



## **“2012 Malaysia-Thailand Graduate Forum in Life Science, Food Science and Agriculture”**

**12<sup>th</sup> -14<sup>th</sup> December 2012**

**Mahidol University, Bangkok, Thailand** is hosting an international forum In order to provide students with inspirational and beneficial lectures and research presentations in the field of Life Science, Food Science and Agriculture, academic institutions from Malaysia and Thailand are currently organizing an open forum, entitled “2012 Malaysia-Thailand Graduate Forum in Life Science, Food Science and Agriculture” to share student research with a wider audience, create a network of scholars, foster collaboration, and generate further confidence in university research at the international level.

**Venue: Faculty of Science, Mahidol University, Bangkok, the Kingdom of Thailand**

**BRIDGES**  
BRIDGES: SINGAPORE & CULTURE OF TRUST

**INTERNATIONAL PEACE FOUNDATION**

**Millennium Hilton**

**THAI**  
SINCE 1932

**Mahidol University**  
Faculty of Science

# How science changes our lives

**Prof. Douglas D. Osheroff**  
1996 Nobel Laureate for Physics  
at the Department of Physics of Stanford University

**Wednesday,**  
**December 12, 2012**

**14:00** Keynote speech and dialogue at Mahidol University followed by a reception  
Venue: Room L01, Lecture Building, Faculty of Science, Mahidol University, Rama VI Rd. Phayathai  
Online Registration URL: [www.wsc.mahidol.ac.th](http://www.wsc.mahidol.ac.th) (no registration fee)

**12 Dec. 09:00-11:30** Campus Tour at Mahidol University Salaya

13:30 Opening Ceremony by delegates (L01, MUSC)

**14:00-15:00pm** Nobel Laureate lecture by **Prof. Douglas D. Osheroff**, in topic “How Science Changes our lives” co-organized by the International Peace Foundation, as part of the 4<sup>th</sup> ASEAN “Bridges” event series program in Vietnam and Thailand.

15:00 Campus Tour at Faculty of Science (MUSC)

18:00 Welcoming Dinner

**13 Dec. (N.101, MUSC)**

- Keynote Lecture “From Protein Research To A Better Understanding of Life”, by Emeritus Professor Mr. Jisnuson Svasti
- Lecture entitled “One Health in Animal Production: Biosafety and Biosecurity Issues”, by Assoc.Prof. Dr. Hassan Hj. Mohd Daud
- Research presentation by graduate students

**14 Dec. (N.101, MUSC)**

- Lecture entitled “Fruits: Importance of Preharvest Factors, Maturity Stage at Harvest & Postharvest Treatments”, by Prof. Dr. Azizah Osman
- Lecture entitled “Practical approaches for invasive pest control: from genetics to systems Biotechnology for ASEAN”, by Asst. Prof. Dr. Sujinda Thanaphum
- Research presentation by graduate students

18:00 Farewell Dinner

**15 Dec. 06:30-17.30** Cultural Tour (One Day Trip with Lunch)



## **2012 Malaysia-Thailand Graduate Forum in Life Science, Food Science and Agriculture**

**December 12-14, 2012**  
**Mahidol University, Bangkok, the Kingdom of Thailand**

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### **Framework and Reasoning**

The greater internationalization of academic institutions and the expansion of regional and global connections and networks has become an important strategy in developing academic institutions across every field of study. Following global educational trends, including ASEAN's mission to promote unity and cooperation among ASEAN member and non-members, and following its philosophy of higher education, "*True success is not in the learning, but in its application to the benefit of mankind*", Mahidol University continues to develop and diversify high-quality teaching and research, share new knowledge, and present a transparent and open image to the world.

As a result, **Mahidol University** in association with **the Office of Higher Education Commission of Malaysia and Thailand** is hosting a graduate forum entitled "*Malaysia-Thailand Graduate Forum in Life Science, Food Science and Agriculture*", in order to support the internationalization of academic institutes, share knowledge, and develop a new vision for the next generation of scholars.

This academic forum is organized by educational teams from both Thailand and Malaysia and intends to create long-lasting bonds between research students whilst developing research methods. This will be achieved via a series of lectures and research presentations to be given by professionals.

In addition, the forum offers an international stage for scholars to present their graduate research in the field of Life Science, Food Science and Agriculture, and to share their experiences and ideas on future research with their international peers. The presentations also intend to forge links between scholars and to foster trans-disciplinary collaborative research. Ultimately, it is hoped that this will contribute toward research development and academic cooperation throughout ASEAN.

Through the professional lectures and research presentations, both Malaysian and Thai students will gain valuable insights into various research topics and methodology. The forum is therefore useful in encouraging future collaborative ventures between scholars or academic institutions within Thailand and Malaysia, such as Joint Research Programs, Student Exchanges, Conferences, Academic Observations, and Joint supervision of Double and/or Joint Degrees.

