The agricultural areas at Thong-en sub-district, RAD7 Radon detector, RAD H_2O technique

Antioxidant Activity and Radioprotective Effect of *Gymnanthemum extensum* on Human Lymphocytes

Chonlatee Suwannarit and Paiboon Reungpatthanaphong*
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
*For Correspondence: fscipbr@ku.ac.th

Abstract

Gymnanthemum extensum, also known as a bitter leaf tree, is a species of flowering shrub of the Asteraceae family. It has been used to treat many diseases such as diabetes and cancer which is becoming a popular herb in elderly people in Thailand. The objectives of this study were to determine antioxidant activities and radioprotective effects of *Gymnanthemum extensum* on human lymphocytes. Antioxidant activities of *Gymnanthemum extensum* was determined by using DPPH, ABTS and FRAP assays. The results demonstrated that *Gymnanthemum extensum* showed antioxidant activity in DPPH and ABTS assay were EC_{50} value of 139.22±0.02 µg /mL and 267.44±0.03 µg/mL, respectively. In addition, FRAP value exhibited 2317.21±0.04 µM/mg. The radioprotective effect was determined on human lymphocytes using the dicentric chromosome assay. Whole blood samples were irradiated *Cobalt-60* (^{60}Co, 2 Gy) before treated with *Gymnanthemum extensum* at the doses of 0,25,50 and 100 µg/ml, respectively. The results demonstrated that *Gymnanthemum extensum* at a dose of 100 µg/ml showed the lowest the number of dicentric chromosome when compared to the other doses. In conclusion, *Gymnanthemum extensum* exhibited both of antioxidant activity and radioprotective effect on human lymphocytes through decreasing the number of dicentric chromosome-induced by ^{60}Co irradiation.

Keywords: Antioxidant, Radioprotective effect, Gymnanthemum extensum

Development of gamma vulcanized natural rubber latex film for use in dental applications

Gunyarat Wicha
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
gunyarat.w@ku.th

Kiadtisak Saenboonruang*
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscikssa@ku.ac.th

Abstract

Radiation vulcanized natural rubber latex (RVNRL) prepared by using gamma irradiation has high elasticity and strength due to the crosslink bonding of the molecular chains, making natural rubber latex highly strong. This work aimed to develop procedure to produce natural rubber latex thin film using gamma irradiation for potential use in dental application in order to replace commonly used plastic materials. In order to improve properties of the film, gamma rays with the doses of 12 kGy and 24 kGy were irradiated on the natural rubber latex (NRL). The latex thin films were then formed by casting into molds to produce 0.22-0.28 mm thick film. Mechanical (tensile modulus, tensile strength, elongation at break, and hardness), physical and chemical structure properties of film were investigated using Scanning Electron Microscope (SEM), X-Ray Diffractometer (XRD), Fourier Transform Infrared Spectroscopy (FTIR). The results of mechanical characterization showed that tensile modulus, tensile strength, and hardness increased while elongation at break decreased with increasing gamma dose. In summary, the overall results suggested that the developed thin film has high potential to be used in dental applications. Furthermore, the latex thin films obtained from this work are also environmental friendly due to their biodegradable properties and substantial reduction in the use of hazardous chemicals.

Keywords: gamma irradiation, natural rubber latex, mechanical, physical, dental

Synthesis of Graphene Oxide Powder for Adsorption of Radioactive Iodine-131

Isaree Bankoh
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
isaree.b@ku.th

Wanwisa Sudprasert*
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
wanwisa.s@ku.ac.th

Abstract

Iodine-131 is increasingly used for diagnostic and therapeutic applications. The majority of the radioactive iodine will be excreted out through urine. Safe disposal of the radioactive waste is a vital component of the overall management of the hospital waste. This study aimed to explore the possibility of using graphene oxide as an adsorbent for removal of iodine-131 in aqueous solution. The graphene oxide (GO) powder was prepared from graphite powder by using a modified Hummers method. The sodium iodide (I-131) solution with the initial activity of 20,444.57 Bq were added into the GO powder with varying concentration. The morphology of GO was characterized by means of scanning electron microscope (SEM). The radioactivity of I-131 adsorbed by GO was measured by gamma spectroscopy. SEM result showed that multi layers of GO were obtained. The amount of I-131 removal was significantly varied with the concentration of GO. The highest removal efficiency of I-131 by GO was 40.5% under the ambient temperature at pH 6.5-7.0 over 24 hour adsorption time. The maximum adsorption capacity of GO was 132.44 Bq/mg. The synthesized GO should be further developed to adsorb radioactive I-131 from wastewater more efficiently.

Keywords: graphene oxide, radioactive iodine-131, adsorption

Survey of Indoor Rn and Th progeny around residential areas in the old mine of Phang Nga Province

Jeerasak Sankasem
Department of Applied Radiation and Isotopes, Faculty of Science,
Kasetsart University, Bangkok, Thailand
jeerasak.san@ku.th

Chanis Pornnumpa
Department of Applied Radiation and Isotopes, Faculty of Science,
Kasetsart University, Bangkok, Thailand
fscicnp@ku.ac.th

Abstract

This research aims to study the amount of radon (Rn) and thoron (Th) progeny such as Po-218, Pb-214, Pb-212, Pb-210, Po-210, and others in residential areas around the old mine of Phang Nga Province that can cause health effects of inhaling radioactive particles in the human. Rn-Th progeny are radioactive particles occurred by decay of uranium and thorium that are the naturally occurring radioactive materials. These radionuclides have more enough energy to interact with lung tissue cells when breathing air that accumulates Rn and Th progeny. Alpha particles emitted by decay products are able to destroy lung cells and bronchi, which may lead to lung cancers. In order to confirm the radiation safety of population in Phang Nga, a survey of indoor Rn and Th progeny concentration was carried out using a solid-state nuclear track detector (CR-39) with difference thickness of the aluminum vaporized mylar films about 4 months. The monitoring devices were divided into 4 channels for detecting the target nuclides, which were able to cut off the energy of the alpha at 4.2 MeV, 6.1 MeV, 7.7MeV for channel 1, channel 2, channel 3, respectively, and non-cut off energy for channel 4. The study areas were selected 5 districts in the province, consisting of Khura Buri District, Thap Put District, Thai Mueang District, Mueang Phang Nga District, and Takua Pa District, which the devices were installed in volunteer houses. However, the annual effective dose of each house could be estimated and reported to confirm the radiation safety.

Keywords: Environmental Radiation, Radon, Thoron, indoor radon-thoron

Determination of radioactivity concentrations in soil samples and the annual effective dose assessment to population living in the old mine area of Phang Nga Province

Juggawan Kunakorn
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
juggawan.k@ku.th

Chanis Pornnumpa*
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscicnp@ku.ac.th

Abstract

Phang Nga was one of the important areas that had been mining and exported in the past. By-products from tin mining and smelting with radioactive substances may have been left to the environment in those days and still remain today. Generally, natural radionuclides that contain in soil, rocks, and tailings from mining are able to produce low activity gamma-ray in the environment. Contamination of the tailings (monazite sand, decay products from uranium series and thorium series) over the surface of the soil is the result of high background radiation area around the mine that may affect people's health around there. Hence, monitoring of gamma activity in the soil is an essential factor to determine the effective dose that can be evaluated the risk of terrestrial gamma exposure to the villagers. In this study, thirty-one samples of the soil were collected from some areas of four districts in Phang Nga, Thailand, for evaluating the specific activity. The gamma activity values and the specific activity values were measured using gamma spectrometry techniques (HPGe semiconductor detector) and were estimated to absorbed dose rates for calculating the annual effective dose rate of general population. However, the result will show as the effective dose table that compares with nationally and internationally approved values from OAP and UNSCEAR, subsequently. The annual effective dose can be estimate to the risk for the population living in the old mine area and can be regarded as the baseline background radiation data.

Keyword: Old tin mine, uranium, thorium, potassium**,** Gamma-ray Spectrometry

Investigation of gross alpha and gross beta radioactivity from popular cigarettes in Thailand

Kandawadee Laton
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
kandawadee.l@ku.th

Chanis Pornnumpa*
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscicnp@ku.ac.th

Abstract

This project focuses on the investigation of gross alpha and gross beta radioactivity in tobacco. Smoking increases the risk of the internal exposure to radioactive substances in cigarette and causes the accumulation of radionuclides on the surface of lung tissue. The significant radionuclides found in tobacco are polonium (Po-210) and lead (Pb-210) that are cause of the risk of respiratory cancers from alpha's interactions. Seven samples of most frequently smoked and popular brands of cigarettes were collected from convenience stores. The cigarette samples were measured by a gas proportional counter, Berthold LB770 for evaluating gross alpha and beta levels. The tobacco was dried at 50 °C for 24 hours and were grinded to become powder. There samples were packed into a measurement dish and repeated 3 times per each sample. The activity concentration of all samples was used to calculate the effective dose rate for smoker.

Keywords: cigarettes, tobacco, effective dose

Development of cotton coating to attenuate electromagnetic wave using copper micro-particles

Kanyanan Kosinarkaranun
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
kanyanan.k@ku.th

Ridthee Meesat
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscirim@ku.ac.th

Abstract

Electronic devices, such as, smart phones, PDAs, TVs, radio transmitters, vehicle systems and so on, can release electromagnetic (EM) radiation with high frequencies (high energy). Many people aware the high energy EM wave may cause cancer or other health problems. The main objective of this project is to develop cotton fabric coating method for Electromagnetic shielding. The screen printing techniques is one of the common methods can be used because of easy and cost-effective process for textile printing. In this study, copper microparticles and activated bamboo charcoal were mixed with a textile printing color to be used for coating. Electromagnetic shielding effectiveness was evaluated in the frequency range from 300 to1500 MHz. The results showed that the electromagnetic shielding properties of fabric were affected by the increased amount of copper and the same result of the different types of screen color. There is one type of screen color that cannot be the electromagnetic shielding it was a plastisol color.

Keywords: electromagnetic shielding effectiveness, copper, screen printing

Effects of gamma irradiation on possible degradation in radiation vulcanized natural rubber latex (RVNRL) thin films

Kanyapuk Intharaprasit
Department of Applied Radiation and Isotope, Faculty of Science, Kasetsart University, Bangkok, Thailand
kanyapuk.i@ku.th

Kiadtisak Saenboonruang*
Department of Applied Radiation and Isotope, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscikssa@ku.ac.th

Abstract

Radiation vulcanized natural rubber latex (RVNRL) thin films, which were produced using gamma irradiation at 12 kGy and 24 kGy, were further irradiated by gamma rays from 60Co source with the accumulated doses of 12 kGy, 24 kGy, and 36 kGy, respectivel, in order to assess effects of gamma irradiation on possible degradation of RVNRL thin films. Properties of interest, which were investigated in this work included mechanical (tensile modulus, tensile strength, elongation at break and hardness), physical, and chemical structure properties of RVNRL thin film under varying gamma irradiation doses. The results showed that gamma irradiation initiated varying degrees of changes in the properties of the RVNRL thin films, depending on gamma doses used for irradiation. In conclusion, the outcome and information of the changes due to gamma rays could be used to understand the film properties for potential uses in medical and food industries that utilize gamma irradiation for sterilization and shelf-life extension.

Keywords: natural rubber latex, gamma-vulcanization, gamma-irradiation, degradation

Study of gross beta radioactivity compared with the concentration of dust dispersed in the air and committed effective dose assessment from inhalation

Monchupa Bandal
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
monchupa.b@ku.th

Chanis Pornnumpa*
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscicnp@ku.ac.th

Abstract

At present, Bangkok is experiencing dust pollution problems that affect to people's health. The sources of the dust problems may be caused by many factors such as naturally dust, burning fuels, constructions, industry, and other activities. The main problem of dust in Bangkok is mainly from transportation and traffic, which small dust or particulate matter of 2.5 micrometers (PM2.5) can affect human health because it is very small size and the human respiratory system cannot trap or expel by themselves. In addition, some radioactive gas can be suspended in the air and combined with dust as radioactive dust. Those radioactive dusts can be cause of dangerous diseases and increase the risk of lung cancer due to interaction of radiation. Alpha and beta particles emitted from radioactive dust on the surface of the skin and respiratory system can directly interact with the various tissues that are an important cause of health effects. Therefore, this research focused on the study and measurement of the amount of radioactive dust compared to the dust concentration in the air for dose assessment at Kasetsart University. Three measurement points around Viphawadi gate, Phaholyothin Gate, and Ngamwongwan Gate were estimated every day in April 2019 by collecting samples during working hours. All samples were measured gross alpha and beta using gas flow proportional counter and were estimated the risk of internal exposure from radioactivity, including the evaluation of the effective dose rate that population received from inhalation.

Keywords: PM.2.5, beta, pollution, radiation, effective dose

Measurement of activity concentrations in radiation vulcanized natural rubber latex (RVNRL)

Nutpakun Kanchanarat
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
nutpakun.k@ku.th

Kiadtisak Saenboonruang*
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscikssa@ku.ac.th

Abstract

Thailand is currently the world's leading natural rubber exporter with significant numbers of rubber processing factories. At the present, more than 44,000 people in Thailand work in natural rubber latex (NRL) factories, of which the numbers tend to increase with higher demands of natural rubber products. However, the radionuclides in the NRL could adversely harm personnel and the general public in the case of excessive exposures. In particular, radiation vulcanized natural rubber latex (RVNRL), which is one of the method for rubber vulcanization, needs special attention due to possible activation of ionizing radiation. Hence, this work aimed to determine activity concentrations of natural and anthropogenic radionuclides in RVNRL that were irradiated with 12-kGy and 24-kGy gamma rays using a gamma spectrometer. In addition to the measurement of activity concentrations, potential health hazards caused by both internal and external exposures were also determined. The results and outcome of this work would have great impacts on the safety of the workers, as well as benefiting policymakers who could adopt safe limits of radiation exposure to RVNRL-related personnel.

Keywords: natural rubber latex, gamma irradiation, gamma spectrometer, activity concentration

Monitoring of Tritium Concentration in Tap Water Samples Collected from Some Areas of Thailand

Pantiwa Kumsut
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
pantiwa.k@ku.th

Wanwisa Sudprasert*
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
wanwisa.s@ku.ac.th

Abstract

Tritium is a radioactive form of hydrogen with a physical half-life of 12.3 years. When it is present either naturally or artificially, tritium may be incorporated into water, thus entering the natural hydrological cycle. Hence, natural background levels of tritium can be found everywhere in the environment, including water, soil, and vegetation. Monitoring of tritium concentration in tap water is an essential tool to determine the effective dose received from tap water. In this study, forty samples of tap water were collected from some areas of Thailand during February – April 2019. The tritium concentrations were measured using low level liquid scintillation counting (LSC) techniques. The results show that the tritium concentrations were in the range of 9.0 – 12.0 Bq/L which were lower than the standard limit and guidelines for tritium in drinking water recommended by the World Health Organization (WHO). As tritium can be used as an indication of contamination from artificial sources, the results from this study can be regarded as the baseline level of tritium concentrations in tap waters before operating the first nuclear power plant in Thailand.

Keywords: Tritium, liquid scintillation, tap water

Designed Fricke dosimeter using RGB sensor by transmission method

Peerawit Saichin
Department of Applied Radiation and Isotopes, Faculty of Science,
Kasetsart University,Bangkok, Thailand
Peerawit.sa@ku.ac.th

Narippawaj Ngernvijit
Department of Applied Radiation and Isotopes, Faculty of Science,
Kasetsart University,Bangkok, Thailand
narippawaj.n@ku.th

Abstract

This research project has the objective of designing color measuring instruments of the Fricke solution and determines the radiation dose of the Fricke solution using RGB Sensor. The project uses the RGB sensor model TCS34725, Arduino Uno3, LED. Arduino is used for control LED and read RGB value from the RGB sensor to determine Fricke's dose.

The design of the measurement system and was used the RGB sensor and connected to the Arduino board. Primary light source from LED transmitted to Fricke sample to the sensor, RGB value from sensor is read by Arduino. The radiation dose can measure by red color value from sensor. The standard value and color value must be measured to check the error values before measuring the color values. The color value of the Fricke solution will change depending on the amount of radiation received. After that, bring the Fricke solution to measure color. Then use the light from the LED to shine through the Fricke solution to the RGB sensor. When the RGB sensor measures the color, then sends the data to the Arduino Uno3 board and to display the color values that have been sent to the display screen.

Keywords :TCS34725,RGB sensor, Fricke dosimeter

The study effect of mixing time of a ball mill on elements distribution of a thermoelectric material using electron scanning microscope

Siriwadee Namkode
Department of Applied Radiation and Isotopes, Faculty of science, Kasetsart University, Bangkok, Thailand
siriwadee.n@ku.th

Ridthee Meesat*
Department of Applied Radiation and Isotopes, Faculty of science, Kasetsart University, Bangkok, Thailand
fscirim@ku.ac.th

Abstract

The world currently faces major problems related to energy supply and consumption. Thermoelectric materials and technology can be considered as a promising alternative for a solution of these problems. High-efficiency thermoelectric materials are a key material system for the thermoelectric devices that can convert heat into electrical energy. In this project, we focus on study of thermoelectric materials based on metal oxide compounds, CuO, Al_2O_3 and Fe_2O_3. We investigate the optimum mixing time of a ball mill to use for mixing the metal oxide materials. The mixing material will be compassed by hydraulic compassion with the mold diameter 10 mm. the compassed samples will be analyzed elements distribution as a function of mixing time using scanning electron microscope (SEM)

Keywords: Thermoelectric materials, balls mill, Scaning Electron Microscope (SEM)

Effects of Gamma Irradiation on Poly-β-Hydroxybutyrate and Phycocyanin Production in *Arthrospira platensis* TISTR 8217

Thanakron Noppanamas and Paiboon Reungpatthanaphong*
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
*For Correspondence: fscipbr@ku.ac.th

Abstract

In this study, the effects of gamma irradiation on Poly-β-Hydroxybutyrate and Phycocyanin production in *Arthrospira platensis* TISTR 8217 were examined by using uv-vis spectrometer. *Arthrospira platensis* TISTR 8217 was cultivated in modified Zarrouk's medium for 8 days before irradiated by gamma ray at the doses of 0, 250, 500, 750 and 1000 gray, respectively. It was incubated for 7 days after irradiation. The results showed that gamma ray at the doses of 500 and 750 Gy can increase the highest production of phycocyanin (72.21 mg/L or 9.86 % dry weight) and poly-β-hydroxybutyrate (6.32 mg/L or 0.94 % dry weight), respectively. In conclusion, the data of this study may be applied to increase the production of both poly-β-hydroxybutyrate and phycocyanin from *Arthrospira platensis* using gamma irradiation.

Keywords: Poly-β-Hydroxybutyrate, Phycocyanin, *Arthrospira platensis*, gamma irradiation

Fricke dosimeter using RGB sensor by back scatter method

Thanavat Napee
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
Thanavat.n@ku.th

Narippawaj Ngernvijit*
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscinrn@ku.ac.th

Abstract

Due to Ferrous sulphate or Fricke solution has been used to radiation dosimetry in the form of Fricke gel, using xylenol orange as an indicator when Fricke gel irradiated from the different absorbed dose. It has a variety of different colors, these colors relative to the absorbed dose.

In this research, the Fricke color measurement instrument is developed based on the principle of light backscattered and measure scattered colors by the RGB color sensor. Light source from LED attach on sensor emitted onto Fricke gel and the colors of backscatter light will be measure. Red color's value from backscatter light of Fricke gel related to absorb dose. This research used Arduino UNO R3 microcontroller device as the controller. It read red value from the RGB sensor (TCS34725), control LED light, interpret data and show RGB color values and the amount of absorbed dose of Fricke gel on display (SH1106).

Keywords: Fricke gel, backscattered, TCS34725 RGB sensor and Arduino

Development of MCU based counter and timer for radiation measurement

Thanin Limpan
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
Thanin.l@ku.th

Manit Jitpukdee*
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
Manit.j@ku.ac.th

Abstract

Counter and timer are electronic devices which are applied in the counting system to measure radiation. A counter is a device for counting signals obtained from radiation detectors, and a timer is a device for setting the time to count the signal. In this work, we have developed a counter and timer module using a microcontroller unit (MCU) which controls the operation of electronic devices. The module was operated by the microcontroller model PIC32MX460F512L, running at 80 MHz. We applied switches including START/STOP, RESET, SECONDS/MINUTES, UP/DOWN and a female BNC connector. They are used for starting and stopping the counter, resetting the count, selecting between second and minute, increasing and decreasing setting time and input signals, respectively. We programmed the firmware to the microcontroller to control the system as designed. The results from the counter and timer were displayed on the organic light-emitting diode (OLED) screen which was connected with the control circuit board. The developed counter and timer module showed results on 8 digits OLED which has setting time between 1 to 5000 seconds, a maximum count of 99,999,999 counts, and a maximum count rate is 1,000,000 counts per second. This module could be used as a Nuclear Instrumentation Module (NIM) for counting radiation signals.

Keywords: Counter, Timer, Microcontroller, OLED

Radiation Sealed Source Safety Method for Department of Applied Radiation and Isotopes

Watcharaphon Rotpanhon
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
watcharaphon.r@live.ku.th

Pakorn Tangpong*
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscipota@ku.ac.th

Abstract

The purpose of this study is developing a safety plan for Department of Applied Radiation and Isotopes, Kasetsart University. All radioactive materials, licensees must request for authorization to use in the department, that requires a safety and security program. To guarantee the protection and peaceful utilization of nuclear technology and for the public, the Office of Atom for Peace (OAP) has originated laws, regulations and ministerial announcements. All radioactive materials for research activities must comply under laws and regulations. The Safety Plan for Department of Applied Radiation and Isotopes is documentary research and followed by Nuclear Energy For Peace Act, B.E. 2559 (2016), Ministerial Radiation Safety Regulation and Ministerial Radiation Security Regulation that was created by OAP, the regulator in Thailand. After investigation and intense study, the Safety Plan for the Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University was developed to prevent the radiation on persons and environment, especially in the research activities in the university that related with radiation generators and radioactive materials.