The local accommodation of invited Malaysian participants (2 professors and 24 graduate students) will be provided courtesy of the Office of Higher Education Commission, Thailand and Mahidol University. There will also be a tour of Mahidol University's Salaya

Campus, and a **Plenary lecture “How Science Changes our Lives”** by world-renowned scholar and winner of the **1996 Nobel Prize in Physics Science - Prof. Douglas D. Osheroff** during the opening ceremony on the 12<sup>th</sup> December 2012, which is a part of **the 4<sup>th</sup> ASEAN “Bridges”** event series program organized by the International Peace Foundation, in cooperation with the Faculty of Science, Mahidol University. Subsequent lectures and research presentations will take place over the following two days on the 13<sup>th</sup> – 14<sup>th</sup> December. Coordinators from the two countries have invited lecturers and nominated 24 students each, to act as *research proposers* in the fields of **(1) Life Sciences** and **(2) Food Science and Agriculture**. Additional activities will include a welcome dinner and a visit to Mahidol University’s Institute of Nutrition and University Hospital. There will also be a cultural tour on 15<sup>th</sup> December to introduce international participants to various aspects of Thai culture.

**Objectives:**

1. To provide scholars with the opportunity to share lectures and new research knowledge in their related fields.
2. To encourage Malaysian and Thai graduate students to share new knowledge and experiences during their presentations.
3. To offer students the opportunity to work together and share ideas openly at the international level.
4. To initiate debate and the exchange of knowledge and research ideas in related fields between students and scholars, including other participants of the program. This could lead to trans-disciplinary research and greater research integration among scholars.
5. To strengthen the relationship between Malaysian and Thai students and scholars, and to further integrate academic networks to benefit the establishment of future academic strategic partnerships.

**Expected Results/Outcomes:** By attending the opening ceremony and the morning lectures, participants will be able to learn from professional lecturers and international scholars. In addition, participants will have the opportunity to exchange knowledge, opinions, and ideas in the field of Life Science, Food Science and Agriculture. This will help encourage the development of trans-disciplinary research in related fields. Moreover, both Malaysian and Thai scholars will be able to learn from each other’s research, and strengthen the relationships and bonds between academic institutions. These are crucial for future cooperation between scholars and academic institutions under the ASEAN Community.

**Venue:**

Faculty of Science, Mahidol University, Phayathai Campus  
272 Rama VI Rd, Ratchathewi, Bangkok 10400, the Kingdom of Thailand

**Program Coordinator:** Assoc.Prof. Kanyaratt Supaibulwatana (scddean8@mahidol.ac.th)  
Deputy Dean for Academic and International Cooperation  
Faculty of Science, Mahidol University  
Tel: +66 (0) 2 201 5070, 5073; Fax: +66 (0) 2201 5070

**Secretary:** Ms. Nongnuch Prasomkhun (nongnuch.pra@mahidol.ac.th);  
Ms. Wannapa Somvong (wannapa.som@mahidol.ac.th);  
Ms. Panooj Fuangfoo (panooj.fua@mahidol.ac.th)

## Tentative schedule

Date	Time	Activities	Note
Tuesday 11 <sup>th</sup> Dec 2012	20.00	Arrive in Bangkok, pick up at Suvarnabhumi airport. All Malaysian participants from recommended flights check in to Grand Tower Inn Hotel	For those who would come later, please find the attachments as a map to Grand Tower Inn hotel.
Wednesday 12 <sup>th</sup> Dec 2012	08.00	pick up at hotel lobby and Depart to Mahidol University – Salaya	MU bus
	09.00-11.30	Salaya Campus Tour, including Institute of Nutrition, Mahidol University	
	11.30	Move to Mahidol University, Faculty of Science (MUSC), Phayathai campus	
	12.30-13.30	Lunch	K.102, K. Bld, MUSC
	13.00-13.30	Registration	
	13.30-13.45	VDO presentation (MU) and introduction of IPF activities	
	13.45-14.15	<b>Opening Ceremony by delegates</b>	
	14.15-15.00	<b>Nobel Laureate lecture</b> Topic: “ <i>How Science Changes our lives</i> ” By <b>Prof. Douglas D. Osheroff</b> (1996 Nobel Laureate for Physic)	Rm. L.01, Lecture Bld., MUSC
	15.00-16.00	<ul style="list-style-type: none"> <li>• Q &amp; A and discussion after lecture</li> <li>• presentation of special token of appreciation</li> </ul>	
	16.00-18.00	Presenters are suggested to load his/her presentation PowerPoint files to our computer	Loading spot will be provided at <b>C.111</b> , 1 <sup>st</sup> Fl., Chemistry Bld., MUSC
18.00-20.00	Welcoming Dinner under “ <i>Thai Traditional Fair</i> ” theme	Lecture Bld. Hall, MUSC Dress Code: Casual	
Thursday 13 <sup>th</sup> Dec 2012	09.00-09.45	<b>Keynote Lecture:</b> Life Science Group Topic: “From Protein Research To A Better Understanding of Life” By Emeritus Professor MR. Jisnuson Svasti	Rm. N.101, 1 <sup>st</sup> Fl., New Biological Bld., MUSC
	09.45-10.30	<b>Keynote Lecture:</b> Life Science Group Topic: “One Health in Animal Production: Biosafety and Biosecurity Issues” By Assoc.Prof. Dr. Hassan Hj. Mohd Daud	
	10.30-10.45	Refreshment	1 <sup>st</sup> Fl., Stang Mongkolsuk Bld.
	10.45-12.00	Graduate Forum: Life Science Group (morning session) <sup>1/</sup>	Rm. N.101, 1 <sup>st</sup> Fl. New Biological Bld., MUSC
		Graduate Forum: Food Science and Agriculture Group (morning session) <sup>1/</sup>	Meeting room, 1 <sup>st</sup> Fl., Stang Mongkolsuk Bld
12.00-13.00	Lunch	1 <sup>st</sup> Fl., Stang Mongkolsuk Bld	