Keywords: Radiation safety plan, Radiation protection

Radiation safety measurement using drone

Wichittra Saenphan
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
wichittra.sae@ku.th

Waraphon Seeoot
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
varaporn.s@ku.th

*Manit Jitpukdee**
Department of Applied Radiation and Isotopes, Faculty of Science, Kasetsart University, Bangkok, Thailand
manit.j@ku.ac.th

Abstract

The aims of this project were to develop a radiation detection system for radiation safety measurement by using a drone as an Unmanned Aerial Vehicle (UAV) which can be controlled from the wireless network to measure radiation in high dose rate area where people is inaccessible. A radiation detection system in this research was a Geiger-Muller detector (GM) as a radiation detector interfaced with Arduino Nano to process radiation counting system. The counting data can be transferred via wireless communication at 2.4 GHz to the receiver module which was attached at a drone remote control. The receiver module was designed using ArduinoIDE to program firmware through Arduino UNO R3 to display counting data at the LCD module. The developed radiation detection system displayed data in count per second, and the maximum range of wireless communication was 20 meters. This drone could be applied for radiation safety measurement in high dose rate area.

Keywords: Drone, radiation detector, Arduino, wireless

Detection of sweetener in sample by electrochemical sensor

Amporn Kuntinuguntanon
Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
Amporn.kun@ku.th

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

Abstract

Glucose ($C_6H_{12}O_6$) is a basic sugar of carbohydrate; therefore, glucose is a precursor of energy production that is essential to the function of the brain and body. Several methods have been used in quantitative measurement of glucose; however, they are complex, inconvenient and expensive. The electrochemical technique is a technique that has been widely used in glucose detection due to its selectivity, sensitivity and low contamination. In this research carbon screen printed electrode has been developed for determination of glucose. The surface of electrode was modified by Ni/PDDA/carbon powder to improve selectivity and sensitivity of the electrode. The current of Ni/PDDA/carbon powder modified electrode is higher than that of PDDA/carbon powder and carbon screen printed electrode, respectively. The Ni/PDDA/carbon powder modified electrode was carried out in different concentrations of glucose from 0.1 mM to 3.0 mM. The linear regression is $y = 0.00002x + 0.00005$ with $R^2 = 0.9972$. The prepared electrode can be used for determination of glucose in real samples of urine.

Keywords : glucose, screen printed electrode, nickle, PDDA

Towards the Synthesis of Anticancer Swainsonine from D-Mannose

Anphisa Lamor
Department of Chemistry, Faculty of Science, Kasetsart University
Bangkok, Thailand
Anphisa.l@ku.th

Nutthawat Chuanopparat*
Department of Chemistry, Faculty of Science, Kasetsart University
Bangkok, Thailand
fscinwc@ku.ac.th

Abstract

Swainsonine is a natural product in the indolizidine alkaloid family, found in native plants of Australia and North America. This compound shows a wide range of biological activities and, interestingly, it was the first glycoprotein-processing inhibitor found to exhibit an anticancer activity with no cytotoxicity against normal cells. As a result, it has become a promising anticancer drug and has drawn many researchers' attentions for many decades. In this research, the synthesis of swainsonine was designed to start from D-mannose, an inexpensive and commercially available starting material with appropriate stereochemistry. The synthesis of its core-structure was accomplished in a fourteen-steps *via* the regioselective-reductive ring opening of acetal reaction, Bernett-Vasella reaction and Horner-Wadsworth-Emmons reaction as key reactions.

Keywords: swainsonine, anticancer, D-Mannose, total synthesis

Vegetable Root-Derived Hierarchical Porous Carbon as Electrode Material for High-Performance Supercapacitors

Anuwat Sukcharoen
Department of Chemistry, Faculty of Science, Kasetsart University
Bangkok, Thailand
anuwat.suk@ku.th

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

Abstract

Vegetables are extensively cultivated worldwide as human food. However, large quantities of vegetable roots, which possess an abundant three-dimension (3D) structure, remain unused and produce enormous pressure on the environment. Here, 3D hierarchical porous carbon was prepared by the facile carbonization of vegetable roots, celery root, culantro root, and water volvulus roots, followed by chemical activation. Among above candidates, the as-prepared material from celery roots, possessing large specific surface area (3,319 m^2 g^{-1}), good electrical conductivity, and unique 3D hierarchical porosity, shows outstanding electrochemical performance as an electrode material for supercapacitors, such as a high capacitance and good rate capability in a three-electrode system in 2 M H_2SO_4. These results show that the as-prepared material from celery roots could simultaneously deliver superior energy and power density.

Keywords: 3D hierarchical porous carbon, biomass waste, vegetable roots, supercapacitors

Preparation, Characterization and *in vitro* release study of *Andographis Paniculata* leaf extract nanoencapsulation

Apisara Bu-ngharat
Department of Chemistry, Faculty of Science, Kasetsart University Bangkok, Thailand
apisara.b@ku.th

Peerada Yingyuad*
Department of Chemistry, Faculty of Science, Kasetsart University Bangkok, Thailand
fscipdy@ku.ac.th

Abstract

In this study, chitosan, which is a biodegradable and biocompatible polymer, was prepared in the form of nanoparticle to encapsulate the crude extract of *Andrographis Paniculata* (AP). AP is one of the well-known Thai traditional herbs possessing many interesting pharmaceutical activities and has been widely used for the treatment of several diseases. However, the active compounds found in AP has low water solubility and low stability, resulting in limited use in medical application. To increase water solubility and stability of such compounds, the crude extract of AP was formulated in polymeric chitosan nanoparticles. The Chitosan nanoparticle (CSNp) were prepared by the ionic gelation method using tripolyphosphate (TPP) as a crosslinking agent. Various weight ratios of chitosan to TPP were used to formulate CSNp including 3:1, 4:1, 5:1 and 6:1, then the crude extract in the amount of 10, 20 and 30 %wt based on the polymer weight were added in the mixture. The size and zeta potential of all CSNp formulations were found between 166 to 220 nm and +29 to +35 mV, respectively. According to the image obtained from Scanning Electron Microscopy (SEM), CSNp showed spherical shape and homogeneous size distribution. Fourier Transform Infrared Spectroscopy (FTIR) was used to confirm the principal function groups of the nanoparticles. The result from High Performance Liquid Chromatography (HPLC) showed that the crude extract could be successfully encapsulated in the nanoparticles. The release study of the crude extract from CSNp using dialysis method in the buffer solution pH 7.4 demonstrated that the crude extract could be gradually released from the nanoparticles during 48h. These results showed the possibility of using the crude extract of AP in the form of CSNp in medical and cosmetic application in the future.

Keyword: *Andrographis Paniculata*, Chitosan, nanoencapsulation

Synthesis, *in vitro* Acetylcholinesterase Inhibitory Activity and Molecular Docking of New Coumarin-3-carboxylic acid Derivatives

Kittiya Thamma
Department of Chemistry, Faculty of Science, Kasetsart University,
Bangkok, Thailand
kittiya.th@ku.th

Sorachat Tharamak
Department of Chemistry, Faculty of Science, Kasetsart University,
Bangkok, Thailand
sorachat.th@ku.th

Wanchai Pluempanupat*
Department of Chemistry, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fsciwcp@ku.th

Abstract

The situation in the present, the world population is completely going to aging society and a major public health problem is Alzheimer's disease. One of the cholinergic hypothesis that occurs in Alzheimer's disease is the loss of acetylcholine as the neurotransmitter. So, the patients can be treated by deceleration of acetylcholine to choline using an acetylcholinesterase inhibitor. Coumarins, which are common natural oxygen heterocyclic compounds, have been reported to show acetylcholinesterase inhibitory activity. Thus, this research aims to study and synthesize the series of coumarin-3-carboxylic acid hybrid with carbazoles for leading to inhibit acetylcholinesterase by comparison with molecular docking.
Keywords : Alzheimer, Acetylcholinesterase inhibitor, Coumarin-3-carboxylic acid, Carbazoles

Dark-Brown Natural Hair Dyes for Health-concern and Aging People

Krittayot Ruengbumroong
Department of Chemistry, Faculty of Science, Kasetsart University
Bangkok, Thailand
krittayot.r@ku.th

Sutasinee Kityakarn*
Department of Chemistry, Faculty of Science, Kasetsart University
Bangkok, Thailand
fscistsn@ku.ac.th

Abstract

Hair color are one of our appearance which reflects person's health and beauty. Colors of hair classified in two groups depending on the concentration of melanin in the medulla and cortex. The brown-to-red hair shows the high concentration of pheomelanin and the red brown-to-black hair shows the high concentration of eumelanin. The loss of melanin in the medulla and cortex results gray hair relating to the hormones, ages, sexual, genes etc. People with gray hair usually covered by dark color for good appearance. In doing so, the synthetic hair dyes are widely used than the natural hair dyes. However, the use of the synthetic hair dyes composing arylamine, i.e. p-phenylenediamine and p-toluenediamine, cause to the loss of hair, dry scalp,the breakage of hair stand, the allergic and carcinogenic effects. Natural hair dyes, therefore, have attracted great attention especially by the health-concerning and ageing people. In this work, the used coffee-grounds, the waste product from brewing coffee, was examined as a source of less toxic hair dye for value addition. The dark brown dye was extracted from the used coffee ground with various solvents with different polarity and subsequently used to color the bleached hair. Hair coloring by the extracted dye was studied compared to the commercial natural and the synthetic hair dye products.

Keywords: Natural hair dye, Health-concern, Hair Dyeing, Coffee, Water extraction

Carbon materials prepared from spent coffee grounds

Napaporn Paerungruang
Department of Chemistry, Faculty of Science, Kasetsart University,
Bangkok, Thailand
napaporn.pa@ku.th

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

Abstract

Nowadays, sustainable development has been focused on the finding ways to recycle waste to value added products. Coffee is one of the world's most popular beverages and largest consumptions, which is producing the huge amount of spent coffee grounds (SCG) from the brewing process. Therefore, the waste management is required to utilize SCG effectively, efficiently, and economically. In this study, we have developed the green and eco-friendly hydrothermal method for cutting spent coffee grounds to carbon derived materials. The hydrothermal process is studied over time duration and temperature assisted with the presence of acid and non-acid. The obtained products are characterized by XRD, TGA, FTIR, and EA.

Keywords: Spent coffee ground, Carbon, hydrothermal

Green synthesis of silver nanoparticles and its antibacterial activity

Narangsun Wonganant
Department of chemistry, Faculty of Science, Kasetsart University,
Bangkok, Thailand
narangsun.w@ku.th

Saijai Charnsettikul
Department of chemistry, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fscisac@ku.ac.th

Abstract

In this research, the silver nanoparticles were synthesized under green chemistry method by using *Pyrus pyrifolia* extract as reducing agent and polyethylene glycol as stabilizing agent. In the study effect of parameter such as concentration of reducing agent, concentration, molecular weight of stabilizing agent and pH were investigated in the synthesis of silver nanoparticles. The silver nanoparticles obtained were characterized by UV-vis spectroscopy and scanning electron microscope. The antibacterial activity of these nanoparticles was also studied on *Escherichia coli*, *Staphylococcus aureus* and *pseudomonas aeruginosa* by disc diffusion and agar well diffusion. The results show that the best parameter for synthesis these nanoparticles are 2% reducing agent, 0.5% stabilizing agent which molecular weight 2000 and pH 10.

Keywords: Silver nanoparticles, Polyethylene glycol, Antibacterial activity.

Atomic Layer Deposition (ALD) of TiOz on the surface of magnetic head components

Natjanan Songsenn
Department of Chemistry, Faculty of Science, Kasetsart University,
Bangkok, Thailand
natjanan.s@ku.th

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

Abstract

In hard-dis k drive, an ultra-thin layer of head overcoat is essential to prevent magnetic headfrom wear and corrosion. In this work, we describe the process of fabrication a thin-film of titaniumoxide (Ti02) over-layer on magnetic hard disk grown by Atomic Layer Deposition. Several techniques were used to confirm the presence and quality of the Ti02 thin film on the surface. Film (2-nm-thick) was then 'subsequently grown on the magnetic hard-disk component and was found to be sufficient to significantly reduce corrosion rate from moisture and oxygen. This result could be significant in terms of designing the new types of overcoat on magnetic head, especially when thickness overcoat reduction is required.

Keywords: Atomic Layer Deposition (ALD) , titanium oxide (Ti02), magnetic head components

Exploring binding mechanisms of DNA aptamer to albumin for diabetes kit design in bovine and canine using molecular dynamics simulation

Nattapon Kuntip
Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
nattapon.kun@ku.th

Prapasiri Pongprayoon*
Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
prapasiri.p@ku.th

Abstract

In human, serum albumin is used as diabetes biomarker. Recently, diabetes aptasensor have been invented. The albumin-selective aptamer has been selected and used to track albumin concentration in human blood. It was found that bovine and canine albumins share structural similarity to that of human. In this work, we thus explore the possibility of using aptamer for bovine and canine albumin detection. The mechanism of aptamer binding to bovine and canine albumin was studied. To observe atomic picture, we employed molecular dynamics simulation. The simulation results show that aptamer can bind to both bovine serum albumin (BSA) and canine serum albumin (CSA). For BSA, aptamer used 3'end to bind to protein at subdomain IIIA at beginning and then it lays the middle chain down to subdomain IIIB. For CSA, aptamer only used 3' end to bind to protein at subdomain IIIA. From this study, it was found that aptamer has a tendency to bind to BSA with similar mechanism to human serum albumin. It shows that aptamer can be used to track albumin concentration in bovine and canine.

Keyword : Albumin, Diabetes, Aptamer, Molecular dynamics simulation

Preparation of surface-modified halloysite nanotubes for electrochemical sensing of CO_2

Nattida Phongzitthiganna
Department of Chemistry, Faculty of Science, Kasetsart University,
Bangkok, Thailand
nattida.ph@ku.th

*Kannika Jeamjumnanja**
Department of Chemistry, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fscikij@ku.ac.th

Abstract

The selective modification of the outer surface of halloysite nanotubes (HNTs) with 3-aminopropyl triethoxysilane (APTES) was performed by self-assembled monolayers (SAMs) method. This amine surface- functionalized HNTs was fabricated to a plate electrode which can selectively capture and release CO_2 at room temperature, permitting for the measurement of the amount of CO_2 by electrochemical impedance spectroscopy (EIS). Before conducting EIS measurements under CO_2 atmosphere, the saturation of the plate electrodes by various types of solvent vapours (methanol, ethanol, acetonitrile, acetone and ammonium hydroxide) was investigated to improve the proton conductivity of SAM-modified HNTs. It was revealed that the plate electrode saturated with methanol vapour provided the highest proton conductivity and was then used for further EIS measurements under CO_2 atmosphere. The EIS results showed that the proton conductivity of SAM-modified HNTs was dropped upon CO_2 binding within a minute. Furthermore, cycling measurements of CO_2 adsorption and desorption indicated that this modified material can be reused by heating at 75 °C. As a result, this works offer a new path for producing a low-cost material for CO_2 electrochemical sensor.

Keywords: SAMs method, CO_2 sensor, Electrochemical impedance spectroscopy

Electrochemical determination of nitrite ions by using modified electrodes

Nitwaree Palavong
Department of Chemistry, Faculty of Science, Kasetsart University
Bangkok, Thailand
nitwaree.p@ku.th

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

Abstract

Nitrite is an important preservative in meat products. It inhibits the growth of several undesirable bacteria, especially *Clostridium botulinum*; however, the use of nitrite may have some health risks by causing the formation of carcinogenic nitrosamines in foods. An electrochemical technique is extensively used for determination of nitrite due to its stability, selectivity, and simple and easy fabrication process. In this research, Ni/PDDA/rGO catalyst was synthesized and applied to modify screen-printed electrodes (SPE) for electrochemical determination of nitrite by using cyclic voltammetry. The morphology of the prepared catalyst was characterized by scanning electron microscopy (SEM), energy dispersive x-ray spectroscopy (EDS) and transmission electron microscopy (TEM). The Ni/PDDA/rGO modified SPE shows promising electrocatalytic activities on the oxidation of nitrite in pH 6.0 phosphate buffer. The modified electrode can detect nitrite in a linear range of 10 µM to 20 µM and 20 µM to 100 µM with a correlation coefficient of 0.9929 and 0.9955, respectively. The limit of detection is 9.844 µM. The prepared electrode was carried out for nitrite determination in food samples.

Keywords: nitrite determination, screen printed electrode, PDDA, nickel

Tyrosinase Inhibition *from Artocarpus lacueha* extract inclusion complex with cyclodextrin polymers

Nunnicha Thaninsurawoot
Department of Chemistry, Faculty of Science, Kasetsart University
Bangkok, Thailand
Tanatchaphan.t@ku.th

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

Abstract

The crude extract from *Atrocapus lakoocha Roxb.*, a plant in Moraceae family or Mahad, has been reported that oxyresveratrol, a major component can inhibit tyrosinase, an enzyme involving in melanin synthesis. In this research, the inclusion complexes of ethanolic extract of Mahad with beta-cyclodextrin polymer crosslinked by citric acid (PbCD-cit) and epichlorohydrin (PbCD-Epi) were prepared. The amount of extracts contained in the complexes were determined by using UV-Vis spectrometry. It was found that crude extract contained in pbCD-cit and pbCD-Ep were 30% and 37%, respectively. The anti-tyrosinase activities of crude extract were investigated compared to pbCD-cit and pbCD-Ep inclusion complexes. As a results, percent anti-tyosinase of crude extract was 38% whereas Mahad:pbCD-cit and Mahad:pbCD-Ep inclusion complex showed anti-tyrosinase 82% abd 83%, respectively. From these results, the inclusion complex of CDs can be developed as an important ingredient for whitening products

Keywords: *Atrocapus lakoocha Roxb* , oxyresveratrol , tyrosinase

Isolation and structure elucidation of metabolites produced by the *Aspergillus* transformants containing the biosynthetic gene cluster of menisporopsin A from the fungus *Menisporopsis theobromae* BCC 4162

PacharaphanSongjanthuek
Department of Chemistry, Facculty of Science, Kasetsart University
Bangkok Thailand
pacharaphan.s@ku.th

PakornWattana-Amorn
Department of Chemistry, Facculty of Science, Kasetsart University
Bangkok Thailand
fscipwa@ku.ac.th

Abstract

Menisporopsis theobromae BCC 4162 is a seed fungus producing two major bioactive compounds i.e. menisporopsins A and B. Both compounds exhibit a variety of biological activities such as antimycobacterial, antimalarial and cyclotoxic activities. Menisporopsin A is a bioactive macrocyclic polylactone that has the polyketide biosynthetic pathway. The biosynthesis of this compound has been proposed, in which both reducing (R) and non-reducing (NR) polyketide synthases (PKSs) are involved in esterification and cyclolactonization of each polyketide subunit. From our recent heterologous expression work of both R-PKS and NR-PKS using *Aspergillus oryzae* NSAR1 as the expression host, three major metabolites were produced by the *A. oryzae* transformants containing both R-PKS gene (*men1*) and NR-PKS gene (*men2*). They are (-) – orthosporin, (-) - 6-hydroxymellein and ascotrichalactone A. However, several new metabolites produced by the transformants are still not yet to be identified. In this work, the *A. oryzae* transformants containing *men1* and *men2* were cultured in 1 L Czapek-Dox Maltose Peptone (CMP) medium for metabolite production. The ethyl acetate extract of the transformants was analyzed for new metabolites using High Performance Liquid Chromatography (HPLC) technique. An unidentified compound named PSPW-1 was purified using semi-preparative column equipped with HPLC and further analyzed for its structure by NMR and MS. Unfortunately, the amount of this compound is not enough for structure elucidation by NMR. However, ^{1}H NMR result shows that this compound could be an intermediate in menisporopsin A biosynthesis. In order to complete the structure of PSPW-1, the A. oryzae transformants used in this work will be cultured in a larger scale (up to 10 L) and the isolated PSPW-1 will be further tested for its biological activity.

Keywords: *Menisporopsis theobromae* BCC 4162, *Aspergillus oryzae* NSAR1, Polyketide synthase (PKS)

One-pot synthesis of 1-nitrodibenzo[*b,f*]oxepine and its derivatives

Panitan Kraikruan
Department of Chemistry, Faculty of Science, Kasetsart University
Bangkok, Thailand
panitan.kr@ku.th

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

Abstract

Cancer is one of the most serious threats to human health, and the cancer mortality rate is increasing every year. Nowadays chemotherapy is one of the major categories of cancer treatments. This type of treatments uses one or more anticancer drugs to reduce the size of tumors. Unfortunately, chemotherapy resistance may occur and result in failed treatments unless the drugs are changed. Therefore, the development of new drugs to treat cancer is very important. Dibenzo[*b,f*]oxepine can be found as a core structure in many biologically active natural products. In addition, it is somewhat similar to tamoxifen, which is a drug used to treat breast cancer. In this work, 1-nitrodibenzo[*b,f*]oxepine was synthesized in one-pot from commercially available starting materials, 2-methyl-3-nitrophenol and 2-fluorobenzaldehyde. Reaction conditions such as temperature, base and solvent were optimized. Substituted 2-fluorobenzaldehydes were also employed to synthesize various analogs. The structures of the desired products were confirmed by Nuclear Magnetic Resonance Spectroscopy (NMR), Infrared Spectroscopy (IR) and Mass spectrometry (MS). All of the synthesized compounds will be evaluated for anticancer activities.

Keywords: 1-nitrodibenzo[*b,f*]oxepine, anticancer, one-step reaction

Electrochemical studied of Ce-substituted in perovskite for water splitting reaction

Phattaraporn Naonamabat and Sutasinee Kityakarn
Department of Chemistry , Faculty of Science , Kasetsart University , Bangkok , Thailand , 10900
phattaraporn.na@ku.th

Abstract

The water splitting reaction is the most attractive reaction for the renewable energy which generates hydrogen and oxygen. Oxygen gas is the clean and sustainable fuel gas. Pervoskite is one of catalysts for water splitting reaction due to the high catalytic activity and excellent electrochemical property. In this work, we prepared and characterized the physical and chemical properties of $La_{1-x}Ce_xCoO_3$ (x = 0, 0.05, 0.10 and 0.15) electrodes. The electrochemical properties of $La_{1-x}Ce_xCoO_3$ electrodes were investigated by the cyclic voltammety (CV) and electrochemical impedance spectroscopy (EIS). The 10% w/w of $La_{1-x}Ce_xCoO_3$ in carbon black showed the highest current density. Moreover, we studied the preliminary of the glucose sensing by $La_{1-x}Ce_xCoO_3$ electrodes.

Keywords: Perovskite , Water Splitting , Cyclic Voltammetry , Glucose sensor

Synthesis and Inhibition of Acetylcholinesterase Activity of 7-Hydroxy-4-methylcoumarin Derivatives

Phudith Pornchokchai
Department of Chemistry, Faculty of Science, Kasetsart University, Jatujak, Bangkok, Thailand
phudith.p@ku.th

Wanchai Pluempanupat*
Department of Chemistry, Faculty of Science, Kasetsart University, Jatujak, Bangkok, Thailand
fsciwcp@ku.ac.th

Abstract

Alzheimer's disease is a recessive condition of brain causing dementia especially in older persons due to decreasing of neurotransmitter, acetylcholine. To inhibit acetylcholinesterase which hydrolyzes and eliminates acetylcholine is one possibility to treat Alzheimer's disease. Therefore, this research aimed to study of structure and acetylcholinesterase inhibitory activity relationship of 7-hydroxy-4-methylcoumarin derivatives. The derivatives were synthesized through esterification of 7-hydroxy-4-methylcoumarin with various carboxylic acids using DCC to obtain the corresponding esters in moderate yields. The results of acetylcholinesterase inhibitory activity of these derivatives are in progress.

Keywords: Alzheimer; 7-hydroxy-4-methylcoumarin; acetylcholinesterase inhibitory activity

An Investigation of Binding between Inhibitors extracted from Blume Spreng Tree and Acetylcholinesterase (AChE) Enzyme Using Computational Chemistry Method

Phujinn Honorio, Supawadee Sainimnuan, Pachareenart Saparpakorn*
Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
phujinn.h@ku.th fscipnsk@ku.ac.th

Abstract

Acetylcholinesterase (AChE) is an enzyme that plays its important role to the Alzheimer's Disease (AD), which is one of the common causes of dementia. Hence, discovering and designing effective therapeutic drugs that can inhibit AChE activity are observed to be one of the ways to deal with this disease. Previously, there were many studies about AChE inhibitors. In 2006, the isolated compounds from Thai herbs, *Stephania venosa* tuber, including Berberine, Cyclanoline and Palmatine were reported as the effective AChE inhibitors. Nevertheless, the binding conformation of these compounds in the AChE is still unknown. Therefore, in this present study, we used three computational methods that composed of; (I) Molecular Docking using GOLD Suite in order to study the binding between ligand (inhibitor) and the binding pocket of AChE. The binding orientation of ligand selected by the highest GOLD score in each system was used to study further. In section (II), Molecular Dynamics (MD) Simulations via GROningen MAchine for Chemical Simulations (GROMACs) version 5.1.4 were applied. This section generated the modelling system to study macroscopic properties. After that, the equilibrated conformation of ligand-protein complex in each system was used in the next step. In section (III), Quantum Mechanics/ Molecular Mechanics (QM/MM) using Our own n-layered Integrated molecular orbital molecular mechanics (ONIOM) methodology was studied in order to calculate the binding energy of each ligand-protein complex system. These results were compared to Donepezil, which is one of the therapeutic drugs for AD that is currently approved by The U.S. Food and Drug Administration (FDA). As a whole of our computational results, we revealed H-bond interactions between amino acids in the binding pocket and ligands as follows: Cyclanoline (i.e. GLY121, TYR337), Berberine (i.e. TYR72, ASP74, TYR124) and Palmatine (i.e. HIS287, TYR341). Especially, Cyclanoline appeared to have H-bonds which are similar to Donepezil. This present study will be useful for further AD's drug development from Thai herbs.

Keywords: Acetylcholinesterase, Alzheimer, Molecular Dynamics Simulations, Quantum Chemical Calculations

Synthesis of Gelatin-containing Microemulsion-based Calcium Phosphate Composite Organogels for Dentine Occlusion Material.

Pimchanok Kanjana
Department of Chemistry, Faculty of Science, Kaseetsart University, Bangkok, Thailand
pimchanok.kanj@ku.th

Krongkhwan Akkarachaneeyakorn
Department of Chemistry, Faculty of Science, Kaseetsart University, Bangkok, Thailand
fscikwa@ku.ac.th

Abstract

Dentine sensitivity is a dental problem found in people aged between 20-50 years. The most effective treatment method is to occlude the exposed dental tubules occlusion. Due to the fact that calcium phosphate is an important mineral for dental and orthopedic application, this study therefore focused on the synthesis of calcium phosphate nanoparticles in the form of gel to use as a proof of concept for home-treatment of sensitive teeth. In this work, calcium phosphate nanoparticles were prepared via microemulsion method where oleic fatty acid was employed as an external phase and sodium dodecyl sulfate (SDS) was used as a surfactant to form water-in-oil nanodroplets. Finally, in order to facilitate the gel formation, the gelatin solution was introduced at the final step. The amount of gelatin was varied from 5-15 percent by weight which was found to have an effect on the size and distribution of calcium phosphate nanoparticles embedded in gel. According to the characterization, the calcium phosphate particles were all spherical in shape, however the size was smaller as the amount of gelatin was increased. More importantly, the gel was successfully proven to be non-toxic and be able to occlude the dentine tubules up to 75 percent only after 1 day of application.

Keyword: nanodroplets , emulsion method , Calcium Phosphate , spherical

Degradation of polycyclic aromatic hydrocarbons by silver halides photocatalysts

Poonsawat Paechotrattanakul
Department of Chemistry, Faculty of Science, Kasetsart University
Bangkok, Thailand
poonsawat.p@ku.th

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

Abstract

The silver halide photocatalysts namely, AgBr and AgI were prepared by precipitation method using $AgNO_3$, KBr and KI at various concentration as starting materials. The crystallize size of AgBr and AgI were determined by powder X-ray diffraction method using Scherrer's equation. The size of crystallites were in the range of 43-117 nm and 22-64 nm, respectively. The XRD results indicated the increasing of crystallinity and crystallize size of AgBr and AgI, when the concentrations were higher. The SEM images of AgBr and AgI illustrated non-spherical particles. The degradation of PAHs including naphthalene, phenanthrene and anthracene resulted as AgI was mostly affected for degrading of anthracene. After degradation for 6 hours, the anthracene concentration was decreased from 10 ppm to 0.0856 ppm and the rate constant was 0.8268 hr^{-1}.

Keywords: photocatalysts, degradation, silver halide, PAHs

Synthesis of Calcium Phosphate Composite Organogels by Using Castor oil and Sorbitan Monopalmitate Based for Dentine Occlusions Material

Pornnapha Changpongpan
Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
pornnapha.c@ku.th

Khrongkhwan Akkarachaneeyakorn
Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscikwa@ku.ac.th

Abstract

Hypersensitivity or sensitive teeth is a common symptom in adults caused by enamel loss resulting in pain. One of the effective ways to treat this symptom is to close the open dentin tubules. In this research, the organogels containing calcium phosphate particles were prepared via the emulsion method to use as a home-treatment of dentine hypersensitivity. The water-in-oil emulsion was formed at elevated temperature using calcium and phosphate aqueous solution as water phase, castor oil (CO) as an external phase and sorbitan monopalmitate (SMP) as a surfactant which yielded gel after cooling down to room temperature. The ratio of surfactant, water and oil were varied to study their effect on the size and shape of calcium phosphate particles. The results showed that calcium phosphate particles were all spherical with particle size in the range of 1.592 - 2.175 micron and could filled in the dentin tubules more than 50 percent only after 1 day of application.

Keyword : Hypersensitivity, calcium phosphate, organogels , sorbitan monopalmitate (SMP)

Using synthesis metal organic frameworkas as precursor to Synthesis metal oxide degradation methylene blue

Prakornkit Taphat
Department of Chemistry, Faculty of Science, Kasetsart University
Bangkok, Thailand
Prakornkit.t@ku.th

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

Abstract

Photocatalyst, ZnO, that have difference morphology were prepared by Thermal decomposition of Metal Organic Frameworks (MOFs) . It was used as a catalyst for the degradation of methylene blue, Octahedral ZnO has highest efficiency for dye degradation. To increase effieiency for degrade, Octahedral ZnO was coated with [Zn(2-methylimidazole)](ZIF-8) by using ZnO as a source of Zn(II) and combined with 2- methylimidazole by ultra sonicated give a ZnO@MOF. The morphological structure was characterized and confirmed by X-ray diffraction spectroscopy (XRD) , thermogravimetric analysis (TGA) , Fourier transforms infrared spectroscopy (FT-IR) , UV-Visible spectroscopy (UV-Vis) , fluorescence spectroscopy, Scanning electron microscopy (SEM) and energy dispersive X-ray analysis (EDX) . Test efficence of methylene blue degradation shown that ZnO@MOF has higher performance than ZnO only.

Keywords : Metal Organic Frameworks (MOFs) , [Zn(2-methylimidazole)](ZIF-8) , ZnO@MOF.

Development of Avocado Oil Extraction Process by Cold-pressed and Quality Analysis of Extracted Avocado Oil

Sukhuman Nokkaew
Department of Chemistry, Faculty of Science, Kasetsart University
Bangkok, Thailand
sukhuman.n@ku.th

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

Abstract

This research studied the pressing of avocado oil from three different species: Hall, Buccaneer and Hass species. All of these were pressed by cold-pressed at the temperature lower than 60 ºC. In experiment, the piece of day avocado that the moisture content less than 4-7% were pressed. The result showed that Hass and Buccaneer species the oil that can be liquid at room temperature but Hall species gave the oil that can be solid at room temperature. The obtained liquid and solid were brought to quality analysis. These quality analysis were peroxide value, saponification value, iodine value, acid value, free fatty acid, fatty acid composition. The result showed that peroxide value was 16.10meq.peroxide/1000g oil to 19.45 meq.peroxide/1000g oil, saponification value was 187.03 mg KOH/g oil to 218.02 mg KOH/g oil, iodine value was 74.36 g I_2/100 g oil to 80.31g I_2/100 g oil, acid value was 0.93 mg KOH/g oil to 18.09 mg KOH/g oil, free fatty acid was 0.57% to 7.53%, the fatty acid composition found that unsaturated fatty acid content was 30.90 to 33.43 and saturated fatty acid content was 66.58 to 69.10 .

Keywords: Avocado,Cold-pressed

The study of graphene related nanomaterials for sensing application

Supapitch Uten
Department of Chemistry, Faculty of Science, Kasetsart University
Bangkok, Thailand
supapitch.u@ku.th

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

Abstract

Graphene oxide, chemically exfoliated graphite, has been considered as one of promising carbon materials for biological applications especially for biosensors because of its aqueous processability, biocompatibility and fluorescence quenching ability. However, these important properties being feasible for the performance of biomolecular detection (reliability, sensitivity, and specificity) such as DNAs or proteins depend on the unique chemical structures of graphene oxide, which are composed of carbon sp^2 domain structure and carbon sp^3 with the hydrophilic oxygen functional groups. In this work, we suggest the post treatment of chemically exfoliated graphite with ultrasonication technique that affects the extent of the oxidation of graphene oxide. The extent of C/O ratios on as-prepared graphene oxide samples is studied by the combination techniques of XRD, XPS, TGA, and UV-vis spectroscopy. Also, fluorescence quenching efficiencies of obtained reduced graphene oxide aptasensors are observed.

Keywords: Graphene oxide, ultrasonication, fluorescence aptasensor

Binding mode Investigation of Molecular baskets and Anions

Tanakorn Dabtham
Department of Chemistry, Faculty of Science, Kasetsart University,
Bangkok, Thailand
b5610401119@ku.ac.th

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

Abstract

Our molecular baskets have been rationally designed and well-constructed from a single benzene ring symmetrically decorated with three units of amphiphilic steroids such as cholic acid and lithocholic acid. The triple components are proposed to organize a tunable pseudo-cavity when significant change of the polarity environment becomes applied. This part of work has only pursued the binding mode of our four tripodal cholate/lithocholate-based receptors and anions including fluoride, chloride, bromide and nitrate. UV-vis spectroscopic experiments using Job method demonstrate the 1:1 host/guest complexation in similarity.

Key words: molecular basket, cholic acid, Job method

Study of tin dissolution rate on tin-coated steel by electrochemistry

Tanaporn Jituatrakoon
Department of Chemistry, Faculty of Science, Kasetsart University
Bangkok, Thailand
Tanaporn.jit@ku.th

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

Abstract

Packaged food has been one of the most export products in Thailand, especially canned food. Normally Sn-coated steel is usually used as a container. However, it is not prone to sustain an acidic food at certain level. Here, we use electrochemistry to present the influence of common acid found in food, e.g., acetic acid, lactic acid and citric acid on Sn dissolution. We found that at the same pH, rate of Sn dissolution in acetic acid is significantly faster than others. Moreover, we discovered that nitrate level at concentration more than 200 ppm significantly expedite the Sn dissolution rate because the passive tin oxide layer was prominently destroyed. We compared the result from electrochemistry with standard method and found a similar trend with negligible differences. The result presented here could be valuable for the food industry in Thailand.

Keyword: Sn, electrochemistry, dissolution, acid

Searching for novel bioactive compounds from *Menisporopsis theobromae* BCC 4162 using one strain-many compounds (OSMAC) approach

Thanakorn Deelee
Department of Chemistry, Faculty of Science, Kasetsart University
Bangkok, Thailand
thanakorn.de@ku.th

Pakorn Wattana-Amorn*
Department of Chemistry, Faculty of Science, Kasetsart University
Bangkok, Thailand
fscipwa@ku.ac.th

Abstract

Menisporopsis theobromae BCC 4162 is a non-pathogenic fungus containing possibly 102 natural product biosynthetic gene clusters. Despite a large number of natural product biosynthetic gene clusters, only two bioactive compounds, menisporopsins A and B, are mainly produced by this fungus. In order to trigger the expression of cryptic or silent gene clusters express, one strain-many compounds or OSMAC approach were applied in this work. Several types of media both solid and liquid were used to culture *M. theobromae* BCC 4162. For solid media, Czapek Dox Yeast Agar (CYA), Fructose Malt Extract Salt Agar (FMESA), Malt Extract Agar (MEA), Potato Dextrose Agar (PDA) and Peptone Yeast Glucose Agar (PYGA) were used to activate the secondary metabolite production. For liquid media, a variety of media were used i.e. Czapex Dox (CD), Fructose Malt Extract Salt (FMES), Malt Extract (ME), Potato Dextrose (PD), Yeast Powder Soluble Starch (YPSS), Yeast extract Peptone Dextrose (YPD), Peptone Yeast extract Glucose (PYG) and Tenellin Production Medium (TPM). Unfortunately, the metabolic profiling of the extracts from both solid and liquid media are not significantly different. Menisporopsins are still the major metabolites found in all media. However, two known metabolites, orthosporin and ascotrichalactone A, could be isolated from ME medium and this is the first time that these compounds were isolated from *M. theobromae* BCC 4162. In addition, plant hormones, 3-indolebutyric acid (IBA), 6-benzylaminopurine (BAP) and 1-napthylaceticacid (NAA) were also added into PDA at different concentrations ranging from 50 – 1000 µM. From preliminary results, these plant hormones have the effects on the growth rate and new metabolite production of *M. theobromae* BCC 4162. These new metabolites will be further isolated and elucidated for their chemical structures including testing for their biological activities.

Keywords: *Menisporopsis theobromae* BCC 4162, OSMAC, menisporopsin

Preparation and study of thermal properties of silver coated silica sand for heating application

Thunchanok Prakit
Department of Chemistry, Faculty of Science, Kasetsart University,
Bangkok, Thailand 10900
thunchanok.pr@ku.th

Junya Jettanasen*
Department of Chemistry, Faculty of Science, Kasetsart University,
Bangkok, Thailand 10900
fscijyk@ku.ac.th

Abstract

The limitation of using herbal medicines for external therapy is making them penetrate into the skin. Hence, the drug efficiency is reduced. In medical, a hot compress is applied for improving skin penetration and enhancing blood circulation. However, the heat storage material does not have enough qualification in term of power consumption for mobile application. Hence, we aim to develop the thermal properties of the material**.** In this work, the silver particles were synthesized by reducing the silver nitrate solution and the obtained silver particles were coated onto silica sand surface. Different conditions were varied; (i) the silver nitrate concentration, (ii) the amount of fructose as a reducer, (iii) the amount of diammonium hydrogen citrate as a stabilizer, (iv) the pH value and (v) the reaction temperature. The successful preparation, coating and thermal properties were verified by different analytical methods, such as, UV-Visible Spectroscopy (UV/Vis), X-ray Powder Diffraction (XRD), Scanning Electron Microscopy with Energy Dispersive X-ray Spectroscopy (SEM-EDX), and Differential Scanning Calorimetry (DSC).

Keywords : hot compress , heat storage material , silica sand , silver coating

Nano-encapsulation of *Andrographis paniculata* extract by cellulose derivatives

Titapa Singchuwong
Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
Titapa.si@ku.th

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

Abstract

In this project, crude extract of Andrographis paniculata was encapsulated by using two biocompatible polymers which are hydroxyethylcellulose (HEC) and poly(vinyl alcohol) (PVA) to increase the releasing time and improve the biological activities. The major components in crude extract were determined by using HPLC-MS and found that andrographolide (65%) and 14-deoxyandrographolide (14%) as two major components. The crude extract was encapsulated by using HEC and PVA with the ratio of polymer:crude extract 1:1. The encapsulation efficiency of HEC and PVA were 41% and 39%, respectively. The size of nano-particles were investigated by DLS and found that the size of HEC nanoparticle was 270.0 nm and PVA was 256.7 nm. The control release of the compounds in nano-particles were done in phosphate buffer pH 5.5 indicating that compounds encapsulated in nanoparticles released slower than pure andrographolide. These results can be developed the nanoparticle to retard the release rate of active ingredients in the biological systems.

Keywords: *Andrographis paniculata* , andrographolide , cellulose derivatives , Hydroxyethylcellulose , poly(vinyl alcohol)

Evaluation of Acacia Biochar Affinity towards N-Fertilizer

Umaporn Sittitut
Department of Chemistry, Faculty of Science, Kasetsart University
Bangkok, Thailand
umaporn.si@ku.th

Ramida Rattanakam
Department of Chemistry, Faculty of Science, Kasetsart University
Bangkok, Thailand
fscirdr@ku.ac.th

Abstract

N-fertilizers adsorption and release from biochar derived from acacia wood was studied. The produced biochar was oxidized and characterized by elemental analysis, FT–IR spectroscopy and Scanning electron microscopy. The urea adsorption and releasing ability of the oxidized biochar was compared with those of the raw biochar. The adsorption experiment of 0.1 M and 0.5 M urea indicated the oxidized biochar adsorbed more N-fertilizers than the raw biochar. The releasing experiment of 0.5 M urea adsorbed biochar showed urea was released fast during the first 60 minutes and after that the releasing rate was slower until 3 hours.

Keywords: biochar; desorption; nutrient release; fertilizer;

Synthesis and Characterization of MoS_2-TiO_2 for Photocatalysis and Deoxygenation Processes

Vimvipa Wangvisavawit
Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
vimvipa.w@ku.th

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

Abstract

This research focuses on the synthesis of MoS_2-TiO_2 catalysts with various loadings of MoS_2 (5 wt%, 10 wt% and 20 wt%) via a hydrothermal method. According to the structural characterization, the nanoflower-like structure of MoS_2-TiO_2 composite was mainly observed with the characteristic lattice planes of (101) TiO_2 and (002) MoS_2 in the MoS_2-TiO_2 composites as indicated by SEM and TEM analyses. The XRD results revealed that TiO_2 was characterized in anatase phase with a presence of (101), (004), (200) and (204) planes, respectively. Due to low crystallinity, MoS_2 was confirmed by only (100) planes. XPS analysis revealed the oxidation state of Mo^{4+} at the binding energy of 229.07 eV (Mo $3d_{5/2}$) and 232.37 eV (Mo $3d_{3/2}$) and S^{2-} at 226.32 eV (S 2s). For the photocatalytic study, it was found that 20-MoS_2-TiO_2 provided the greatest activity in methylene blue degradation with the rate constant of 0.0294 min^{-1}. For the deoxygenation process, 20-MoS_2-TiO_2 effectively converted oleic acid into long chain hydrocarbons of C17-C18 with 83% of total liquid weight in product. In addition, the researcher has the idea of applying MoS_2-TiO_2 catalysts as a bi-functional material. Typically, MoS_2-TiO_2 can be used in deoxygenation process. At the same time, MoS_2-TiO_2 can eliminate the organic matter, also known as coke, accumulated on its surface by using photodegradation process. The organic cokes generally result from the accumulation of high molecular weight organic by-products derived from the deoxygenation process.