Date	Time	Activities	Note
	13.00-17.20	Graduate Forum: Life Science Group (afternoon session) <sup>2/</sup>	Rm. N.101, 1 <sup>st</sup> Fl. New Biological Bld., MUSC
		Graduate Forum: Food Science and Agriculture Group (afternoon session) <sup>2/</sup>	Meeting room, 1 <sup>st</sup> Fl., Stang Mongkolsuk Bld
Friday 14 <sup>th</sup> Dec 2012	09.00-09.45	<b>Keynote Lecture:</b> Food & Agriculture Topic: “Fruits: Importance of Preharvest Factors, Maturity Stage at Harvest & Postharvest Treatments” By Prof. Dr. Azizah Osman	Rm. N.101, 1 <sup>st</sup> Fl., New Biological Bld., MUSC
	09.45-10.30	<b>Keynote Lecture:</b> Food & Agriculture Topic: “Practical approaches for invasive pest control: from genetics to systems Biotechnology for ASEAN” By Asst. Prof. Dr. Sujinda Thanaphum	
	10.30-10.45	Refreshment	1 <sup>st</sup> Fl., Stang Mongkolsuk Bld.
	10.45-12.00	Graduate Forum: Life Science Group (morning session) <sup>1/</sup>	Rm. N.101, 1 <sup>st</sup> Fl. New Biological Bld., MUSC
		Graduate Forum: Food Science and Agriculture Group (morning session) <sup>1/</sup>	Meeting room, 1 <sup>st</sup> Fl., Stang Mongkolsuk Bld
	12.00-13.00	Lunch	1 <sup>st</sup> Fl., Stang Mongkolsuk Bld
	13.00-17.20	Graduate Forum: Life Science Group (afternoon session) <sup>2/</sup>	Rm. N.101, 1 <sup>st</sup> Fl. New Biological Bld., MUSC
		Graduate Forum: Food Science and Agriculture Group (afternoon session) <sup>2/</sup>	Meeting room, 1 <sup>st</sup> Fl., Stang Mongkolsuk Bld.
	18.00-20.00	<ul style="list-style-type: none"> <li>Awarded for Certificate of Attendance to presenters and Farewell Dinner</li> </ul>	
Saturday 15 <sup>th</sup> Dec 2012	06.30-18.00	Pick up at hotel lobby for Cultural Tour (One day trip to Ayudhaya province - UNESCO World Heritage with lunch for Malaysian participants)	Dress Code: Casual

**NOTE: The presentation time for graduate student is 25 min-each (including Q&A).**

- All programs will be conducted in English. This schedule will be subject to further adjustments.
- Please wear polite (business casual style) clothing during the forum.
- All presenters are requested to submit the registration form and abstract before 1<sup>st</sup> Dec. 2012.
- All presenters are suggested to load his/her presentation PowerPoint files to our computer. Contact our IT staff at loading point as soon as possible to avoid the technical problem. Loading point for 12 Dec. 2012 will be arranged at rm. C.111, 1<sup>st</sup> Fl., Chemistry Bld., MUSC. Loading point for 13-14 Dec. 2012 will be arranged in front of rm. N.101, New biology bld.

<sup>1/</sup> Two groups will run parallel and consist of about 3 presentations, each in the morning session.

<sup>2/</sup> Two groups will run parallel and consist of about 9 presentations, each in the afternoon session. The afternoon refreshment of coffee or tea break will be arranged during 15.00-15.15 am.