Keywords: MoS_2-TiO_2, photocatalytic study, deoxygenation process

Effects of Activated Carbon Surface on the Synthesis of MIL101(Cr)-Activated Carbon Hybrid Materials for Methane Adsorption

Wanatcha Thongkum
Department of Chemistry, Faculty of Science, Kasetsart University
Bangkok, Thailand
wanatchadiamond@gmail.com

Ramida Rattanakam*
Department of Chemistry, Faculty of Science, Kasetsart University
Bangkok, Thailand
fscirdr@ku.ac.th

Abstract

In this work, synthesis of MIL-101(Cr) - activated carbon hybrid materials by one-step hydrothermal method was studied. Activated carbon with high porosity was loaded into the aqueous solutions of $Cr(NO_3)_3$ and terephthalic acid. Activated carbon were reacted with 2M, 6M and 10M nitric acid to increase acidic functional groups on activated carbon surfaces. Moreover, functional groups of total acids on the activated carbon surfaces were analyzed by Boehm titration method. The functional groups on the activated carbon surfaces affected generation of hybrid materials. Scanning electron microscopy and EDS mapping showed the agglomeration of MIL-101(Cr(crystals and MIL-101(Cr(crystals covering on activated carbon particles. Morphology and crystallinity of MIL-101(Cr(depended on total acidic functional groups on activated carbon surfaces. Furthermore, the methane adsorption ability of the hybrid materials also depended on the functional groups of total acids on activated carbon surfaces.

Keywords: metal-organic framework, adsorption, MIL-101(Cr), activated carbon, hybrid material

Study of the colorimetric behavior of a novel spiropyran derivative for the detection of cyanide ion in Cassava leaf

Woranistha Kongmon
Department of Chemistry, Faculty of Science, Kasetsart University, Bangkok, Thailand
woranistha.k@ku.th

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

Abstract

Spiropyran, a photochromic molecule, has been developed as a colorimetric sensor for quantitative analysis of cyanide ions in cassava leaf. Herein, we aim to synthesize a spiropyran derivative, defined as SP, and study its selectivity and sensitivity toward cyanide ions. The result shows that SP can selectively bond with cyanide ions in mixed solution of tetrahydrofuran and 1 mM HEPES in water 9:1 v/v. The UV-Visible spectrum of SP and cyanide solution exhibits a new absorption peak at 413 nm and the color of solution significantly changes from pink to yellow. Meanwhile, the other anions mixed with SP do not exhibit the absorption peak at the similar wavelength. SP and cyanide ion can form a 1:1 stoichiometry as confirmed by Job's method. The detection limit of SP in this work is 0.52 µM which is far below the permission level of the World Health Organization (WHO) in drinking water (1.9 µM). Importantly, we have been developed a spiropyran sensor to investigate the quantity of cyanide ions in cassava leaf. The cyanides ions were extracted from cyanide species in cassava leaf by acid-base extraction. The cyanide content in cassava leaf determined by SP sensor is 202.5 ppm which is consistent with the result obtained by the Chloramine-T/Pyridine-barbituric acid standard method. Moreover, viable paper-based colorimetric test strips of SP were also fabricated to detect cyanide ions.

Keyword: spiropyran, colorimetric sensor, cyanide, cassava leaf

Chess of Future

Deeprom Sangroongruangsri Kittisak Praphuet and Somchoke Ruengittinun
Computer Science Department, Faculty Science
Kasetsart University

Abstract

Propose of this research project is develop Thai Chess game in the name of “Chess of Future”. Thai game can help Alzheimer’s patients to think and move that patients can relieve their symptom.

This Chess of Future was applied Microsoft Kinect II as input deviser. Kinect II’s camera take snapshot of hand movement to determine hand position with 64 cells of virtual chess board. Player in light brown chess can play with machine in dark brown chess. Simple 2 link lists were assigned to human player and machine player. Each move of chess must verified with specific rules of chess type. Game can continue until player can fight all machine chess and vice versa.

Development tools of thing are Adobe Photoshop CS6 and Visual Studio 2017 use C# language.

Application of A Smart Mulberry Farm using IoT

Natdabhorn Piromnin, Kampanat Ruangbamroong
and Preecha Ngamsaowaros
Department of Computer Science Faculty of Science
Kasetsart University

Abstract

The purpose of this research is to apply cheap IoT device to control Mulberry planting Application of A Smart Mulberry Farm using IoT or “ASMF” is IoT mobile and is a mobile application integration into an embedded system in ASMF use 2 Arduino board, master board, and communication board, Zigbee and GSM. This system design to fit 2 area plots, 2 pumps, 2 humidity sensors a connect and capture vital information planting, temperature, water supply, and fertilizer. This experiment has 2 plots in this research, The first plot is the server network to receive data from the second plot and send data from the first plot, the second plot to MQTT Cloud services. The second plot is a client to send data to the first plot. Regular data capture is every hour and sends to MQTT Cloud services. The farmer can set to lower or higher frequencies. Data were verified with a threshold and a lower or higher threshold. If ASMF indicates that it is too hot or barren humidity which effects on the production of mulberry, the Arduino board will request pumps to start pumping water and/or fertilizer. Seven mulberries were cultivated for 5 weeks. Circumference and height of mulberry were measured 3 times and compare with the normal growth of mulberry. Finally, this experiment mulberry growth is in normal growth.

Keywords IoT, Smart Farm, MQTT

Chinese characters written sequence detection

Tanya Panichtrakul, Chamamas Khamput and Somchoke Ruengittinun
Computer Science Department, Kasetsart University

Abstract

The purpose of this research is to build a tool for students who start to learn Chinese character writing. The hard part of Chinese language study is writing Chinese characters. Chinese character compose of line(s), so students have to learn how to write part of character step by step. Sequence of each part or line is very important so learners must complete many exercises and many times. The line according to the sequence of each characters. This research project call “Chinese Character Sequence Detection” or CCSD was an application which applied Microsoft Kinect II as an input device which capture human motion and generate stream of input frames. With handPosition, handPoint, and related functions, inputs were filter to only hand positions. Positions of hand were change to lines, detect and checked with Chinese Character Lines Pattern (CCLP) line by line. Each Chinese character compose of sequence of CCPL(s), each CCPL is an order pair of start and destination point, (startPoint(A(j)), destinationPoint(A(k)), j is start point, and k is destination point of A(i). CCPL were predefine in 2 dimension of 9x9 arrays. This research project provide 30 CCPLs in A(i). CCSD program was developed using Microsoft VisualStudio C# to capture hand motion from Kinect II against CCPL A(i). Results from CCPLs detection were orders of CCPL in Chinese character. When student start this program he or she must select Chinese character then try to write that Chinese character. CCSD will capture each hand movement and transfer to CCPL in A(i) array. The veirifyFunction() was applied to check sequence of CCPL, if output is false then program popup a warning message mention that missing sequence so students can practice Chinese character writing and repeat again and again. 30 test cases were applied to ensure correctness of CCSD. All cases past but only problems in case of fast hand movement. Limitation of CCSD is student should use in open area 1 to 3 meters from Kinect II.

Keyword : Chinese characters, Kinect, human computer interaction

Application for Finding a New Home for Pets

Titiya Jeearanaijaroen, Vasupon Komenkul and Kanlayanee Banjongjit
Computer Science Department, Faculty Science Kasetsart University

Abstract

This application, Application for finding a New Home for Pets runs on the Android operating system, and was developed for owner of pets. The application focuses on giving or adopting pets among owners. There are several functions in this application such as information about pets, chat between users via the posts, information for users, record about pets such as age, gender, breed and highlights of pets. The applications will help homeless pet problems**,** motivate users to turn to help and find homes for pets without being discarded**,** because it easy to use not complicated and it can be accessed anywhere**.**

The application was developed by using Java, Android Studio, and Fire Base.

Keyword: Pet, Android, Application, Homeless

The Precipitation Rate Correlation among of Meteorological Factors in Thailand

Aut Attaset, Pongsakorn Jiwapornkurp and Panu Trivej

Abstract

In the tropical weather of Thailand, mean mixing ratio (MMix), convective available potential energy (CAPE), and convective inhibition (CIN) are correlated to the precipitation rate of rainfall in this region. The study is based on measurements from weather radar stations providing upper air data and rainfall data during the period of 2016-2018 from Department of royal rainmaking and agricultural aviation and Thai meteorological department. The result shows mean mixing ratio has a better correlation coefficient to precipitation rate than convective available potential energy and convective inhibition but due to the weak correlation coefficient among the three parameters, we need to study the three parameters and their correlation to the weather of Thailand in the further works.

Keywords : Precipitation Rate, Convective Available Potential Energy, Convective Inhibition, Mixing Ratio

Microstructure of Pyrite related to Gold Deposit, Huai Yuak area, Sukhothai Province, Northern Thailand

Chadayu Kerdsuwan, Ladda Tangwattananukul

Abstract

Huai Yuak gold deposit is located in Ban-Kaeng villege, Si Satchanalai district, Sukhothai province. Geology of Huai Yuak consists of 2 units such as unit 1 shale intercalated with sandstone and Unit 2 metashale intercalated with metasandstone. Quartz veins are hosted in unit 1 and unit 2. The pyrite can be found in unit 1, unit 2 and quartz veins. Base on the shape, size and texture, the pyrite can divide into four types. Type I pyrite (P1) occurs in unit 1 and unit 2 which is characterized by single crystal, subhedral to euhedral shape with a size in ranging from 0.1 to 3.0 mm. Type II pyrite (P2) occurs in shale and metashale which is characterized by subhedral shape with a size in ranging from 0.1 to 3.0 mm. Type III pyrite (P3) occurs mainly in quartz veins which is characterized by anhedral to euhedral shape with the size <0.1 mm. in diameter. Type IV pyrite (P4) occurs in unit 1 which is characterized by spherical aggregates of the size <50 µm. showing framboidal texture. The mineral assemblage of P3 consists of arsenopyrite, galena, sphalerite and chalcopyrite. Gold in quartz vein is related to Type III pyrite (P3).

Keyword: Huai Yuak gold deposit, framboidal texture, pyrite

Characteristics of red spinel from Myanmar

Chalida Intawong, Dr.Natthapong Monarumit, Asst.Prof.Dr. Somruedee Satitkune

Abstract

Spinel is a group of popular gemstone with a variety of colors, clarity and durability. On the Mohs scale, spinel has hardness 8. Nowadays, spinel is one of the important gemstones in gem market, especially red spinel. Refractive Index and Specific Gravity of spinel from Myanmar are consistent with the range of gem spinel about 1.718±0.050 and 3.580±0.080, respectively. Commonly, internal features observed by gemological microscope are transparent mineral inclusions, negative crystals and minute particles with various size. UV-Vis-NIR spectra of red and pink spinel samples indicated that the absorption peaks about 390 and 537 nm are due to Cr^{3+}. FTIR spectra of red and pink spinel samples were two absorption peaks that are found in the range 3300-2500 cm^{-1}, which are caused by stretching of O-H molecular bonds. Therefore, these characteristics are specific information for identifying red and pink spinel samples from Myanmar.

Keywords: Internal features, Spectroscopy, Spinel

Characterictics of amber from Myanmar

Chanitsiri Hun-amphan, Natthapong Monarumit, Somruedee Satitkune

Abstract

Nowadays, gems are popular items and amber is one of them because it is an organic gems and can be found an animal and plant inclusions which different from other gemstones. Therefore, the study of amber characteristics is important and the amber samples from Myanmar are interesting samples for creating a database using by Fourier Transform Infrared Spectroscopy for analysis. The absorption bands of FTIR spectra indicated to methyl group, methylene group and exocyclic methylene group which are functional group of internal structure of ambers. And when observed by gemological microscope can be found bubbles and various size particle of organic inclusions. Moreover, the amber samples were divided into 4 groups to a thermal treatment in coconut oil, palm oil, soybean oil and lard respectively in a hot air oven at 150°C for 15 minutes. After heating, the samples in 4 oils are more transparent but the color of samples in palm oil is darkest and followed by the sample in soybean oil, coconut oil and lard respectively.

Keywords : FTIR Spectroscopy, Inclusions, Heat treatment

Deep Shear Wave Velocity of Satun Province, Southern Thailand.

Chanutpat Chankong and Passakorn Pananont

Abstract

The microtremor observation of ambient vibrations can be used to identify predominant period of the ground. The technique of single point microtremor observation with Horizontal-to-Vertical spectral ratio (H/V) method and array processing technique known as Spatial Auto Correlation (SPAC) method determine both ground response and shear wave velocity. In the study, microtremor observation and SPAC method are analyzed at six sites in the Satun Province for the estimation of ground response, thickness of the basin and deep shear wave velocity. The result from microtremor observation show the average predominant period of the ground approximately between 0.2-0.3 sec and deep shear wave velocity of Satun Province are less likely to be in the vicinity of the sedimentary rocks. The result of this work can be used for seismic hazard effect evaluation of Satun province in the future.

Keywords: Microtremor observation, H/V spectrum, SPAC method

2D Resistivity imaging for Subsurface Geological Study in Mae Sai district, Chiang Rai province

Chotika Yodchompoo and Passakorn Pananont

Abstract

Electric resistivity imaging surveys are used to determine geological conditions beneath the ground. The survey is based on the electrical characteristics of the soil - rocks under the ground that allowing electricity to pass through in different media. This survey can be done quickly and reliably with the interpretation of results. The 2011 Myanmar earthquake cause significant liquefaction at the Wiang Hom Stadium, Mae Sai district, Chiang Rai province where resistivity imaging were conducted. The results of the surveys showed high resistance values under the ground at the position that liquefaction occurred. The high resistance could suggest the position of liquefied sand. The result from this study can be used to evaluate the liquefaction hazard in the study area.

Keywords: Resistivity Imaging, Liquefaction, Masai, Chiang Rai, Earthquake.

Deep shear wave velocity of Krabi Province, Southern Thailand

Hataipat Kaewpakham and Passakorn Pananont

Abstract

Ground motion is very essential for assessing and mitigating the earthquake disaster. The major factor that controls the intensity and characteristics of ground motion is site effects, which characterize the ground response of sedimentary deposit beneath the site. The microtremor observation is to record ambient vibration at the ground surface and analyze for the site characteristics such as the predominant period and the deep shear wave velocity profile at a given site by SPAC method. The technique of point microtremor observation with Horizontal-to-Vertical spectral ratio (H/V) method is applied to estimate the predominant period. While the technique of array microtremor with phase velocity is applied to determine deep shear wave velocity profile of sedimentary deposit. In the study, microtremor observation and SPAC method are analyzed at fourteen sites in the Krabi Province for the estimation of ground response, basin thickness and deep shear wave velocity. The results of H/V microtremor observation in Krabi Province show that the predominant periods are in the range of 0.18 to 0.36 second.

Keywords: soil amplification, microtermor observation, SPAC method, site effects

Characteristics of Bang Saphan Gold deposit in Bang Saphan District, Prachuap Khiri Khan Province, Thailand

Hathairat Chumchuen, Ladda Tangwattananukul

Abstract

Bang Saphan gold deposit is located in Bang Saphan District, Prachuap Khiri Khan Province which is in a part of Kanchana Buri - Prachuap Khiri Khan - Phangnga gold belt. Geology of Bang Saphan gold deposit consists of sandstone, siltstone and pebbly sandstone of Devonian to Silurian age. Veins are hosted in sandstone and siltstone. The characteristics of veins are veins, veinlets and networks structures. Base on cross-cutting relationships and mineral assemblages, it can be divided into 3 stages; Stage I, vein containing of microcrystalline quartz. Stage II vein and veinlet consisting of microcrystalline quartz and sulfide minerals and Stage III network vein consisting of quartz and sulfide minerals. The mineral assemblages of stage II and III consist of abundant of quartz with minor of sulfide mineral such as pyrite and chalcopyrite that the stage II and III may be containing gold.

Keyword: gold-bearing quartz vein, mineral assemblages, Bang Saphan gold deposit

A Study of Effect of Dissolution of Pyrite at Mae Moh Mining, Lampang Province

Kannika Somchueweng, Sarinya Paisarnsombat

Abstract

Previous studies revealed that pyrite contributed to Acid Mine Drainage or AMD in mine. Thus, an objective of this work is to study effect of dissolution of pyrite in samples collected from Mae Moh mining, Lampang province. 23 samples were collected from sediment layers and coal zones including red bed, I-zone, J-zone, over burden, K-zone, inter burden, Q-zone, and under burden (from top to bottom). Microstructures and elemental compositions of 10 representative samples were studied by Scanning Electron Microscope-Energy Dispersive X-ray Spectrometer (SEM-EDS). Mineral compositions were analyzed by x-ray diffractometer (XRD). The results indicated that a total of 7 samples out of 10 samples contain pyrite. Dissolutions of the seven samples were performed in acid (pH 3.21), neutral (pH 6.53) and basic (pH 11.33) solutions for 13 days. Solution and powdered samples were separated by vacuum filtration. After the dissolution, pH of the solutions from every basic dissolution experiments are decreased. The solutions from acid and neutral experiment are decreased, except the acid dissolution of parting between J3 and J4 seam, parting between K1 and K2 seam, K2 seam and Q3 seam, and the neutral dissolution of parting between J3 and J4 seam and parting between K1 and K2 seam. The higher pH is a result of dissolution of calcite, aragonite and muscovite. Surface weathering of the powdered samples were observed under the SEM suggesting occurrences of chemical reactions at the surface. The results show that dissolution of pyrite can occur in any condition with source of solvent from underground water, precipitation and sump in the pit and is the cause of the AMD. However, presences of calcite, aragonite, and gypsum in Mae Moh Group help buffer the reaction and lower acidity of the AMD.

Keywords: Acid Mine Drainage, Mae Moh Group, Weathering

Petrography and petrochemistry of Ky-Sil gneiss at Tenmondai Rocks, East Antarctica

Kantapong Charusiri, Prayath Nantasin

Abstract

This research scopes to petrology and petrochemistry of kyanite – sillimanite gneiss at Tenmondai Rocks, Antarctica in order to understand the evolution of metamorphic rocks in Lützow-Holm complex. The methodology of this study covers two main laboratory works that are, firstly, using the polarizing microscope to identify the mineral assemblage and observe textures of samples. Secondly, to analyze whole-rock chemical composition of representative samples using wavelength detector X – ray Fluorescence Spectrometer (WD-XRF). Based on petrographic observation, the samples can be categorized to be Bt-Grt gneiss and Grt-Bt gneiss which consists of kyanite coexist with sillimanite in an equilibrium texture. Bt-Grt gneiss is characterized by an assemblage Kfs-Pl-Qtz-Bt-Grt-Crd. While Grt-Bt gneiss is composed of Kfs-Pl-Qtz-Sil-Ky-Grt. Specimens of these groups are medium-grained and show gneissose structure. Under microscope these samples show grano-lepidoblastic texture. The latter type also shows and obvious texture of break-down reaction of staurolite to be sillimanite. Thermodynamic modelling of the KFMASH system using the Perplex program will be employed to construct the pseudosections of each sample. Combination of textures and pseudosections is expected to illustrate some metamorphic evolution paths.

Keywords : Ancient continent, Pseudosection, Granulite – amphibolite facies, Lützow-Holm complex

Multichannel analysis of surface wave survey for Subsurface Geological Study in Mae Sai district, Chiang Rai Province

Kasian Prasertwongphilai and Passakorn Pananont

Abstract

Five line of the Multichannel analysis of surface wave survey (MASW) which can portray the shallow shear wave velocity structure off the ground are conducted at the Wiang Hom Stadium, Mae Sai district, Chiang Rai Province that experienced extensive liquefaction on March 24, 2011 in order to examine the shallow subsurface of the affected area. The result of the survey shows the discontinuity and shear wave anomaly which was located at the position of the liquefaction in the past. The information from the study can be used to study the nature of the liquefaction in the future.

Keyword: Multichannel analysis of surface wave, MASW, Chiang Rai

Rare Earth Elements in Granite, Prachuap Khiri Khan Province, Thailand

Nittaya Jarunai and Ladda Tangwattananukul

Abstract

Granite in Bang Saphan is a part of the Western Belt Granites. These granite intruded into Carboniferous to Permian rocks, shale, siltstone and sandstone, whereas is in north-south trending. The twenty two samples were collected from Bang Saphan and Bang Saphan Noi areas for thin sections and observe mineral assemblages. Twelve samples were collected to classify by a modal minerals composition. Based on mineral assemblages, it can be classified into three groups such as granite (Group I), granodiorite (Group II) and quartz syenite (Group III). Group I consists of quartz (23.80-49.10 modal %), alkali feldspar (18.55-44.00 modal %), plagioclase (24.50-32.50 modal %) and mafic minerals (1.65-6.80 modal %). Group II consists of quartz (51.05 modal %), plagioclase (31.15 modal %), alkali feldspar (11.90 modal %) and mafic minerals (5.90 modal %). Group III consists of alkali feldspar (64.95 modal %), quartz (14.40 modal %), plagioclase (12.55 modal %) and mafic minerals (8.10 modal %). Small amount of biotite, muscovite, apatite, zircon and opaque minerals contain in Groups I to III, while tourmaline occurs in Group I and III. The results of chemical compositions in rock shows a concentration of minerals related to REEs including zircon and sphene (titanite). Group I is composed of zircon (300-600 ppm). Group II is composed of zircon (300 ppm). Group III is composed of zircon (100 ppm). Sphene contains in some samples in Group I and reaches up to 9700 ppm.