## **Nobel Laureate Lecture**

### **Topic: How science changes our lives**



**Prof. Douglas D. Osheroff,**  
1996 Nobel Laureate for Physics  
at the Department of Physics of Stanford University

#### **Biography:**

Professor Douglas D. Osheroff is a 1996 Nobel Laureate for Physics at the Department of Physics of Stanford University who was awarded the Nobel Prize for his discovery of superfluidity in the isotope helium-3. Superfluidity in  $^3\text{He}$  is a neutral analog to superconductivity in metals, but here the  $^3\text{He}$  atoms play the role that electrons play in conventional superconductors. In addition, there is no lattice in liquid  $^3\text{He}$ , so the interactions that lead to the formation of 'Cooper Pairs' results from ferromagnetic spin fluctuations, and not virtual phonons in the lattice as is the case in most superconductors. Superfluid  $^3\text{He}$  was the first example of a BCS state in which the Cooper pairs possess a net angular momentum. Professor Osheroff's work was considered a breakthrough in low-temperature physics, and in the course of his research on helium-3 he developed an early form of magnetic resonance imaging, but only in one spatial dimension.

Douglas D. Osheroff attended the California Institute of Technology (Caltech), where he took the famous two year course in physics developed by Nobel Laureate Richard Feynman. In his senior year Douglas Osheroff became fascinated with the physics of low temperatures and as a result decided to go into condensed matter physics.

After graduating from Caltech, Douglas Osheroff entered Cornell University for graduate study in 1967. Working in the university's Laboratory of Atomic and Solid State Physics with David Lee and Robert C. Richardson, he and his colleagues began to investigate the behavior of liquid helium-3 at temperatures within a few thousand of a degree of absolute zero.

It was during this time that Professor Osheroff noticed a jump in the heat capacity of the liquid  $^3\text{He}$ , which marks the conditions under which helium-3 changes from an ordinary liquid to a superfluid. This discovery sparked intensive research into superfluid helium-3 and other so-called “quantum liquids”, as it enabled scientists to study the types of quantum mechanical effects in large, visible systems that could previously only be studied at the atomic and subatomic level. It is from this discovery that Lee, Richardson and Osheroff would later be jointly awarded the Nobel Prize for Physics in 1996.

In 1972 Professor Osheroff moved to AT&T Bell Laboratories in New Jersey, where he continued his work into helium-3 superfluidity. Between 1973 and 1978 he measured many characteristics of the superfluid phases. He continued his research at Bell Laboratories as head of the Department of Low Temperature Research until 1987, when he came to Stanford University, along with his friend Steven Chu, who would later be appointed Secretary of Energy by President Obama. At Stanford, Professor Osheroff has been the J.G. Jackson and C.J. Wood Professor of Physics and the Gerhard Casper University Fellow for Undergraduate Education. His research there still focuses on the properties of condensed matter near the absolute zero of temperature. He has also served as Chair of the Physics Department at Stanford from 1993-96 and again from 2001-04.

Professor Osheroff has received numerous honors for his research. Besides the Nobel Prize, these include the Sir Francis Simon Memorial Award, the Oliver E. Buckley Condensed Matter Physics Prize and the MacArthur Prize Fellowship Award. In 1991 he received the Walter J. Gores Award for Excellence in Teaching from Stanford University. Professor Osheroff is a member of the American Academy of Arts and Sciences and the National Academy of Sciences.

Besides his work in Physics, Professor Osheroff was appointed to the Columbia Accident Investigation Board in 2003 following the Space Shuttle Columbia disaster, and he currently serves on the board of advisors of Scientists and Engineers for America, an organization focused on promoting sound science in American government.

As a fascinating application of superfluidity in helium-3, the phase transitions to superfluidity in helium-3 have over the years been used by experimental research teams to test a theory regarding how cosmic strings can be formed in the universe. These immense hypothetical objects, which are thought possibly to have been important for the forming of galaxies, could have arisen as a consequence of the rapid phase transitions believed to have taken place a fraction of a second after the Big Bang. The research team used rapid local heating in the  $^3\text{He}$  superfluid using both X-rays and neutron capture in their superfluid  $^3\text{He}$  to simulate these events that occurred in the early universe. When these were rapidly cooled back through the superfluid transition, balls of vortices were formed. It is these vortices that are presumed to correspond to the cosmic strings.

# **Nobel Laureate Lecture**

**12 December 2012**

**Topic: How science changes our lives**

## **Abstract**

Our understanding of Nature (which is what science is all about) has allowed us to better understand and control powerful forces in Nature for our benefit, such as the conversion of heat in to mechanical and electrical energy, communications via propagating electromagnetic waves, etc. Biology has given us a much better understanding of life, and medicine has allowed us to live longer and more productive lives. However, often these new capabilities produce unwanted side-effects, such as the global transmission of new diseases, the pollution of our environment, and a growing human population that has strained our natural environment in many ways. While all this is true, thanks to science we live more comfortable and meaningful lives than could ever have been possible a thousand years ago, and our ability to harness Nature has given us the time and ability to better understand our environment, our universe, and even ourselves.

This is a very public lecture, not for a scientific audience. In it Professor Osheroff shows how our ability to develop new technologies has vastly benefitted mankind, but that it has posed a serious dilemma in that mankind has placed an enormous burden on our environment in order to deal with the byproducts of our energy production and factories and the growth of the human population.



## Keynote Lectures

**Thursday, 13<sup>th</sup> Dec 2012**

**Keynote Lecture: Life Science Group**

Rm. N.101, 1<sup>st</sup> Fl., New Biological Bld., MUSC

**09.00 - 09.45 am**



Topic: “From Protein Research To A Better Understanding Of Life”

**By Emeritus Professor MR. Jisnuson Svasti**

**09.45 - 10.30 am**



Topic: “One Health in Animal Production: Biosafety and Biosecurity Issues”

**By Assoc. Prof. Dr. Hassan Hj. Mohd**

**Friday, 14<sup>th</sup> Dec 2012**

**Keynote Lecture: Food Science and Agriculture**

Rm. N.101, 1<sup>st</sup> Fl., New Biological Bld., MUSC

**09.00 - 09.45 am**



Topic: “Fruits: Importance of Preharvest Factors, Maturity Stage at Harvest & Postharvest Treatments”

**By Prof. Dr. Azizah Osman**

**09.45 - 10.30 am**



Topic: “Practical approaches for invasive pest control: from genetics to systems Biotechnology for ASEAN”

**By Asst. Prof. Dr. Sujinda Thanaphum**

**Abstract**

**Keynote Lecture**

# From Protein Research To A Better Understanding Of Life

M.R. Jisnuson Svasti

Emeritus Professor of Biochemistry, Mahidol University, and Head, Laboratory of Biochemistry, Chulabhorn Research Institute, Bangkok, Thailand.

M.R. Jisnuson Svasti, e-mail: jisnuson.sva@mahidol.ac.th; jisnuson@cri.or.th

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## Abstract

Proteins are the instruments through which the genetic potential of an organism are expressed. This lecture describes my interest in protein research from my undergraduate days, my training in one of the best protein chemistry laboratories of the world, and my efforts to continue studying protein structure and function in Thailand for 40 years, despite the lack of equipment and other challenges. This research has covered two major themes: first the relationship between protein structure and its function, and secondly the changes in structure or expression of proteins that can give rise to diseases. Throughout this time, I have had the good fortune to learn from many renowned protein scientists, not just about protein structure and function, but also about the special insights of great researchers. In addition, as an academic, I have tried to integrate my research and teaching activities, so that they strengthen each other. Like most senior academics, I have also held various administrative positions, and tried to enjoy them by focusing on promoting academic excellence, while at the same time continuing research. Most of I have enjoyed working for local and international scientific organizations, because this has shown me that science can unite people of different universities, different countries, different ethnic origins, different religions, and different political ideals so that we can work together for the benefit of mankind.

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## References

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# **One Health in Animal Production: Biosafety and Biosecurity Issues**

Hassan Hj. Mohd Daud

<sup>1</sup> Department of Veterinary Clinical Studies, Faculty of Veterinary Medicine, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor D.E., Malaysia

\*e-mail: hassan@vet.upm.edu.my

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## **Abstract**

World human population is expected to increase tremendously in forthcoming years. More human meaning more food needed. In addition, concurrent natural disasters such as floods, earthquake, war and crop failure due to environmental changes have put intense extra strains on demand for food. Animals and plants (land and aquatic origin) are the main supplier of energy and protein rich food. At present most of the animal food source are coming from domesticated animal, capture fisheries and aquaculture. Increased demand for animal meat and its products has led to the use of chemicals to hasten animal and plant growth, uncontrolled used of antimicrobials leading to rise of antibiotics resistant bacteria, intensifying of culture, especially monospecies culture which lead to disease to be readily spread and animal to be in close contact with man. While overzealous in capturing wild animals as exotic food and exhibits, and overfishing, led to transfer of exotic diseases from wild animals to man and extinction of many species. Inevitably also, to cater for the increase demand for seeds for culture and with easy and safe transportation, animal culturists has purposely transferred many species of animals across the continents in matter of hours. This increase in live animal traffic led yet again to biosecurity threat to receiving countries. Laws and regulations are prepared. But are they enough to maintain biosafety and biosecurity? Are we able to interpret the statistics and plan appropriate and better strategies?

One health-One medicine-One World concept was introduced to integrate human, animal and ecosystem disciplines in a synchronize and collaborative approaches to resolve issues concerning human, animal and ecosystem health. Multifacet effects of one's health either in human, animal and ecosystem will certainly effect one another in terms of food biosafety and biosecurity of production. Thus multi directional and interdisciplinary methodologies are needed in lieu to single spear method.