Key words: granite, Rare Earth Element, Western Belt Granite

Efficiency optimization in fabric dyeing with natural dyes

Nuthanicha Yodket, Sarinya Paisarnsombat

Abstract

Natural dyeing of cotton fabric has always been a challenge due to its low fastness. Several chemicals have been used in the dyeing process to improve fastness of the dyeing. However, it causes serious ecological problem. Thus, this research aims to use natural material in place of chemicals operating under a mild condition. Tannin was selected as an additive in the study due to previous study on natural dyeing using tannic acid. The objectives of this research were to study fabric dyeing using natural materials including organic materials, fresh red water lily and inorganic materials, malachite and iron oxide ore, at different pH and the effects of tannin on an efficiency of the dyeing. For organic material, natural acids including pineapple, lime and tamarind, were used to enhance the color of the dye. The results show that lime gives the best color. The study of effect of tannin on dyeing process were perform in 3 conditions; 1) fabric was first treated by tannin, then dyed in the prepared dye, 2) dyes were first mixed with tannin, then the fabrics were submerged into the mixed dye, and3) fabric were first dyed in the natural dye, then treated with tannin. The study shows that dyeing by treating the fabric with tannin prior to the natural dyes gives the best color and fastness.

Keywords: Iron oxide, Red water lily, Tannic Acid

The refraction and lustre of cultured pearls.

Nutthanicha ponyiem, Natthapong Monarumit, Pongsakorn Jantaratana
Somruedee Satitkune.

Abstract

Nowadays, pearls are the most popular organic gems. High quality pearls are expensive. Layer thickness, color, surface integrity, shape, size, lustre, and orient are all factors that determine the quality and price of pearls. It is thus important to study the refraction and the lustre of the pearls, in order to grade pearl quality from different levels of lustre.A study of refraction and lustre of pearls by Atomic force microscope can describe the surface structure characteristic of Pearls that consists of $CaCO_3$. In pearls with high lustre, $CaCO_3$ are arranged as hexagonal crystals. Pearls with more organized structures will have a higher reflective value. Reflective percentage can be used to classify pearl quality using Reflective and light intensity meter with high quality pearls having high lustre. This result indicates that reflectance is a useful quantitative indicator of pearl lustre. Additionally, using Fourier transform infrared spectroscopy to study the absorption band of the functional group between the pearl layer and pearl surface from transmittance absorption, discovering both Aragonite and Vaterite.

Keyword : Reflective and light intensity meter, Pearl quality, Atomic force microscope.

Sustainable Water Management of Subchampa Swamp Forest with Groundwater System using Determination of 2D Resistivity Imaging, Bansabchampa, Tha Luang District, Lobburi Province

Peson Suksamai and Desell Suanburi

Abstract

Subchampa Swamp Forest located at Tha Luang district, Lobburi province, is a tourism attraction isolated forest due to specific physical is swamp freshwater. Which are the new species of the world and have a specific biological species. Especially Champee Sirindhorn (Magnolia sirindhorniae Noot & Chalermglin). There is water supply input is a shortage. As the results of a lot of pumping groundwater around forest area use then drought crisis currently found in the forest zone. In order to study the nature of groundwater system subsurface geological feature aspect to 2D Resistivity Imaging (ERI) is conducted coving forest area. With data collecting stage 5 survey lines were designed to North-South and East-West. With the survey lines used 60 multi-electrodes (Roll a long technique). With line length of 150 meters to 300 meters. The 2D ERI were operated with Schlumberger and Dipole-Dipole configuration. The results of 2D ERI show groundwater layer with low resistivity (20-30 Ω•m), clay layer with very low resistivity (10 Ω•m) and the rest is limestone with high resistivity (>100 Ω•m). Subchampa groundwater system is found that main water flow inlet system at South East through about Southern part and outlet flow at North-West with wide of 200 meters depth. Challenge groundwater management of Subchampa Swamp Forest can be support as Sustainable use by pass from the other groundwater resources nearby and apply technology to increase water level by constructing underground dam at outlet zone. The resistivity measurement can support subsurface feature with help for sustainable water management of the forest.

Keywords : 2D Resistivity Imaging, Groundwater, Swamp Forest

Study of opal structure before and after thermal enhancement

Piangchamas Srichai and Somruedee Satitkune

Abstract

The white opal samples without phenomena from Ethiopia that effect to the low value. Heating opal samples at various temperatures for 1 hour can increase play of color effect. To observe microstructure, the samples have been investigated using Scanning Electron Microscope. Besides, Fourier transform infrared spectrometer and Raman spectroscope were used for studying the functional groups of the samples. As the results, the microstructure of heated opals has been changed. Moreover, the radii of the silica spheres are reduced in consequence of complete loss of water molecules, silanol groups (Si-OH) after thermal enhancement at 700°C. At the increasing temperature up to 700 °C, the heated opals begin to reconstruct new Si-O-Si linkages. After heating at 700° C, the samples change from milk color to white and show the play-of-color effect. Hence, the thermal enhancement can improve clarity and phenomena of opal.

Keywords: Play-of-color phenomena, Precious opal, Thermal enhancement

Remote Sensing application for mineral deposit: case study in Bang Saphan District Prachuap Khiri Khan Province

Pitipong Kulsukhrangsan and Krit Won-in

Abstract

Remote sensing (R.S.) is a process of information for detecting the geological target areas such as a mineralize phenomenon and is a good desk study before the reconnaissance exploration. This research aimed to apply the Landsat enhanced thematic mapper Plus (Landsat ETM+) for the R.S. applications to classify some geological evidences for the preliminary mineral exploration. The Landsat ETM+ data was acquired on February 17, 2005. The study area is located in Bang Saphan district, Prachuap Khiri Khan Province. There were two R.S. techniques to apply in this investigation such as the Hill shade and the Band Ratios. This research used the gamma ray spectrometer to collect the U, Th and K_2O from the rock powder samples in the surveying areas. As the result, the regional investigation of these lineaments showed that the main trends of lineament in this area are NE-SW, ENE-WSW and E-W that trend was related to Ranong fault. The rock units in this study was divided into 7 units by using the different physical properties in the false-color composite on Landsat ETM+ image. The Band Ratio techniques were using band 3/1, 3/5, 4/7, 5/1, 5/4, 5/7, 3/4*5/4, 3/1*((3+5)/4) and (2+5)/(3+4) to indicate the iron oxide and hydroxyl-bearing minerals zones. The spectrometric data revealed that the potential zone have values of uranium content 3.24 ppm, thorium content 28.39 ppm and potassium concentration 8.72%.

Keywords: Band Ratios, Gamma-Ray Spectrometer, Landsat ETM+, Remote Sensing, Prachuap Khiri Khan

Lithostratigraphy and Geologic Structure of Nong Pong Formation, Rural Road 2007, Nong Bua, Phatthana Nikhom, Lop Buri

Rattapong Sinteam and Wasinee Aswasereelert

Abstract

Lithostratigraphy can lead to interpretation of geological events and related features. In this study, we investigate lithostratigraphy and geologic structures at a quarry to explain geologic history of our study area. The quarry is located on the western side of the rural road number 2007 and on the northern side of Phu Tawan Resort, Nong Bua, Phatthana Nikhom, Lop Buri. It is located in the vicinity of the Khao Khwang fold and thrust belt, central Thailand, which was caused by the collision of the Sibumasu and the Indochina terranes in Triassic-Jurassic. The outcrop at the quarry consists mostly of volcanic clastic sediments, including andesitic tuffaceous sandstone, rhyolitic tuffaceous siltstone and shale, belonging to the Nong Pong Formation, Saraburi Group. The pyroclastic rocks are interpreted to be erupted from a composite volcano or stratovolcano. Geologic structures in the study area include an anticlinal fold and faults. Fold limbs orient east-west with dip angles ranging from 10 to 80 degrees. Fault planes dip to the south. Based on the orientation of those geologic structures, it can be interpreted that they were related to the Khao Khwang fold and thrust belt.

Keywords: Saraburi Group, pyroclastic rock, Khao Khwang fold and thrust belt

Field Mapping and Petrographic Study of Inter-Thrust Ultrabasics and Clastic Sediments of Nan Accretionary Wedge at Ban Huai Lao, Na Noi District, Nan Province

Miss Sannapon Sa-nguankaew, Prayath Nantasin and John Booth

Abstract

The Nan suture is proposed to be formed by the amalgamation between Shan-Thai and Indochina microcontinents during Late Triassic. In such event, the oceanic crust was subducted beneath the continental crust, creating the Nan accretionary wedge, but some authors have proposed that the Nan suture could be back arc basin. This propose raise a controversy among geologists. Therefore, this research is aimed to clarify such issue by conducting a detailed mapping and petrographic study. Based on field observation, the Nan accretionary wedge comprises of all rock types, igneous rock, sedimentary rock and also metamorphic rock. Igneous rocks comprise of peridotite, pyroxenite, hornblendite, gabbro, basalt and volcano-clastic rock. Sedimentary rocks comprise of sandstone, siltstone, shale and carbonate rock. Metamorphic rocks include sheared serpentinite, quartz-amphibole schist, garnet-amphibolite and garnet-glaucophane schist. The minerals assemblage of garnet-glaucophane schist is glaucophane-garnet-muscovite-stipnomelane which indicates an ultra-high pressure metamorphic condition of blueschist facies. On the other hand, garnet-amphibolite composed hornblende with blue-violet tinge pleochroic at the rim. This texture could be resulted from metamorphism under high pressure condition. This sample is characterized by an assemblage hornblende-garnet-stipnomelane-muscovite-quartz-plagioclase which indicate medium to high pressure condition of amphibolite facies. In addition, thrust faults that align in ENE direction are commonly found in the study area. The orientation of these thrust faults might suggest the west-dipping subduction. Based on the aforementioned evidences, we prefer to conclude that the Nan suture is not a back-arc basin but instead the main setting of subduction zone between Shan-Thai and Indochina terranes.

Keywords: Nan suture, Subduction zone, Serpentinite mélange

Determination of Subsurface Geological Factors Affect Landslide Recurrence by 2D Resistivity Imaging at Huai Khap Village, Bo Kluea District, Nan Province.

Santichai Yoyyat and Desell Suanburi

Abstract

Landslide hazard is one of the geohazards which affects both life and property. Landslide hazard occurred at Huai Khap Village in Bo Kluea Nuea Subdistrict, Bo Kluea District, Nan Province on July 28th, 2018 was killing 8 people and destroying 4 houses. The aim of the study is focused on the management and evaluation of land-use areas from the risk of landslides recurrence. The cause of ground movement due to geological factors (e.g. groundwater movement, geology, and geological structure) with water from heavy rainfall. The 2D Electrical Resistivity Imaging (ERI) technique was used to investigate subsurface geological factors that may cause landslide recurrence. ERI technique was carried out in 3 survey line with 450 and 300 meters long and 5 meters electrode spacing located in N-S and W-E directions. Two technique approaches were conducted in variety purposed i.e. 2D inversion model by 2D resistivity technique with Schlumberger and Dipole-Dipole configuration for shallow detailed section. 1D inversion model by scanning technique with Schlumberger configuration for deeper detailed (e.g. rock and soil thickness and fracture zone). The result from 2D and 1D inversion model revealed that weathered rock with very moist contains (>600 Ω.m) on the landslide toe with the depth of 10 meters, about 30 meters wide, and 80 meters long. This zone is a risk to fall down through the slope again when motivated by heavy rainfall. Moreover, there is a large low resistivity (<100 Ω.m) with approximately 20 meters deep from the surface that supports the recurrence of the landslide.

Keywords: 2D Electrical Resistivity Imaging, Landslide Hazard, Huai Khap Village

Contamination of heavy metals in sediment at coastal erosion protected area by bamboo wall, Klong Muen Han, Samutsongkhram province.

Sirawit Suprakarn and Unnop Homchan.

Abstract

This research aimed to evaluate the contamination of 4 heavy metals (Cr, As, Cd and Pb) in sediment at protected and non protected area by bamboo wall, Klong Muen Han, Samut Songkhram Province in wet season (September, 2018) and dry season (February, 2019) by geo-accumulation index (Igeo), contamination factor (CF), and pollution load index (PLI). The 4 x 2 x 2 factorial in completely randomized experiment with 3 replications was designed. The 12 sediment samples were collected from protected and non protected area by bamboo wall. The sediment samples were air-dried then digested with acid according to the method of USEPA 3050B. Sample solutions were analyzed for 4 heavy metals by Inductive Coupled Plasma Optical Emission Spectrometer (ICP-OES). The results of the heavy metal concentration; chromium, arsenic, cadmium and lead showed as follow: In wet season, 58.05 mg/kg (range 43.50 - 67.17 mg/kg), 3.80 mg/kg (range 1.72-4.89 mg/kg), 0.56 (range 0.20-1.04 mg/kg), 15.36 (range 13.59 - 21.01 mg/kg), respectively. In dry season, 52.27 mg/kg (range 40.79- 68.57 mg/kg), 4.23 (range 2.06- 7.40 mg/kg), 0.22 mg/kg (range 0.18 - 0.28 mg/kg), and 11.70 mg/kg (range 5.76- 17.90 mg/kg), respectively. It showed that the concentrations of heavy metals in wet season were higher than in dry season (but not significantly different at 95% confidence level, except cadmium because in wet season there is leaching of cadmium from the source of the watershed into the Mae Klong River). Comparing with the standard of coastal sediment quality of Thailand, chromium in both 2 seasons were higher than standard values. The evaluation by geo-accumulation index (Igeo) showed that cadmium was the highest value (moderately polluted levels), followed by chromium (unpolluted to moderately polluted), arsenic and lead (unpolluted). Contamination factor (CF) showed that cadmium in the highest value (considerable contamination), followed by chromium and lead (moderate contamination). And evaluation by pollution load index (PLI) showed that sediment samples in the study area were polluted by heavy metals.

Keywords: Contamination, Heavy metals, Coastal sediment

Characteristic of sapphire samples from Sri Lanka and Laos

Sudarat Naseesen, Natthapong Monarumit and Somruedee Satitkune

ABSTRACT

Study of the characteristics of sapphires from Sri Lanka and Laos with different geological characteristics from natural sapphire samples (in the range 0.1450 to 0.7625 ct.). The Sapphire samples from Laos with medium to strong saturation and medium blue to dark blue tone. From Sri Lanka with very light saturate and light violet to milky very light blue tone. The samples from both localities show colour zoning, minute particles in zoning, negative crystal, fingerprint, healed fissure, and crystal inclusions. The sapphire samples of Laos had more iron, gallium, and titanium content than sapphires from Sri Lanka. Which are the chemical composition analysis by EDXRF. The FTIR spectra show the absorption peaks of –OH, -CH and $–CO_2$ of both source and the UV-Vis-NIR spectra of Laos present higher $Fe^{3+}$and Fe^{2+}/Fe^{3+} absorption peaks than sapphires from Sri Lanka. Heat treatment technique, in reducing atmosphere at 800 ˚C, 1200˚C, and 1600˚C were designed to enhance the colour and clarity of sapphire samples from Sri Lanka. Which the temperature of 1600˚C gives the blue colour that is darker than other temperatures.

Keywords : Sapphire, Internal features, Heat Treatment

Petrography and Whole-Rock Chemistry of Mafic Metamorphic Bodies at Runvågshetta, East Antarctica

Supitsara Juntima and Payath Nantasin

Abstracts

Runvågshetta locates on the western part of Lutzow-Holm complex. The area is the crucial element for tracking the tectonic and metamorphic evolution of East Gondwana called Pan-African orogeny. During such event the area has been juxtaposed with other continental fragment especially Sri lanka and East Africa. The high grade metamorphic rocks exposed in this area have been metamorphosed under ultra-high temperature (UHT) condition of granulite facies. Charnokitic gneiss is predominantly rock that expose in this locality. Mafic bodies and veins are commonly enclosed in these gneissic rocks. Some veins are parallel to the foliation of the host rock but some layers cut through those structures. Most previous works emphasize on gneissic rocks. However, this study keep focus on petrography and mineral chemistry of mafic metamorphic bodies which is metamorphosed from igneous protolith. Polarizing microscope was using to identify mineral constituents and observe textures of the sample. Moreover, whole-rock chemical composition of the representative rock samples will be analyzed by X-ray Fluorescence (XRF). The representative samples were collected from 2 sites. The first site located at 69^{o} 54.242' S latitude and 39^{o} 2.131' E longitude (sample no. PN17012003). Petrographic study shows the sample is characterized by an assemblage Bt-Plg-Hbl-Cpx. The second site located at 69^{o} 54.458' S latitude and 39^{o} 2.317' E longitude (sample no. PN17012205, PN17012206) The mineral assemblage of this sample is composed of Bt-Plg-Hbl-Cpx which are common minerals found in Mafic granulite.Whole-rock chemistry is still during on working process and the results will be used for thermodynamic modelling in order to constrain the evolution of Mafic bodies.

Keyword: Mafic granulite, Paleocontinent, X-ray fluorescence

Assess Ground Collapse Risk Around Khao Singto Community Area using Electromagnetic Technique at Khao Singto, Bo Phloi District, Kanchanaburi Province

Teeratat Thongsima and Desell Suanburi

Abstract

Ground collapse, one of the geohazards that often found in rainy season in Thailand, is something found to affect land use area. Phenomenon ground collapse has happened Khao Singto, Bo Phloi District, Kanchanaburi Province on 11th October 2016, with a dimension of 10 m in diameter and 10 m in deep (occurrence in tobacco planting away from home 50 m). The landscape of the study area is located covering Khao Singto community is quaternary sediment thick. Previous 2D resistivity found ground collapse caused by sediment erosion zone. Water drainage (surface water + groundwater information) analysis direction of groundwater flow move from the West (limestone mountains) to the East (Lam Taphoen). Shallow groundwater channel indicates the risk of ground collapse. In order to locate the sediment erosion zone that will affect safety in the residential zone and damage to agricultural land. Electromagnetic (EM) with multi-frequency technique was applied to locate the sediment erosion zone with vary in resistivity value in the sediment layer. In data 7 survey lines were in the field are designed in North-South direction with a distance of 5 to 7 km and with line spacing about 0.5 to 1 km. Before taking EM measurement stage work which needs to do 2D resistivity result. Then applied frequency of 1, 6 and 12 kHz were used for all reading simultaneously to obtain vary different depth target. Background of resistivity reading is quite stable value with value about > 100 Ω.m (at 1 kHz), 25-100 Ω.m (at 6 kHz), < 25 Ω.m (at 12 kHz). As a result of 12 kHz, sediments erosion zone with 20 m wide can be identified with low resistivity which is low dangerous residential area safe from ground collapse. EM technique can help to support ground collapse risk management in the residential area.

Keywords : Electromagnetic, Ground collapse, Khao Singto Community, Geohazard

The Relation between the Height of Temperature Inversion and Air Quality Index over Bangkok

Teerissara Pimsarn, Dr.Panu Trivej and Pongsakorn Jiwapornkupt

Abstract

Pollution Control Department reports that Air Quality Index is higher than the standard in the dry season, affecting the health of people and visibility. The intermediate that brings pollutants from the origin to receivers is the atmosphere. The distribution of pollutants in the atmosphere depends on meteorological factors. If the pollutants are well distributed in the atmosphere, the severity of air pollution problems will be less. The study show that temperature inversion is one of factors that cause air pollution from January to February 2018 in Bangkok.

Keywords: Meteorological factors, Air pollution

The Study of The Shallow Groundwater Potential using 2D Resistivity Survey at Rai Phatthana Subdistrict, Manorom District, Chainat Province

Thanakorn Sermsri and Desell Suanburi

Abstract

The margin of Chao Phraya basin is found as high terrace zone whereas the most of land use is mainly crop field. Water supply is used in crop of this region mainly taken from rain water during rainy season and shallow groundwater during dry season. The study area is located at Rai Phatthana Subdistrict, Manorom District, Chainat Province, western margin of Chao Phraya basin found double-crop field cultivation was found as the main agricultural land. This area faces water supply shortage. Shallow groundwater is found as high potential of water supply for help to cultivate double-crop field. 2D Resistivity Imaging (ERI) was applied to study the potential shallow groundwater zones. Four survey lines were designed survey with electrode spacing of 10 meters (2 lines in a north-south direction with a length of about 640-1800 meters and 2 lines in a east-west direction with a length of about 640-950 meters) covering the area of about 1.8 km x 9.5 km with measurement techniques, Dipole-Dipole configuration was designed for shallow groundwater with about 27 meters depth while Schlumberger configuration was designed for a deep subsurface structure and for VES processing with about 80 meters depth. The result of ERI show the boundary of shallow groundwater in a sand layer at a depth of about 12-20 meters (with the resistivity values about 30-45 Ω.m). for the VES processing represent shallow groundwater was found at a depth is about 12-20 meters and a thickness is 8 meters in the central part of area, and a shale bedrock was found at a depth is about 60 meters. From the result can use for shallow groundwater mapping, which useful for water supply in double-crop field cultivation.

Keywords : Shallow Groundwater, 2D Resistivity Imaging, Rai Phatthana Subdistrict

Petrography and Mineral Chemistry of Calc-silicate at Akebono Rock, Lutzow - Holm Complex, East Antarctica

Thaweechoke Saechiang, Payath Nantasin

Abstracts

The Akebono Rock is located on the Prince Olav Coast in a geological complex area east of Antarctica that called Lutzow–Holm Complex. The high grade metamorphic rocks exhumed in this area have been metamorphosed under amphibolite facie. Though many petrological works have been done in this area but the calc-silicate rocks which usually occurs as small lenses or elongate body within other gneisses in the Akebono Rock are still not well-studied. Polarizing microscope is used to identify mineral constituents and observe textures of the sample. In addition, whole-rock chemical composition of the representative rock samples will be analyzed by X-ray Fluorescence (XRF). The representative samples were collected from 2 sites. The first site is located at the $42^0$54'- $43^0$00'E longitude and $68^0$05' – 06'S latitude. Petroghaphic study shows that the rock samples in this zone is garnet-bearing calc–silicate rock. It is made up of an assemblage Qtz-Kfs-Pl-Cpx-Grt-Cc-Hbd. The second site is located at the latitude S68^0 5.781 and E42^0 55.429 in longitude. Metamorphic samples in this sites are garnet-bearing calc–silicate and mafic enclave. The minerals assemblage of calc-silicate is consisted of Qtz-Pl-Cpx-Hbd-Cc-Grt-Hyp-Ep-Mt. The minerals assemblage of mafic enclavement is consisted of Qtz-Pl-Cpx-Hbd-Mt. Whole-rock chemistry is in process and it will be used for thermodynamic modelling in order to constrain the evolution of calc-silicate and mafic enclave in Akebono Rocks.

Keyword: Akebono Rock, Calc – silicates, Amphibolite facie

Contamination of heavy metals in mangrove sediment at coastal erosion protected area by bamboo wall, Klong Muen Hai, Samut Songkhram Province.

Torlarp Inson and Unnop Homchan.

Abstract

This research aimed to evaluate contamination of 4 heavy metals (As, Cr, Cd and Pb) in mangrove sediment at coastal erosion protected area by bamboo wall, Klong Muen Han, Samut Songkhram by geo-accumulation index (Igeo), contamination factor (CF), and pollution load index (PLI). The amount of heavy metals in sediments at mangrove forest and erosion protected area by bamboo wall during wet season (September, 2018) and dry season (February, 2019) were compare. 4 x 2 x 2 factorial in Completely Randomized experiment with 3 replications was designed. 10 sediment samples were collected from mangrove forest. The sediment samples were air-dried, then digested with acid according to the method of USEPA 3050B. Sample solutions were analyzed for 4 heavy metals by Inductive Coupled Plasma Optical Emission Spectrometer (ICP-OES). The results of the average concentrations of arsenic, chromium cadmium and lead in mangrove sediment in the wet season showed as follows: 10.04 mg/kg (range 6.12-17.58 mg/kg), 91.93 mg/kg (range 84.19-101.70 mg/kg), 0.32 mg/kg (range 0.17-0.60 mg/kg), 23.43 mg/kg (range 20.03-28.16 mg/kg) respectively and in dry season were: 8.79 mg/kg (range 6.12-10.32 mg/kg), 103.92 mg/kg (98.67-106.79 mg/kg), 0.20 mg/kg (range 0.18-0.22), 22.86 mg/kg (range 20.06-25.37 mg/kg), respectively. It showed that the concentrations of heavy metals in wet season were higher than in dry season, except chromium. Comparing with the standard of coastal sediment quality of Thailand, arsenic and chromium in both 2 seasons were higher than standard values. The evaluation by geo-accumulation index (Igeo) showed that cadmium was the highest value (moderately polluted levels), followed by chromium and lead (unpolluted to moderately polluted). Contamination factor (CF) showed that cadmium was the highest value (considerable contamination), followed by chromium and lead (moderate contamination). For overall evaluation by pollution load index (PLI) showed that sediment samples in the study area were polluted by heavy metals.

Keywords: Heavy metals, Mangrove sediment, coastal erosion

Chemical and Physical Characteristics of Salt Flower and Rock Salt Collected from Rock Salt Productions in Udon Thani Province

Waraporn Kanbun, Sarinya Paisarnsombat

Abstract

Ban Dung District, Udon Thani Province is a major rock salt industry that produces salt flower and rock salt, which has been associated with our daily life as food, cosmetic and pharmaceutical. Salt flower has received more attention and become more expensive than regular salt because of its mellow taste. The aim of this research is to study chemical and physical properties of salt flower and rock salt. Salt is commonly formed as a cubic crystal, but the study shows that salt flower crystallized as a pyramidal form. According to recrystallization experiment starting from 6.8 M salt solution, salt flowers started to crystallize at temperature of 90°C forming pyramidal crystals at the beginning of the crystallization process. Results from chemical analysis using Energy Dispersive X-ray Spectrometer (EDS) shows that rock salt and salt flower have different elemental content in addition to Na and Cl. Salt flower contains Na, Cl and Ca but rock salt contains only Na and Cl. According to structural and chemical analysis, pyramidal form of the salt flower may cause by having Ca in the structure. In addition, salt flower from rock salt production at Ban Dung is different from sea salt flowers. Sea salt flower crystals show a pyramidal form similar to salt flower from rock salt, but its surface is uneven and rougher. The EDS result also shows that sea salt contains Mg, which may affect the form of crystals and the rough surface texture. The study suggests that different crystal form of salt depending on concentration, temperature and timing of crystallization. The study also shows that salt flower from rock salt has the highest purity compare to rock salt and sea salt flower due to source of brine and crystallization process of the rock salt by boiling. The results will support the further development of the salt flower products in Ban Dung district.

Keywords: Pyramidal crystal, Sea salt, Crystallization

Determination the Subsurface Geology Using Electromagnetic and Resistivity Measurement in Soap Hole Phenomenon area at Khok Krabueng Sub-distric,Banleaum District NaKhon Ratchasima Province

Wasin Puthong and Desell Suanburi

Abstract

Soap hole phenomenon (Mud volcano) occur in the paddy field at Khok Krabueng Sub-distric,Banleaum District NaKhon Ratchasima Province at the end of January 2019.As such, tourist are interested and drawn towards the area. In this research, geophysics is used to determination the subsurface geology. The Resistivity using 10m interval Dipole-Dipole and Schlumberger array. The results show 2 zones which is different. First is the zone of low resistivity about 1-10Ω and another zone is high resistivity zone that more than 20 Ω . The Electromagnetic using 3 different frequency include 1000,5000 and 15000 Hz. The results show two zone similar the Resistivity. From all data, the zone that have low resistivity is Maha sarakham formation that have rock salt so that salts solution causes low resistivity. Another zone is Phu Thok formation which is placed above the Maha Sarakham formation. (Department of Mineral Resources, 2559) The solution from Maha Sarakham formation inserted in the cracks of the rock layer and bring the mud together caused the soap hole

Keyword : Soap hole, Resistivity, Electromagnetic

Characteristics feature of placer gold deposit in Bang Saphan District, Prachuap Khiri Khan Province, Thailand

Watta Wongkham and Ladda Tangwattananukul

Abstract

Bang Saphan gold deposit is located in Khanchana buri - Prachup Khiri Khan - Phangnga gold belt. Geology of Bang Saphan gold deposit consists of Carboniferous Sandstone and Siltstone and Permian Pebbly sandstone. Secondary gold deposit in Bang Saphan deposit occurs in regolith and transported along the river. These gold are characterized by plate, tabular and accumulate shape with grain sizes ranging from 0.26 - 3.00 mm in a diameter. The feature of gold on the basis of shape and sizes, the gold in soil is different from the river. Secondary gold in soil is characterized by plate and tabular shape with the grain sizes ranging from 0.26 - 1.20 mm. The gold from river is characterized by accumulate shape with the grain sizes ranging from 0.60 - 3.00 mm. Accumulation and transportation process of gold from soil and river to be the result of the gold show different shapes and sizes. Mineral assemblage of second gold from soil are associated with quartz, pyrite, chalcopyrite and heavy metal while gold from river does not associated with similar mineral form soil.

Keyword: Secondary gold deposit, transport, Gold shape

Study of heavy metals in seawater at coastal erosion protected area by bamboo wall, Klong Muen Han, Samutsongkhram province.

Worapon Siriboon and Unnop Homchan.

Abstract

This research aimed to study the concentration of 4 heavy metals including lead, chromium, cadmium and arsenic, in protected and non-protected area by bamboo wall in wet season (September 2018) and dry season (February 2019). 4x2x2 factorial in completely randomize experiment with 3 replications was designed. 12 seawater samples were collected. The seawater samples were preserved by adding nitric acid and then digested by nitric and hydrochloric acid according to the USEPA 3010A method. Sample solutions were analyzed for 4 heavy metals by Inductive Coupled Plasma Optical Emission Spectrometer (ICP-OES). In wet season, the average concentration of lead was 8.86 μg/l (range 6.33-11.33 μg/l) chromium 29.42 μg/l (range 25.25-33.83 μg/l) cadmium 0.90 μg/l (range 0.83-1 μg/l) arsenic 0.83 μg/l (range 0.13-1.75 μg/l) and dry season, the average concentration of lead was 6.81 μg/l (range 4.92-8.33 μg/l) chromium 22.04 μg/l (range 16.92-27.67 μg/l) cadmium 0.76 μg/l (range 0.5-0.92 μg/l) arsenic 0.15 μg/l (range 0-0.917 μg/l). It could be seen that the amount of chromium cadmium and arsenic were distinctly different from season to season and between protected and non-protected area. The average concentration of chromium cadmium and arsenic in wet season (29.42 0.90 and 0.83 μg/l respectively) was significantly higher than dry season (22.04 0.76 and 0.15 μg/l respectively) (α = 0.05). Because in wet season, chromium cadmium and arsenic might be leached and run off from the upstream sources into the Mae klong River. Comparing with the coastal seawater standard of the Pollution Control Department, the concentration of lead in wet season was very high, and exceed the standard, followed by chromium, cadmium and arsenic respectively. It was showed that the contamination of heavy metals in seawater at the mouth of Klong Muen Han. Therefore, the heavy metals contamination should be continuously monitored and the possible sources should be investigated.

Keywords: Contamination, Heavy metals, Seawater

Petrology of metamorphic rocks within the Mae Ping Fault zone at the Khao Ruak area, Tak Province

Yanee Amornvisuit and Prayath Nantasin

Abstract

The Mae Ping Fault zone is currently right-lateral strike-slip fault associated with brittle deformation which overprints on the former ductile deformation of left-lateral movement. The new excavated road cut of Route 12 at Khao Ruak area, the part of the Mae Ping Fault zone, is selected for this study. The route shows an obvious exposure of metamorphic sequence. It is suitable for tracing the variety of metamorphic grades within the Mae Ping Fault zone. On the basis of field investigation, out crops reveal a variation of metamorphic grades ranging from zone of non-metamorphosed rock to the west and increasing to higher grade zones to the east. Such variation is non-metamorphosed, greenschist facies, amphibolite facies and granulite facies, respectively. Evidence which is used to characterize each zone is mineral assemblage observed under polarizing microscope. Unmetamorphosed limestone doesn't shows any recrystallization. Greenschist facies are indicated by quartz and muscovite which occur in phyllite and quartzite. Amphibolite facies are indicated by biotite, muscovite and quartz which occur in paragneiss and orthogneiss. Granulite facies are indicated by our new discovery of spinel-forsterite-phlogopite-diopside marble. Thermodynamic modelling of this spinel-bearing marble will be construct and the metamorphic evolution path of rocks within the Mae Ping Fault zone is expected to be clarify by this study.

Keywords : Polarizing Microscope, Facies of metamorphic rock, Thermodynamic modelling

The recurrences of the partitions

Adisak Kaewwisit
Department of Mathematics, Faculty of Science, Kasetsart University, Bangkok, Thailand
adisak.kaew@ku.th

Teerapat Srichan*
Department of Mathematics, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscitrp@ku.ac.th

Abstract

We present a new recurrence for the partition function that is similar to Euler's recurrences relation and we obtain the recurrences that is the following,

Let $n \geq 2$ and a parameter y. Then

$$T_{2n}(y) = (y^{2n} - y^{2n-1} - y^{n+1} + y^{n}) \prod_{i=1}^{n-2} \left(1 - \frac{1}{y^{i}}\right)$$

$$T_{2n+1}(y) = (y^{2n+1} - y^{2n} - y^{n+2} + y^{n+1}) \prod_{i=1}^{n-2} \left(1 - \frac{1}{y^{i}}\right)$$

If $T_{2n}(y) = \sum_{j=0}^{\infty} a_j y^{2n-j}$ then $\sum_{j=0}^{\infty} a_j p(2n-j) = 1$ and if $T_{2n+1}(y) = \sum_{j=0}^{\infty} a_j y^{2n+1-j}$ then $\sum_{j=0}^{\infty} a_j p(2n+1-j) = 0$ where $p(n)$ denote by the unrestricted partition function with $p(0) = 1$ and $p(n) = 0$ for all negative integer n

.

Some conditions for commutative rings

Anansit Kitisubkul and Utsanee Leerawat
Department of Mathematics, Faculty of Science, Kasetsart University,
Bangkok, Thailand

Abstract

The aim of this work is to investigate for commutativity of rings satisfying one of conditions:

$$(xy)^k = x^k y^k \quad \text{for } k = n, n+1, n+2,$$
$$\text{or} \quad (xy)^k = -y^k x^k \quad \text{for } k = n, n+1, n+2,$$

where n is a positive integer.

Keywords: ring, commutative

New relations for Newman digit sums in base 3 respectively different modulos

Duangporn Lamkam
Department of Mathematics, Faculty of Science, Kasetsart University, Bangkok, Thailand
duangporn.l@ku.th

Teerapat Srichan*
Department of Mathematics, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscitrp@ku.ac.th

Abstract

For positive integers m, q, x and $0 \leq l < m$, we study the sum

$$S_{m,l,q}(x) = \sum_{\substack{0 \leq n < x \\ n \equiv l \ (mod\ m)}} (-1)^{\sigma_q(n)},$$

where $\sigma_q(n)$ is the digit sum of n in base q.
Moreover, we study also the sum

$$S^*{}_{m,l,q}(x) = \sum_{\substack{0 \leq n < x \\ n \equiv l (mod\ m)}} \exp\left(\frac{2\pi i \sigma_q(n)}{q-1}\right).$$

The 2^n th the roots of 2 × 2 matrices

Kunlatida Treebutr
Department of Mathematics, Faculty of Science, Kasetsart University, Bangkok, Thailand
kunlatida.t@ku.th

Katthaleeya Daowsud*
Department of Mathematics, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscikyd@ku.ac.th

Abstract

This article aims to find the explicit formulas for all the 2^n th roots of 2 × 2 matrices. For the case of the square roots of 2 × 2 matrices, there are infinitely many roots for the scalar matrices and a finite number of square roots for the nonscalar matrices. We expect the same phenomena for the 2^n th roots of 2 × 2 matrices.

A study of sums of integer powers

Nonthanut Keawsuksombat and Utsanee Leerawat
Department of Mathematics, Faculty of Science, Kasetsart University,
Bangkok, Thailand

Abstract

The aim of this work is to determine the sums $a_1^k + a_2^k + \cdots + a_n^k,\ k = 0,1,2,3,\ldots$ where $a_1, a_2, \ldots, a_n, \ldots$ is an arithmetic progression with common difference $d \neq 0$.
The main result is as follows:
Let $S_k(a,d,n-1) = a^k + (a+d)^k + \cdots + (a+(n-1)d)^k$, where a and b are real numbers with $d \neq 0$ and n is a positive integer.
Then

(1) $$\sum_{r=0}^{k} \binom{k+1}{r} d^{k+1-r} S_r(a,d,n-1) = (a+(n-1)d)^{k+1} - a^{k+1},$$
where $k = 0,1,2,3,\ldots$

(2) $$\sum_{r=0}^{p} \binom{2p+1}{2r+1} d^{2r+1} S_{2p-2r}(a,d,n-1) = \frac{(a+(n-1)d)^{2p+1} - (a+(n-2)d)^{2p+1} - a^{2p+1}}{2},$$
where $p = 0,1,2,3,\ldots$

(3) $$\sum_{r=0}^{p-1} \binom{2p}{2r+1} d^{2r+1} S_{2p-2r-1}(a,d,n-1) = \frac{(a+(n-1)d)^{2p} - (a+(n-2)d)^{2p} - a^{2p}}{2},$$
where $p = 1,2,3,\ldots$

(4) $$\sum_{r=0}^{\left\lfloor \frac{k-1}{2} \right\rfloor} \binom{k}{2r+1} d^{2r+1} S_{2k-2r+1}(a,d,n-1) = \frac{(a+(n-2)d)^k (a+(n-1)d)^k}{2},$$
where k is a positive integer.

Keywords: integer, power sums, arithmetic progression

An extension from Schwarzanberger's work

Phatchara Jariyasit and Watcharapon Pimsert
Department of Mathematics, Faculty of Science, Kasetsart University,
Bangkok, Thailand
Phatchara.j@ku.th and fsciwcrp@ku.ac.th

Abstract

In 2017, M. Schwarzenberger determined the unique solution of a functional equation, motivated by the study of symmetrizing measures for a Levy-driven Ornstein–Uhlenbeck process, of the form

$$f(x+y)(x-y) = (f(x)-f(y))(x+y) \text{ for all } x, y \in \mathbb{R},$$

with no additional assumptions on the function f. The author also considered the case f is only defined on a finite interval.

In this work, we consider an extension functional equation of Schwarzenberger's work. Our equation is of the form

$$f(x+y)[g(x)-g(y)] = [f(x)-f(y)]g(x+y),$$

where g is the given function with some restrict conditions.

Keyword : Functional equation, Symmetrizing measure

On reciprocals of the modified 2-series tails

Punyathat Noothong
Department of Mathematics, Faculty of Science, Kasetsart University,
Bangkok, Thailand
saharat.n@ku.th

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

Abstract

A generalization of the harmonic series is the *p*-series defined as

$$\sum_{n=1}^{\infty} \frac{1}{n^p}$$

for any real number *p*. When $p = 1$, the *p*-series is the harmonic series, which diverges. When $p > 1$,the *p*-series converges.

Recently Lin Xin gave the solution for the integer part of the inverse of the 2-series tails,i.e.,

$$\left\lfloor \left(\sum_{k=n}^{\infty} \frac{1}{k^2} \right)^{-1} \right\rfloor = n - 1.$$

In this project, we will extend the result of Lin Xin on n^2 to $(an)^2$, where $a = 3,4,5,6$.

Generalization of some Topological Concepts

Sahachat Kopkanchanapruet
Department of Mathematics, Faculty of Science, Kasetsart University, Bangkok, Thailand
sahachat.k@ku.th

Pongpol Ruankong*
Department of Mathematics, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscippru@ku.ac.th

Abstract

We propose the concept of general essential closures in axiomatic way and develop the theory of essential closures. In the process, we introduce the concepts of essential connectedness and essential continuity analogous to the concepts of topological connectedness and topological continuity, respectively. We also introduce the concept of essentiality which is the core of the theory of essential closures to explains the concepts of essential connectedness and essential continuity. It is what distinguishes the concept of essentiality from the concept of topology. For applications, we construct concrete examples of essential closures via the concept of measures and apply the definitions of essential supremum and essential infimum. We use them as tools to study the concepts of essential connectedness and essential continuity.

Keywords: Essential closures, Essential connectedness, Essential continuity

Some Results on Attractive and Repulsive Fixed Points.

Sirinapa Huaysai
Department of Mathematics, Faculty of Science,
Kasetsart University, Bangkok, Thailand
sirinapa.h@ku.th

Pongpol Ruankong
Department of Mathematics, Faculty of Science,
Kasetsart University, Bangkok, Thailand
fscippru@ku.ac.th

Abstract

The objective of this study is to find some sufficient conditions on attractive fixed point for example $\left|\frac{f(x)-f(x_*)}{x-x_*}\right| \leq \lambda$, $0 \leq \lambda < 1$ and $|f'(x)| \geq \lambda > 1$ and find some sufficient conditions on repulsive fixed points for example $\left|\frac{f(x)-f(x_*)}{x-x_*}\right| \geq \lambda > 1$ and $|f'(x)| \geq \lambda > 1$ via the rate of change of the function and slope of function near a fixed point.

Keywords: attractive fixed point, repulsive fixed point

Connections between Newton's formula and Continued fraction of the square root of a positive integer having small periods.

Sunantha Phosri
Department of Mathematics, Faculty of Science, Kasetsart University, Bangkok, Thailand
Sunantha.p@ku.th

Vichian Laohakosol*
Department of Mathematics, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscivil@ku.ac.th

Abstract

The Newton's approximants R_n of the positive real number $\sqrt{d}$ are defined by $R_n = \frac{1}{2}\left(\frac{p_n}{q_n} + \frac{dq_n}{p_n}\right)$, where the quotients p_n / q_n denote the convergents of the continued fraction expansion of $\sqrt{d}$. Various connections between R_n and p_k / q_k are either collected or proved.

The still unsolved problem "when are all the approximants R_n equal to the convergents p_k / q_k ?" is considered. The cases where the periods $s(d)$ of the continued fraction of $\sqrt{d}$ are 1 or 2 are well-known. We give here a complete answer to the case $s(d) = 3$, and analyze several classes in the case $s(d) = 4$.