**Keyword: One Health, Biosafety, Biosecurity, Animal Production**

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## **Acknowledgements**

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## **Fruits: Importance of Preharvest Factors, Maturity Stage at Harvest & Postharvest Treatments**

Azizah Osman\*

Department of Food Science, Faculty of Food Science and Technology, Universiti Putra Malaysia  
43400 Serdang, Selangor, Malaysia

\*Azizah Osman, e-mail: azosman@putra.upm.edu.my

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### **Abstract**

Fruits have been part of the human diet since the dawn of history but their nutritional importance has only been recognised in recent times. Commerce in fruits began in the 1980's when awareness on their nutritional importance has risen. Since then, its demand in the international markets has also increased tremendously. Malaysia went through a series of phases to develop its fruit industry to reach its present status- able to be leading exporter of some tropical fruits.

Quality of fruits could not be improved once harvested but it can be preserved by slowing down the rate of undesirable changes which leads to a reduction in their quality. Postharvest qualities of fruits are affected by pre-harvest factors, stage of maturity at harvest and postharvest factors because of the many physico-chemical changes taking place during the life span of the fruit. The rate at which these changes occur can be manipulated by careful management of the postharvest handling system for quality maintenance and shelf-life extension of the fruits.

Due to changes in consumers' life style especially in urban areas, convenient and ready-to-eat fresh-cut fruits are becoming more popular in the last few decades. However, there are problems associated to it which requires studies to be carried out to overcome them. Apart from the increasing demands for these fresh cut fruits, there is also a trend during the same period of time, where consumers consume fruits not only for its nutritional contents but emphasis is also given to its functional properties.

**Keywords:** Fruit quality, pre-harvest, maturity stage, postharvest, fresh-cut

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# Practical Approaches for Invasive Pest Control: from Genetics to System Biotechnology for ASEAN

Sujinda Thanaphum and Nidchaya Aketarawong

Department of Biotechnology, Faculty of Science, Mahidol University, Rama VI Road, Bangkok, THAILAND  
sujinda.tha@mahidol.ac.th

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## Abstract

The tephritid fruit flies are both organisms with high level of modality for basic research, and economic pests causing reductions of fruit yields and generating constrains in the international market. Many of these flies are invasive due to their apparent wide host ranges, high fecundity, dispersal tendency, bioclimatic adaptive abilities, and globalization of fruit trade. The genetics research have been initiated and carried out to gain knowledge in the field of molecular systematics, molecular ecology, population genetics, cytogenetic, gene linkage mapping, and molecular biology of sex determination pathways from these insects. Subsequently, translational research with system biotechnology approach has been conducted to modernize Integrated Pest Management (IPM) using Sterile Insect Techniques (SIT) for ASEAN. Genetic tools such as genetic sexing strains, sperm-marking technology, and application of microsatellite DNA analyses for practicing IPM using SIT were validated in a pilot-scale pest control programme with economic feasibility assessment.

**Keyword** the oriental fruit fly, genetic sexing strain, microsatellite DNA, Sterile Insect Techniques, *doublesex* genes

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**Abstract**

**Graduate Forum**

**Life Science**

**(LS Group)**

**Chairperson of the Life Science Session**

**13 December 2012**

10.45 – 12.00	Prof. Pimjai Chaiyen Assoc. Prof. Dr. Jirundon Yuvaniyama
13.00 – 15.15	Prof. Dr. Nateetip Krishnamra
15.20 – 16.35	Prof. Dr. Sumalee Tungpradabkul

**14 December 2012**

10.45 – 12.00	Prof. Dr. Jonggonnee Wattanapermpool
13.00 – 15.15	Assist. Prof. Dr. Suthep Wiyakrutta
15.20 – 16.35	Assoc. Prof. Dr. Jarunya Narangajavana