On reciprocals of even and odd terms in 2-series tails.

Supitchaya Khunphrom
Department of Mathematics, Faculty of Science, Kasetsart University, Bangkok, Thailand Supitchaya.kh@ku.th

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

Abstract

The *p*-series is a power series of the form $\sum_{k=1}^{\infty} \frac{1}{n^p}$, where p is a positive real number.

The *p*-series converges if $p>1$ and diverges if $p\leq 1$.

Lin Xin study the reciprocal sums of 2-series tails and gave a formula

$$\left\lfloor \left(\sum_{k=n}^{\infty} \frac{1}{k^2} \right)^{-1} \right\rfloor = n-1. \qquad (*)$$

In this project, we first generalize the above formula **(*)** for $(2n-1)^2$ and $(2n)^2$. Next, we give the analogue of the formula (*) for the alternating sums of reciprocals of ^{2}.

Keywords: reciprocals, floor function, 2-series

A relationship between the product of two prims prodex and the Highly powerful number

Tula Pratab
Department of Mathematics, Faculty of Science, Kasetsart University, Bangkok, Thailand
tula.pr@ku.th

Nongnuch Sukvaree*
Department of Mathematics, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscinos@ku.ac.th

Abstract

Let n be a positive integer, such that $n = \prod_{i=1}^{k} p_i^{E(p_i)}$,
where $p_1, p_2, ..., p_k$ are k distinct primes in increasing order and $E(p_i)$ is a positive integer for i = 1, 2, …k. Define $prodex(n) = \prod_{i=1}^{k} E(p_i)$. The positive integer n is defined to be a **highly powerful number** if and only if, for every positive integer m, $1 \le m < n$ implies that $prodex(m) < prodex(n)$

In this article will study a relationship between the prodex (n) is of the form product of two primes and the highly powerful number, it was found that,

If n is highly powerful number, then n is divided by every prime number is less than p_k .

If n is a positive integer and prodex (n) is the prime number greater than 7, then n is not highly powerful number.

If n is a positive integer with prodex (n) = 2 p and p is prime number greater than 5, then n is not highly powerful number.

If n is a positive integer with prodex (n) = 3 p or prodex (n) = 5 p and p is prime number greater than 7, then n is not highly powerful number.

If n is a positive integer with prodex (n) = pq and p *and* q are prime numbers greater than 5, then n is not highly powerful number.

Reciprocal sums of triangular numbers

Uraiwan Khamphet
Department of Mathematics, Faculty of Science, Kasetsart University, Bangkok, Thailand
Uraiwan.kha@ku.th

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

Abstract

A triangular number or triangle number counts objects arranged in an equilateral triangle. The nth triangular number is the number of dots in the triangular arrangement with n dots on a side, and is equal to the sum of the n natural numbers from 1 to n. In this project, we will find the solution for the integer part of the inverse of reciprocal sums of the triangular numbers. We also consider a similar result for the triangular numbers with odd-index(even-index).

Domino Tiling on Holey Square

Waraphorn Hongsachat
Department of Mathematics, Faculty of Science, Kasetsart University
Bangkok, Thailand
Waraphorn.h@ku.th

Pattira Ruengsinsub
Department of Mathematics, Faculty of Science, Kasetsart University
Bangkok, Thailand
fscipar@ku.ac.th

Abstract

J. Bao discusses the following conjecture due to Edward Early: the number of tilings of a holey square, that is a $2n \times 2n$ square with a hole of size $2m \times 2m$ removed from the center, is 2^{n-m} where k is an odd number which depends on n and m. The conjecture has been proven for $m = 1,2, \ldots,6$ and numerical experiments indicate that it holds for several other values of m. R.Tauraso showed that the conjecture is verified also for $m = n - 2$.

In this we study about the number of Domino Tiling on Multi-Holey Squares base on the number of Domino Tiling on Holey Squares by using L-grid formula.

$$L_{n,m} = f_{n+1}f_m + f_n f_{m+1}$$

Keyword: L-grid, Domino Tiling, Multi-Holey Squares

GCD of the shifted Lucas sequence

Wipawan Boonduang
Department of Mathematics, Faculty of Science, Kasetsart University, Bangkok, Thailand
wipawan.bo@ku.th

Angkana Sripayap*
Department of Mathematics, Faculty of Science, Kasetsart University, Bangkok, Thailand
Angkana.s@ku.th

Abstract

Let G_n be the generalized Fibonacci sequence defined by $G_{n+2} = G_n + G_{n+1}$ where $G_0 = \alpha$ and $G_1 = \beta$. We call G_n the Lucas sequence if $G_0 = 2$ and $G_1 = 1$. Let $\mathrm{g}_n(a) \coloneqq \gcd(G_n + a, G_{n+1} + a)$ be the greatest common divisors of the generalized Fibonacci sequence where a is an integer. In 2011, K.W. Chen proved that if G_n is the Lucas sequence then $\mathrm{g}_n(a)$ is bounded. In 2016, J. Spilker has shown that, if $m \coloneqq a^4 - 1 \neq 0$, then $\mathrm{g}_n(a)$ is simply periodic. Let M_{g_a} be the mean-value of such periodic function. In this paper, we find the mean-value of the sequence of greatest common divisors of shifted Lucas sequence for some integer a.

Spherical Gold Nanparticles based signal enhancement of Lateral flow immunochromatographic assay LFIA for detection of Acidovorax citrulli bacterial in Cucurbit

Arphaphon Sichamnan
Department of Physics, Faculty of Science, Kasetsart University,
Bangkok,Thailand
Arphaphon.s@ku.th

Weeraphat Pon-On*
Department of Physics, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fsciwpp@ku.ac.th

Abstract

Plant pathogens are one of the causes for low agricultural productivity worldwide. Main reasons are emerging plant infectious diseases. Early detection of plant pathogens is an important role in plant health monitoring, including to minimize the risk of the spread of disease infections and prevent introduction of new plant diseases quarantine pathogens at country boarder. For solving these problems and adding signs of disease tests, in this study using the spherical gold nanoparticles as a labeling and an enhanced sensitivity in the side flow immuno-chromatography technique or lateral flow immunochromatographic assay (LFIA) for detect Acidovorax citrulli which is a disease bacterium in the melon plant. Applied for LFIA, the selecting antibodies and antigens of AA9 and 11E5 molecules were used. The result from this research demonstrated that the gold with dual structure exhibit higher color changed and the wavelength shift after adding antibodies and sodium chloride salt than the sensitivity of the assay with spherical gold nanoparticle. Based on this result revealed that the combination of gold has a positive prospect in the preparation of gold nanoparticles with selective and enhancement signal application in biosensors for plant pathogenic detection.

Keywords: Gold nanoparticles, Lateral flow immunochromatographic, biosensors

A smart water monitoring and controlling in agriculture based on IoT technology

Asadech Chowanapanit
Department of Physics, Faculty of Science, Kasetsart University,Bangkok,Thailand
asadech.c@ku.th

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

Abstrats

Based on information from the Office of Agricultural Economics, average income of farming family (about 4 person) is around 57,448 baht per year (40 baht per day). It is very low and isn't enough for cost of living. At present, technologies for agriculture are growing rapidly. They can help to reduce production costs and increase productivity by applied the sensors to measure the factors of plant growth. In this work, a smart system that can monitor and control water has been developed. It can be worked as an automatic watering machine by received moisture and temperature values to process and decide watering. Also it can work in timed mode for watering the plant in setting time by controlling relay to set on/off of water. From the experiments, we found the developed watering machine can work well as designed. The soil moisture tended to decrease significantly in the midday because the soil raise temperature when receiving sunlight caused heat from the surface to the ground causing the water in the soil to be very volatile, especially on the surface of the soil. The moisture will be greatly reduced. During the night, the humidity will increase slightly because at night there isn't has sunlight. The surface temperature is lower than the soil temperature below then heat conducting in the soil from below up to top. That makes water in down soil layer evaporate into the top soil layer the moisture values has increased.

Keyword: Smart farm, Internet of thing, Sensor, Temperature, Sol moisture

Quadcopter motion stability control by acceleration and gyroscope sensor.

Chanasorn Nutsataporn and Noparit Jinuntuya

Abstract

Nowadays, many unmanned aerial vehicles or drones are being used in various aspects. The most important thing is to maintain motion stability. In order to apply the unmanned aerial vehicles in the future. Then, this project has been developed quadcopter motion stability control by acceleration and gyroscope sensor. Our quadcopter control by Arduino UNO and uses brushless motor to propel the propeller. In stabilized motion, MPU6050 were used. The MPU6050 is the acceleration and gyroscope sensor that measure the acceleration and gyration about XYZ axis. The outputs were used to calculate the unwanted rotate angles of quadcopter around three axes cause by unequal of four motor. To adjust the rotate angles, we use PID controller to correct the angles.

Study on oxidation state of Mn in Pearl by X-ray Absorption technique

Chutinun Salyacheewin
Department of Physics, Faculty of Science, Kasetsart University, Bangkok, Thailand
chutinun.sal@ku.th

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

Abstract

Pearl is an organic gem that originates from an organism by biological process. It's high value and very popular. Classification of pearls can be divided by the habitat of pearl oysters, freshwater pearls and sea pearls. The main component of pearl is calcium carbonate ($CaCO_3$), organic substance and trace elements such as Manganese (Mn), Strontium (Sr) and Iron (Fe), etc.

In this study, Synchrotron light is used to study the oxidation state of Manganese (Mn) in pearls by X-ray Absorption Spectroscopy technique (XAS) which can analyze trace elements. Analysis of oxidation states of Manganese (Mn) in Pearl is used to separate the type of pearls into freshwater pearls and sea pearls. Nine samples of pearl are used in this study, there are seven samples of freshwater pearl and two samples for sea pearl.

From the study on oxidation states of Mn in pearls, it was found that in freshwater pearls and sea pearls have different oxidation states, the oxidation state of freshwater pearls was Mn^{2+} while the oxidation state of sea pearls was Mn^{3+}.

Keyword : Pearl, Manganese, Oxidation state, X-ray absorption technique

Development of gas sensor circuits for enhancement of sensor Sensitivity.

Iwarin Posri and Chatchawal Wongchoosuk
Department of Physics, Faculty of Science, Kasetsart University, Bangkhen

Abstract

The ammonia fumes have a sharp and pungent odor, which can seriously irritate the eyes, nose, mucous membranes and skin, and the respiratory tract. Therefore, the exposure to a high level of concentration of ammonia gas can cause permanent lung damaged and death. Therefore it is necessary to have a device to measure gas when leakage occurs. As a result, we created an ammonia gas sensor based on graphene quantum dot and we also developed gas sensor circuits for enhancement of sensor sensitivity. The result indicates that the gas sensor can detect ammonia gas at room temperature. In addition, the sensor measurement circuit also has a direct influence on the gas sensor response depending on the resistance and the selection of field effect transistor (FET) which is suitable for gas sensor. This circuit increases the response about 13.34 % from the original response. It is useful to develop the gas sensor circuits to have a better response. As a result, the circuit can be applied in various types of gas sensors.

Keyword: Environment and health, Ammonia gas sensor, Graphene quantum dots, Field Effect Transistor

Multiwavelength light source using LED and plane grating with Raspberry Pi

Jantarat Markchum and Noparit Jinuntuya

Abstract

Typical cameras use RGB color systems to emulate human vision. That is, the cameras use RGB filters, which is the three colors filters, red, green, and blue to record the color images. Without the filters, the images will be recorded as black and white If there are filters with a variety of colors rather than RGB filters, we will be able recording images that can see details in the view that the human eye cannot see normally. In this project, we developed a multiwavelength light source, using light from the LEDs projected to a plane grating at various angles. The reflected angle is fixed to obtain the reflected light with various wavelength. Then we use the Raspberry Pi to control the camera to take pictures from specific LED to obtain images with wavelengths. When we bring all the images together. We can get multispectral image comparable to that obtained from an expensive multi-filter camera.

Star Gold Nanoparticles based signal enhancement of Lateral flow immunochromatographic assay LFIA for detection of Acidovorax citrulli bacterial in Cucurbit

Kaewta Yeenang and Weeraphat Pon-On

Abstract

Bacterial fruit blotch of cucurbits is a serious threat to the cucurbit industries. It can be found in cucumber, watermelon, melon, cantaloupe and other cucurbits. Bacterial fruit blotch of cucurbits, is caused by Acidovorax avenae subsp. citrulli and it can adhere to or penetrate the seed. Because of this, it loses 100% of the yield in the cultivated area.

As a result, agriculture must have a guarantee of seed germination before selling in the country and exporting seeds that contain Acidovorax avenae subsp. citrulli to customers or buyers. If sellers sell contaminated seeds, they will be sued and prosecuted. Therefore, the method used in the examination must be specific, highly sensitive, accurate, convenient and can be checked quickly.

While the current standard methods (seedling grow-out test) require to plant a seed for seedling, then observe the disease in the seedling and take it separately which will take 14 - 25 days for the result depending on the amount of the pathogen to adhere to the seed.

With this concept, I am inspired to study how to develope a way to add a signal to the detection kit for detecting Acidovorax avenae subsp. citrulli with star gold nanoparticles in the immunochromatographic strip test or Lateral flow immunochromatographic assay (LFIA), which is specific to this type of infection, is accurate and covers all species. As a result, it will be easy to be carried, can be used for pre-export inspection and nor react with other bacteria by randomly checking within five minutes.

Keywords : Bacterial fruit blotch, cucurbit, nanoparticles, Lateral flow immunochromatographic

Fabrication and Properties of Pb doped ZnO Nanostructures

Kittiya Trikijja and Sirikanjana Thongmee
Department of Physics, Faculty of Science, Kasetsart University, Ladyao, Jatujak, Bangkok, 10900

Abstract

In this work, Pb doped ZnO structures up to a concentration of 10 mol % of lead were grown by the hydrothermal technique. XRD measurements showed that Pb doped ZnO nanostructures have hexagonal wurtzite structure. The lattice parameters of Pb doped ZnO nanostructures were closed to the lattice parameters of ZnO nanostructures. SEM images found that the structure of Pb doped ZnO nanostructures had been changed from hexagonal to the nanorods. The length and diameter of nanorods increased with the increasing small amount of Pb. In contrast, when the amount of Pb was increased the length and diameter of nanorods decreased. The UV-vis revealed that the absorption of both ZnO and Pb doped ZnO nanostructures were not different and the band gap of Pb doped ZnO nanostructures decreased.

Study on oxidation state of Fe in corundum by X-rays absorption technique

Noppawan Tipkanon
Department of Physics, Faculty of Science, Kasetsart University,
Bangkok, Thailand
noppawan.ti@ku.th

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

Abstract

Sapphire is jewelry in the corundum (Al_2O_3) group. There are different color depending on the adulteration of transition metals elements such as Fe, Ti, Cr, etc. In general, the oxidation state of iron in sapphire can be Fe^{2+} or Fe^{3+}, which will give different colors. Only Fe^{3+} will give the yellow color in sapphire. While if there is an exchange of charge between atoms (intervalence charge transfer) of Fe^{2+} and Ti^{4+} replace of Al^{3+} will give the blue color in sapphire.This project studies on the oxidation state of iron in sapphire by x-ray absorption spectrometry (XAS) technique. This technique can measure the oxidation state of Fe in the sample with a small amount of Fe. We focus on the x-ray absorption near edge structure (XANES) of the samples. We use 16 samples of natural sapphire from the same source. The samples were divided as 8 samples before heat treatment and 8 samples after Be heat treatment for the quality enhancement. From the study on the oxidation state of Fe in sapphire, it was found that oxidation states of Fe in sapphires are all the same as Fe^{3+}

Keyword: sapphire, Fe oxidation state, quality enhancement by Be heat treatment, x-ray absorption technique

Incorporation of ion element in hydroxyapatite as a biomaterial for bone treatment

Nuttanit Poonsri and Weeraphat Pon-On

Abstract

In the present study, scaffolds for bone tissue engineering applications were made by immersing the inorganic phases of ion doped hydroxyapatite with different ratios of polycaprolactone (PCL) in an organic phase of chitosan-alginate (ChiAlg) matrix. Porous scaffolds were obtained by freeze-drying. The mechanical properties and in vitro growth of rat osteoblast-like UMR-1 0 6 cells were investigated. The investigation indicated that the compressive strength was controlled by the ratios of organic phases. The highest compressive modulus of thecomposites was 11.66 MPa for mHAP@PCL –[ChiAlg=1 :1]. In vitro cell availability and proliferation tests confirmed the osteoblast attachment and growth on the mHAP@PCL –[ChiAlg=1 :1] surface and non-significant differences when compared to that on the glass substrate after 7 days of culturing. To test the cell activity MTT and ALP assays on UMR-1 0 6 cells were reported. The results indicated that the UMR-1 0 6 cells were viable and had higher ALP activity as the culturing times were increased. Therefore, mHAP@PCLChiAlg scaffold shows promise for future in bone regeneration.

Keywords : calcium phosphate, Biphasic, biopolymers, bone tissue engineering

Measurement of Radioactive Iodine-131 Airborne Dispersion at Radioisotope Production Room, Thailand Institute of Nuclear Technology (TINT)

Paksupree Janha
Department of Physics, Faculty of Science, Kasetsart University,
Bangkok, Thailand
paksupree.j@ku.th

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

Abstract

This research is measured airborne dispersion of I-131 within Radioisotope production room and before release radioactive waste into environment to safety assessment for radiation workers and people who lived near radioisotope production place. We used high-purity Germanium (HPGe) radiation probe and gamma spectrometer analysis system that used Mock-131 standard radiation source to calibrate efficiency. We used this detector to calculate radioactivity of I-131 and we started to collect 39 air samples between October 2018 to March 2019. We found, from our analysis, that the amount of radioactivity in radioisotope production room are between 11.57 - 441.63 Bq/m^3 for I-131. The results show the some value more than accepted maximum value of airborne dispersion: 416.67 Bq/m^3 which is limited dose that allow for radiation worker. Then amount of radioactivity released to environment is 1.37 x 10^4 Bq which lower than accepted value for emission radioactive waste in air per year where limit at 1 x10^9 Bq.

Keywords: I-131, radioactivity, high-purity Germanium (HPGe) detector, radioisotope, gamma-rays, airborne dispersion

Measuring permanent magnet properties with a fluxmeter and Helmholtz Coil

Panut Chotigunjara and Pongsakorn Jantaratana

Abstract

A flux meter and a Helmholtz coil was designed and constructed for measuring magnetic properties of the permanent magnet. When the permanent magnet is placed between the coils in alignment with the coil axis and rotated 180°, the electromotive force is induced in the coils. In order to measure magnetic moment of the magnet, the induced voltage was measured by the fluxmeter based on the microcontroller board. The remote control software collected the data and calculated the parameter that use to determine magnetic properties of the magnet under test.

Keyword: Helmholtz coil, Fluxmeter, Permanent Magnet

Unmanned Aerial Vehicle for air quality monitoring

Phatsakorn Jintaruthai
Department of Physics, Faculty of Science, Kasetsart University
Bangkok, Thailand
Phatsakorn.ji@ku.th

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

Abstract

In the present day, there is quite different from in the past since increasing of industrial factory, vehicle and burning waste in the open air. All of these directly affect air quality in the present. And when it reaches at the point will affect health of people in the community and affect different in each person. With these reason, having sensor which can sense precisely dust particle in air is necessary information to people in community and community boards for prevention guidelines and solution to minimize loss at any various dust level. In this study, there are using UAV (Unmanned Aerial Vehicle) technology apply with dust sensor since there are advantage in reaching a place where hard to reach, reaching a place quickly and easy to maintenance. At dust sensor, there is applying light scattering in dust detection. It has ability in high level dust sensing. It can senses PM 2.5 (dust particle which has average diameter less 2.5 micrometer). The test show that equipment can works properly. The primary results indicate amount of tree and amount of vehicle in any environment significantly affect to amount of dust so it causes set of mathematical which can be precisely used to assessment any project to solve air quality problems.

Keywords: Dust detection, PM 2.5, UAV

Properties of Al doped ZnO film on flexible substrate prepared by sputtering

Rawinnipha Seangkum
Department of Physics, Faculty of Science, Kasetsart University, Bangkok, Thailand
rawinnipha.sa@ku.th

Watcharee Rattanasakulthong*
Department of Physics, Faculty of Science, Kasetsart University, Bangkok, Thailand
fsciwrr@ku.ac.th

Abstract

Al-doped Zinc Oxide (ZnO:Al) films with different sputtering times (20, 30, 40, 50 and 60 min.) were prepared on polyimide substrate by RF sputtering technique. The cross-sectional SEM images showed that the thickness of the film were 90, 122, 162, 189 and 193 nm. The film thickness was obviously increased with increasing sputtering time and surface morphology of the film also depended on the film thickness. XRD result confirmed that all prepared ZnO:Al films displayed the hexagonal wurtzite structure in the (002) direction. Intensity of the main peaks was increased with increasing sputtering time. All results confirmed that sputtering time directly affects the film thickness and modifies the surface morphology of the RF-sputtered film.