**Student presentation list: Life Science**  
**N101 Room, 1<sup>st</sup> Floor, Biology Building, MUSC**

**Thursday 13<sup>th</sup> of December 2012**

<b>Time</b>	<b>Topic</b>	<b>Presenter</b>	<b>Institution</b>
10.45-11.10 <b>LS 1</b>	Characterization of the interaction of white spot syndrome virus (WSSV) protein with shrimp prophenoloxidase activating enzyme	Ms. Natthiya Wetsaphan	Faculty of Science, Chulalongkorn University
11.10-11.35 <b>LS 2</b>	Effect of feeding Lupin ( <i>Lupinus angustifolius</i> ) on carcass composition of Boer Goat	Mr. Azhari Sharidan Abu Bakar	Universiti Putra Malaysia
11.35-12.00 <b>LS 3</b>	Characterization of the interaction of white spot syndrome virus (WSSV) protein with shrimp prophenoloxidase activating enzyme	Ms. Jantiwan Sutthangkul	Faculty of Science, Chulalongkorn University
	<b>Lunch</b>		
13.00-13.25 <b>LS 4</b>	Visualization and characterization of peptides and lipids by imaging mass spectrometry	Ms. Piyachat Chansela	Faculty of Science, Mahidol University
13.25-13.50 <b>LS 5</b>	Administration of $\beta$ -glucan ( <i>Saccharomyces cerevisiae</i> ) via oral feeding increases immune parameters and survival in <i>Oreochromis</i> spp. infected with <i>Aeromonashydrophila</i>	Ms. nur Hidayahanum Hamid	Universiti Putra Malaysia
13.50-14.15 <b>LS 6</b>	Stereo- inverting property of D-Phenylglycine aminotransferase	Ms. Juntratip Jomrit	Faculty of Science, Mahidol University
14.15-14.40 <b>LS 7</b>	Topical treatment with blue-green algae aqueous extract promote healing of diabetic wound	Ms. Nur Aimi Syarina Pauzi	Universiti Putra Malaysia
14.40-15.05 <b>LS 8</b>	Protective effect of <i>Moringaoleifera</i> supplement against lead-induced toxicity in fish	Ms. Sunisa Sirimongkolvorakul	Faculty of Science, Mahidol University
15.05-15.20	<b>refreshment</b>		
15.20-15.45 <b>LS 9</b>	Gross morphology of the proventriculus and ventriculus of Edible Bird's Nest Swift ( <i>Aerodramus fuciphagus</i> ) and House Swift ( <i>Apus nipalensis</i> )	Mr. Fhaisol Mat Amin	Universiti Putra Malaysia
15.45-16.10 <b>LS 10</b>	Effect of iron chelator on hepcidin synthesis in iron overloaded and thalassemic mice model	Mr. Surasak Wichaiyo	Faculty of Science, Mahidol University
16.140-16.35 <b>LS 11</b>	Effectsoffeedingdifferent level of Lupin( <i>Lupinus angustifolius</i> ) on growth performance of boer goats	Mr. Ainul Yuzairi Mohd Yusof	Universiti Putra Malaysia



**Friday 14<sup>th</sup> of December 2012** (N101 Room, 1<sup>st</sup> Floor, Biology Building, MUSC)

Time	Topic	Presenter	Institution
10.45-11.10 <b>LS 12</b>	Anxiolytic-like actions of antidepressant drugs and endurance swimming and thalassemic mice model	Mr. Sarawut Lapmanee	Faculty of Science, Mahidol University
11.10-11.35 <b>LS 13</b>	Immunomodulatory effects of food in allergy rhinitis and cancer	Ms. Nurul Ain Abu Baker	Universiti Putra Malaysia
11.35-12.00 <b>LS 14</b>	Regular Exercise ReversesSuppressions of Cardiac Contraction, SERCA Activity and MHC Expression in Orchidectomized Rat	Ms. Pavarana Vutthasathien	Faculty of Science, Mahidol University
	<b>Lunch</b>		
13.00-13.25 <b>LS 15</b>	Transcriptomic Analysis on Susceptibility of Different Inbred Chicken Lines towards Very Virulent Infectious Bursal Disease Virus Infection	Ms. Noor Farhanah Mohd Isa	Universiti Putra Malaysia
13.25-13.50 <b>LS 16</b>	Overexpression of Urokinase plasminogen activator (uPA) contributes to cholangiocarcinoma	Ms. Parichut Thummarati	Faculty of Science, Mahidol University
13.50-14.15 <b>LS 17</b>	Assessment on Therapeutic Properties & Toxicity of Local Plants for Microbial Diseases in Freshwater Food Fish	Ms. Sharifah RainaManaf	Universiti Putra Malaysia
14.15-14.40 <b>LS 18</b>	In vitro Acanthamoebicidal Activity of Fusaric Acid from Endophytic Fungus Fusarium sp. Tlau3	Ms. Narumon Boonman	Faculty of Science, Mahidol University
14.40-15.05 <b>LS 19</b>	Antibiotic and plasmid profiles of <i>Aeromonashydrophila</i> isolated from clinically infected freshwater fishes ( <i>Oreochromismossambicus</i> , <i>Puntiusgonionotus</i> , <i>Leptobarbushoevenii</i> , <i>Pangasiuspangasius</i> , <i>Anabas testudineus</i> , <i>Clariasgariepinus</i> and <i>Cichlasoma</i> sp.)	Ms. Ruhil Hayati Hamdan	Universiti Putra Malaysia
15.05-15.20	<b>refreshment</b>		
15.20-15.45 <b>LS 20</b>	Characterization of fusion luciferase from <i>Vibrio campbellii</i> : A development toward a reporter gene applications	Ms. Ruchanok Tinikul	Faculty of Science, Mahidol University
15.45-16.10 <b>LS 21</b>	Polyphenolic compounds and potential antioxidant properties from a green microalgae, <i>Tetraselmistetrahele</i>	Ms. Nurul Farahin Abd. Wahab	Universiti Putra Malaysia
16.10-16.35 <b>LS 22</b>	Development of Bacterial Polyhydroxyalkanoate Polymeric Nanoparticles for Anti-cancer Drug Delivery	Ms. Sasivimon Pramual	Faculty of Science, Mahidol University
16.35-17.00 <b>LS 23</b>	Assessment of ammonium uptake by two periphytic microalgae <i>Spaerocystisschroeteri</i> and <i>Stigecloniumnanum</i> immobilized in alginate beads	Ms. Norulhuda Mohamed Ramli	Universiti Putra Malaysia