Keywords: ZnO:Al film, RF sputtering, flexible substrate, polyimide substrate

Study of carbon dioxide absorption of plants

Sarawut Kondee and Chatchawal Wongchoosuk
Department of Physics, Faculty of Science, Kasetsart University, Ladyao, Chatuchak, Bangkok 10900

Abstract

Global warming or the greenhouse effect is a condition in which the world has a higher average temperature. Which is mainly due to the increase in the amount of carbon dioxide(CO_2) in the atmosphere caused by the burning of fuel, transportation, and industrial production. Planting trees are one way that can help reduce global warming. The plant will absorb carbon dioxide(CO_2) under conditions where light intensity is sufficient for photosynthesis and will emit carbon dioxide(CO_2) under a light intensity condition that is not sufficient for photosynthesis. Therefore, we have been invented a carbon dioxide detection system. If plants absorb a large amount of carbon dioxide(CO_2), causing carbon dioxide(CO_2) in the atmosphere to disappear a lot. Alternatively, if plants release less carbon dioxide(CO_2), it will cause less carbon dioxide (CO_2)in the atmosphere. In this paper, we created a simple and inexpensive carbon dioxide detection system. It measured in different light intensity and different wavelengths. We experimented with three types of trees:1. Philodendron 2. Epipremnum pinnatum marble planet 3. Aglonema. When plants have insufficient light intensity, it will have low photosynthesis rates, but they will have more breathing. The results indicate that Plants will emit less carbon dioxide(CO_2) when in extreme light conditions and will emit more carbon dioxide(CO_2) when in low light conditions.

Keywords: Photosynthesis, carbon dioxide, sensor

Properties of Iron Oxide Decorated Graphene Oxide

Tanawan Chansagiam and Sirikanjana Thongmee
Department of Physics, Faculty of Science, Kasetsart University, Ladyao, Jatujak, Bangkok 10900

Abstract

Iron oxide (Fe_2O_3) decorated graphene oxide (GO) in the concentration ratio of Fe : GO (5 : 95, 7 : 93, 9 : 91 and 11 : 89) were fabricated using modified Hummers method. Scanning electron microscope (SEM) images showed that the GO surfaces were covered with Fe_2O_3 nanoparticles at whose average sizes increased as Fe_2O_3 was increased. The optical property of the samples was investigated by UV-vis spectroscopy. From UV-vis result, it revealed that the absorption peaks of GO presence the wavelength between 200-250 nm. The absorption peak of Fe_2O_3 did not appear.

Effect of alcohol on the oscillation of the Belousov-Zhabotinsky chemical media

Thanatphon Mangsachat
Department of Physics, Faculty of Science, Kasetsart University, Bangkok, Thailand
thanatphon.m@ku.th

Jiraporn Luengviriya
Department of Industrial Physics and Medical Instrumentation, King Mongkut's University
of Technology North Bangkok, Bangkok, Thailand

Chaiya Luengviriya*
Department of Physics, Faculty of Science, Kasetsart University, Bangkok, Thailand
fscicyl@ku.ac.th

Abstract

We studied the effect of alcohol on the oscillation of the Belousov-Zhabotinsky (BZ) chemical media. During the oscillation, the color of the reaction alternately changes between red and blue. In the absence of alcohol, it is found that the oscillation period decreases when we increase the concentration of H_2SO_4 and $NaBrO_3$. Alcohol affects the BZ reaction as follows. If we increase the concentration of alcohol up to 1.0% v/v in the BZ solution, the period will decrease. If the alcohol concentration is greater than 1.5% v/v, there will be no oscillation, and the color of the substance will change to blue, blue-green and eventually become orange.

Keywords: Belousov-Zhabotinsky reaction, Alcohol, period, oscillation

The applications of acid treated carbon nanotubes and NiCO2S4 for Li-S batteries

Thanphisit Artchuea and Weeraphat Pon-on
Department of Physics, Faculty of Science, Kasetsart University (Bangkhen) Ladyaow Chatuchak Bangkok 10900

Abstract

Lithium-sulfur battery is a new generation of lithium-ion battery research and development to replace the old lithium-ion battery. The reason for choosing lithium-sulfur batteries is that because they give energy density It is about 6-7 times theoretical and is lighter than the old battery. Smaller batteries and cheaper production costs, as well as sulfur, are found in nature and are also environmentally friendly. However, the poor conductivity and large volumetric expansion of sulfur result in low rate performance and unfavorable cycle stability. Herein, a laminated structure of sulfur/reduced graphene oxide intercalated by carbon nanotube (CNT-rGO/S) composites was designed and fabricated for the first time to address the issue. The composites prepared via hydrothermal coprecipitation was endowed a perfect crystal and highly integrated structure, which retained a good electrical conductivity and accommodated the sulfur volume expansion due to the sufficient free space between the CNT-intercalated graphene layers. We adjusted the sulfur content to 30%, 50%, 70% of the composite materials. At 70%, the maximum capacity was 500 mAh / g at 0.1 C after 10 cycles. And after the composite material. Nickel cobalt sulfide It has a capacity of 1150 mAh / g at 0.1 C which is very good for the use of lithium-sulfur batteries.

Keywords: host, hydrothermal

A Comparison of Multicollinearity Resolving Methods in Multiple Linear Regression

Kamonchanok Koonsawat, Patcharada Udomvej,
Chalermpon Lertwattanamongkol and Nopparat Sriburadach,
Department of Statistics, Faculty of Science, Kasetsart University,
Bangkok, Thailand
Kamonchanok.koo@ku.th

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

Abstract

The objective of this study is to compare the three estimation methods of multiple regression coefficient when multicollinearity problem is occurred. The three estimation methods are ordinary least square method (OLS), ridge regression method (RID), principle component regression method (PCR). The criterion of comparison is an average mean square error of coefficient (AMSE).

In this study, it is expected that the four factors affected to AMSE in coefficient estimation are the number of independent variables, sample sizes, level of multicollinearity and variance of error. So, 3 and 5 of independent variables are studied. Also, sample sizes (n) = 30, 50, 100; level of multicollinearity split into 3 levels : 0.30, 0.60, 0.90; and variance of error are 1.0, 5.0 and 10.0 are studied.

For the results, it is found that PCR is the best efficiency for prediction for high level of multicollinearity in all level of error variance. For other levels of multicollinearity, it depends on variance of error. However, when the variance of error are 1 and 5, the efficiency of RID is the best in all cases except when the number of independent variable is 3 and sample size is 30. For variance of error is 10, PCR is the best efficiency for prediction.

In addition, the value of AMSE of all methods decrease when sample size increases. Contradictory, the value of AMSE of the 3 methods increase when variance of error and level of multicollinearity increase.

Keywords: Ordinary least square method, Ridge regression method, Principle component regression method

Efficiency Comparison of Classification Methods for Payment Status of a Bank Loan Client

Motana Chinakotr*, Wuttichai Monthanee,
Siripong Kobkulsuwan and Saowanee Namaksorn
Department of Statistics, Faculty of Science, Kasetsart University,
Bangkok, Thailand
Motana.c@ku.th

Juthaphorn Sinsomboonthong
Department of Statistics, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fscijps@ku.ac.th

Abstract

The objective of this research was to compare the efficiencies of three classification methods–logistic regression analysis, decision tree analysis and artificial neural network methods–and the last two methods were also improved their accuracy of classification by using two techniques, namely, adaboost and bagging algorithms. The studied data consist of 23 independent variables and one dependent variable for 30,000 sample units. Furthermore, it was divided into two parts for training and testing data sets with percentages of 70 and 30 respectively by using stratified random sampling method.

The efficiency comparison of classification methods was found that the decision tree analysis using with adaboost technique gave the highest predictive accuracy with percentage of 92.32. In addition, the performance improvement of decision tree analysis and artificial neural network by using adaboost technique tended to give more accuracy than bagging technique.

Keywords: classification method, logistic regression analysis, decision tree analysis, artificial neural network

A Comparison of Simple Linear Regression Coefficient Estimation with Outliers

Vorapat Hirunpod, Sutiwat Chatpuak, Chawannuch Nopwisuthisakun
and Pattharapun Laopirot
Department of Statistics, Faculty of Science, Kasetsart University, Bangkok, Thailand
pattharaphun.l@ku.th

Ampai Thongteeraparp*
Department of Statistics, Faculty of Science, Kasetsart University, Bangkok, Thailand
fsciamu@ku.ac.th

Abstract

The purpose of this research is to compare the five methods of estimation in linear regression with outliers: Least Squared method (LS), Theil method, Maximum Likelihood method (ML), Nonparametric Bootstrap method and Parametric Bootstrap method. The criterion is the Mean Square Error value (MSE). The method which provide the least Mean Square Error will be the best method. The data is simulated which the sample sizes are 20, 30, 50, 60 and 90. The distribution of independent variable and error term are also normal with mean of 0 and variance of 1. The proportions of outliers are 0.1, 0.2, 0.3 and 0.5 with three conditions; (1) none outlier in the independent variable and in the error term, (2) outliers occurring to the independent variable and to the error term in different positions, (3) outliers occurring to the independent variable and to the error term at the same position. The result of this research can be divided into 3 conditions as follows,

- In case of none outlier in the independent variable and in the error term, Least Squared Method (LS) and Maximum Likelihood Method (ML) are the most efficient methods for estimating β_0 and β_1.

- In case of the outliers occurring to the independent variable and to the error term at the same position, Theil Method is the most efficient methods for estimating β_0 and β_1.

- In case of the outliers occurring to the independent variable and to the error term in different positions, Theil Method is the most efficient methods for estimating β_0. However, for estimating β_1, the most efficient methods will depend on different situations.

Keywords: least squared method, theil method, maximum likelihood method, bootstrap method

Efficiency Comparison for Methods of Data Transformation from a Gamma Distribution into a Normal Distribution

Phitchaphat Phureejarurot*, Worawan Payakwach,
Nattapong Tresutumas, Supanooch Raksakom
Department of Statistics, Faculty of Science, Kasetsart University,
Bangkok, Thailand
phitchaphat.p@ku.th

Juthaphorn Sinsomboonthong
Department of Statistics, Faculty of Science, Kasetsart University,
Bangkok, Thailand
fscijps@ku.ac.th

Abstract

The objective of this research was to compare the efficiency of data transformation methods from the Gamma distributed data to the normally distributed data for four methods: Box-Cox transformation, power transformation, fourth root transformation, and exponential transformation of Manly methods. The simulation data were generated in the form of Gamma distribution with scale parameter was equal to 1, 2 and 5, shape parameter was equal to 1, 3, 5, 10, 20, 50 and the sample size (n) was equal to 5, 10, 20, 30, 50, 100. The totals of 108 situations were studied and repeated 1,000 times for each situation. The criterion of efficiency comparison based on the acceptance percentage of a null hypothesis that the transformed data were normally distributed by using Anderson-Darling test at the significance level 0.05. If the transformation method has a high acceptance percentage of the null hypothesis, it means that this method is better than another. According to this research, it was found that Box-Cox transformation and power transformation methods gave the highest acceptance percentage of the null hypothesis for almost all situations—this is, these were the best data transformation methods for almost all situations.

Keywords: Box-Cox transformation, power transformation, exponential transformation, Normal distribution

Predictive Model for the Winning Number of Player Unknown's Battlegrounds (PUBG) in Three Play Modes by the Poisson Regression Analysis

Tanaton Nompitakcharoen, Natacha Phonkerd, Natsuda Vechsuwan and Yossinee Wichitakat,
Department of Statistics, Faculty of Science, Kasetsart University, Bangkok, Thailand
Tanaton.n@ku.th

Ampai Thongteeraparp*
Department of Statistics, Faculty of Science, Kasetsart University, Bangkok, Thailand
fsciamu@ku.ac.th

Abstract

The objective of this research is to construct the predictive model. For the number of wins in Player Unknown's Battlegrounds (PUBG). Poisson regression and regression analysis of count data with zero-inflation with 85,000 observations are studied. For each model, three different types of winner are considered which are single-player, two-player and team-player. However, if dependent variable was over dispersion, negative binomial regression model and analysis would be used instead. The result of this study indicates that negative binomial regression model with zero inflation is the most suitable model to forecast the number of winners in this game for all types of players.

Keywords: Predictive model, Poisson regression, negative binomial regression model

ACCURACY CLASSIFICATION ALGORITHM BASED ON SPOT-7 DATA OBJECT WITH WATER COLUMNS CORRECTION AND DETECTION OF CHANGES SEAGRASS AREA IN PAJENEKANG ISLAND , SOUTH SULAWESI

Turissa Pragunanti Ilyas
Department of Marine Technology, Faculty of Fisheries and Marine Science, IPB University, Bogor, Indonesia
turissa_pragunanti@apps.ipb.ac.id

Bisman Nababan
Department of Marine Technology, Faculty of Fisheries and Marine Science, IPB University, Bogor, Indonesia
bisman@ipb.ac.id

Hawis Madduppa
Department of Marine Technology, Faculty of Fisheries and Marine Science, IPB University, Bogor, Indonesia
hawis@apps.ipb.ac.id

Dony Kushardono
Remote Sensing Center, National Aeronautics and Space Agency, Jakarta, Indonesia
dony_kushardono@lapan.go.id

Abstract

Some of the results of previous studies of water column correction in mapping benthic habitats using remote sensing data can increase the accuracy of the information produced. In this study, mapping of benthic and seagrass habitat dynamics was carried out using remote sensing data by water column correction and without water column correction and classification of the object based image analysis (OBIA) methods on the waters of Pajenekang Island, South Sulawesi. As a comparison, 196 seagrass and non seagrass distribution fields were used for data taken in July-August 2018 with a 1x1 m^2 size square transect. The satellite data used is SPOT 7 satellite imagery acquired on December 26, 2015 and March 27, 2017 with a spatial resolution of 6 × 6 m^2. In this study the classification of OBIA methods was tried using a classification algorithm Support Vector Machine (SVM), Bayes, K-Nearest Neighbor (KNN), and Decision Tree (DT). The results showed that the application of water column corrections did not provide significant results on the level accuracy on the mapping of ecosystem benthic, and seagrass habitats in the waters of Pajenekang Island. In addition, the dynamics of seagrass changes also indicate the rate of seagrass increase in the application of water column correction. In the classification of benthic habitat with satellite imagery without water column correction shows that the Bayes classification algorithm produced the good accuracy with a value of 70% accuracy. While the results of classification of seagrass habitat without water column correction also produced the good accuracy value of 66% with the Bayes algorithm.

Keywords: Seagrass, water column correction, OBIA, classification algorithm, Pajenekang Island

Development of muon trigger for long-lived particle search toward LHC-ATLAS experiment Run4

Yuki Fujimori
Shinshu University, Graduate School of Science and Technology
Nagano Prefecture, Japan
19ss215b@shinshu-u.ac.jp

Abstract

The LHC, built in a tunnel 100 meters below the CERN laboratory in the France-Switzerland border region, accelerates protons to high energy and collides them. The ATLAS experiment is searching for the new physics beyond the Standard Model (BSM) by observing particles generated in LHC collisions. The ATLAS experiment adopts the “Trigger System” as selecting interesting physics events. The muon trigger, one of the main trigger chains in the ATLAS trigger system, is designed to choose events which contain a high transverse momentum (p_T) muon. However, as it is designed to trigger muons generated near to the interaction point (IP), it has limited performance, which is trigger efficiency and p_T reconstruction, for the muon generated not around IP. Since a lot of BSM models predict long-lived particles emit muons at far away from IP, therefore we need to improve existing the Muon Trigger algorithm to correctly trigger generated muons from long-lived particle. My research shows that the trigger efficiency improves 6 times and the trigger coverage expands twice than existing it by using angle of muon track bent by the magnetic field for the trigger. This result leads to improve trigger efficiency for long-lived particles and discover some particles of the BSM.

Keywords: ATLAS, Muon Trigger, Beyond the Standard Model, long-lived particle

Nozzles for Dropping Carbon Fluid Electrode

Xianmei Liu*
Chemistry Unit, Department of Science, Graduate School of Science and Technology,
Shinshu University, Matsumoto, Japan
19ss309d@shinshu-u.ac.jp

Abstract

Polarography at a dropping mercury electrode (DME) has an advantage of high reproducibility derived from the automatically renewable electrode surfaces. But its use has become very limited due to the toxicity of mercury. We have developed dropping carbon fluid electrode (DCFE) as a less toxic alternative to DME. Reproducible removal of the carbon drops was possible at DCFE, but the influence of ohmic drop was significant, because the conductivity of the carbon fluid was not as high as mercury. In this study, we examined the nozzles for DCFE to reduce the ohmic drop. We found that a plastic nozzle the inside of which was coated by a conductive paste was useful.

Keywords: Polarography, Dropping Carbon Fluid Electrode

Polarography with pencil lead electrodes

Atsushi Miyama*
Chemistry Unit, Department of Science, Graduate School of Science and Technology,
Shinshu University, Matsumoto, Japan
19ss308f@shinshu-u.ac.jp

Abstract

Polarography is a type of electrochemical measurement methods in which a dropping mercury electrode is used as a working electrode. It has an advantage of high reproducibility due to automatically renewable electrode surfaces, and was widely employed in the chemical analyses of various substances, such as heavy metals. However, it has almost completely gone out of use, because of the toxicity of mercury. We are studying polarography with less toxic electrode materials than mercury. Here, we examined pencil leads for mechanical pencils. A mechanical system to renew electrode surfaces was developed by snapping the pencil lead during the course of measurements.

Keyword: Polarography, automatically renewable, pencil lead

Two Tangent Spaces for a Diffeological Space

Kei Shibuya
Mathematics Division, Department of Science,
Graduate School of Science and Technology, Shinshu University,
Matsumoto, Japan
18ss104g@shinshu-u.ac.jp

Abstract

Manifolds are important objects in mathematics, but they have some inconvenient properties. The notion of manifolds has been generalized in many ways to resolve such problems. Diffeological spaces are one of the generalizations of manifolds, which were introduced by Souriau in the 80's. The notion of diffeological spaces is manageable and the tools used for considering manifolds are applicable to the study of diffeological spaces. Tangent spaces are one of these tools. There are two ways to define tangent spaces. These ways give the same space for a manifold, but they don't give the same space for a diffeological space in general. It is not known a necessary and sufficient condition for these two tangent spaces being same each other. In this talk I am going to explain the above story with examples.

Keywords: Manifold, Diffeological space, Tangent space

Sparse form bounds for Fourier integral operators

Ryosuke amamoto
Department of Mathematical Sciences, Shinshu University,
Nagano, Japan.
18ss109h@shinshu.ac.jp

Abstract

The boundedness of operators on Lebesgue space is important concept in harmonic analysis and many researchers have studied about it. In addition, in recently years, researchers are interested in establishing sparse form bounds for several operators. For example, Beltran and Cladek proved sparse form bounds for pseudodifferential operators. In this talk, we study sparse form bounds for Fourier integral operators. Fourier integral operator was defined by Hormander in 1971 to consider the non-elliptic equations. Sparse form is the stronger estimate than the boundedness on Lebesgue space. Namely, if sparse form bounds hold, then the boundedness on Lebesgue space holds. Furthermore, sparse form bounds give us weighted boundedness of operators. The weighted boundedness of sparse form was shown by Bernicot, Frey, and Petermichl in 2016. By using this result, one obtain weighted boundedness of FIO.

Keywords: Fourier integral operator, sparse

A Study of double readout of a scintillation detector for ILC

Kanehira IMAI
High Energy Lab., Physics Unit, Graduate school of Science and Technology, Shinshu University, Matsumoto, JAPAN
imaik@azusa.shinshu-u.ac.jp

Abstract

I research reading out double sides of the scintillator light quantity in order to improve the accuracy of the electromagnetic calorimeter of ILC's ILD detector, whose construction is planned for the purpose of new particle search. The electromagnetic calorimeter measures the energy of electrons and photons. The calorimeter is considered to be a strip readout in which scintillators are formed in a grid and a MPPC is attached to one end of the scintillators. The advantage is that the number of MPPCs can be reduced.The problem is that the quantity of light depends on the position. Also the passing point of each particle can not be identified when a plurality of particles pass. The expected advantage of this method is that the light quantity is reduced by adding the two light quantities to reduce the position dependency of the light quantity, and the difference can be used to specify the particle passing position. it was found that the dependency is different between the one cut out by the laser processing machine and the one by the mechanical molding. those cut out with a laser processing machine have large positional dependence in one side read out, but mold formation in both sides read out It was found that there was only a small degree of position dependency as that of From this, it is considered that the passing position of the particles and the light quantity can be determined with high accuracy by using the performance obtained by the scintillator cut out by the laser processing machine.

Keywords: ILC, Calorimeter, scintillation detector, double readout

MICUPER: Eco-Friendly Portable Smart Washing Machine Prototyping

Fauzan Ahmad [1)], Indra Yasri [2)], Fikri Fatwa Ulhuda [3)], Meilita Kurniati [4)]
[1,2,3,4)] Electrical Engineering Department, University of Riau
fauzan.ahmad1491@student.unri.ac.id[1)]

Abstract

The washing clothes activity is inconvenience things to do for most of housewives if done manually. The same thing is also happened to college student. Even though the laundry services are available in many places but they cannot simply send their clothes over there. Housewives or college student who coming from poor family they do not have afford for laundry services fee because they have another urgent priority to allocating the budget. Due to this problem we propose the MICUPER, a low cost and eco-friendly portable smart washing machine. The design of MICUPER is composed by 0.5 Gallon bucket, DC Motor, flexible shaft, washing blade and microcontroller for smart controller. The MICUPER operational is initiated by weighing the weight of the clothes to be washed. Once the weight of the clothes is obtained, this value will trigger the microcontroller to perform a packet of setting which covers the following parameter i.e. the motor speed, water supply, detergent amount and duration of washing process. The MICUPER is able to save water and electric power consumption during the washing processes. The MICUPER compact design is also convenience for travelling.

Keywords: MICUPER, low cost, washing machine, smart controller, compact design