# CHARACTERIZATION OF *PmSERPIN3* GENE FROM BLACK TIGER SHRIMP, *Penaeus monodon*

Wetsaphan N\*, Rimpanichayakit V, Tassanakajon A and Somboonwiwat K  
Center of Excellence for Molecular Biology and Genomics of Shrimp,  
Department of Biochemistry, Faculty of Science, Chulalongkorn University, Phayathai Rd., Phatumwan,  
Bangkok, 10330, Thailand  
\*Presenter, e-mail: pompom\_natthiya@hotmail.com

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## Abstract

Serpin or serine proteinase inhibitor is a family of a protease inhibitor that involves in controlling the proteolytic cascade in various biological processes and has been identified in most of organisms. In shrimp, several serpins have been identified so far but only a few have been characterized [1-2]. In this study, *PmSERPIN3* gene identified from *Penaeus monodon* EST database was chosen for further characterization. By using the 5' and 3' Rapid Amplification cDNA End (RACE) techniques, the full-length of *PmSERPIN3* gene containing an open reading frame of 1,233bp encoding for 410 amino acid residues protein was obtained. The calculated molecular mass and isoelectric point of the mature peptide are 46.20 kDa and 5.73, respectively. RT-PCR analysis revealed that it expressed in all shrimp tissues tested. The expression level of *PmSERPIN3* gene did not respond to *Vibrio harveyi*, White Spot Syndrome Virus and Yellow head virus challenges. The recombinant mature *PmSERPIN3* protein (r*PmSERPIN3*) was successfully produced in *Escherichia coli*. The proteinase inhibitory activity assay revealed that the purified r*PmSERPIN3* could inhibit various proteinases, such as subtilisin, elastase, chymotrypsin and trypsin. Interestingly, r*PmSERPIN3* also inhibited the shrimp prophenoloxidase system activation *in vitro*. Our results suggested an important role of *PmSERPIN3* in the regulation of shrimp prophenoloxidase system.

**Keywords:** serine proteinase inhibitor, *Penaeus monodon*, prophenoloxidase system

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## Acknowledgements

This work was supported by research grants from the Thailand National Center for Genetic Engineering and Biotechnology (BIOTEC) and the Faculty of Science, Chulalongkorn University (Grant No.RESA1B1-11) to Kunlaya Somboonwiwat.

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## Effect of Feeding Lupin (*Lupinus Angustifolius*) on Carcass Composition of Boer Goat

Azhari, S.A.B.<sup>1</sup>, Zuki, A.B.Z.<sup>1\*</sup>, YusofHamali .H.A.<sup>1</sup>, Goh, Y.M.<sup>1</sup> and Abu Hassan, M.A.<sup>2</sup>

<sup>1</sup>Department of Pre-Clinical Veterinary, Faculty of Veterinary Medicine, University Putra Malaysia, Serdang, Selangor, Malaysia

<sup>2</sup>Research Division, Department of Veterinary Services, Malaysia, Putrajaya, Malaysia

\*Presenter e-mail: aemacho@yahoo.com

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### Abstract

This study was undertaken to measure the effects of different dietary treatments on carcass composition of Boer goats. The main protein source in the diet was *Lupinus angustifolius* and other ingredients were palm kernel expeller (PKE), soya bean meal, fish meal, wheat pollard, corn, molasses, crude palm oil, broken rice, and *Bracharia humidicola* hay. The protein level and energy level in all treatment diet was isocaloric and isonitrogenous (Crude Protein ~ 16.3% and Metabolizable Energy ~ 10.3MJ/kg). The Lupin composition in three treatment diets was 0%, 10% and 30%, respectively. Twenty four Boer goats, age 8-9 months old were used in this study which was divided into three equal groups. The adaptability period was 14 days and the feeding trial goes for 103 days. All goats were slaughtered according to Malaysian Halal Protocol 2009. The results revealed no significant differences ( $P < 0.05$ ) in the initial weight, final weight, weight gain, hot carcass weight, cold carcass weight and dressing percentage among the groups. There was also no significant difference on carcass composition: production of lean meat, and bone to fat ratio among the groups. Thus, this study showed that Lupin can be used as an alternative for protein source in goats reared in tropical condition and its performance in term of weight gain and carcass composition is as good as soybean meal.

**Keywords :** *Lupinus angustifolius*, Boer goat, carcass composition

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### Acknowledgements

This study was supported by the University Putra Malaysia Research grants and Department of Veterinary Services, Malaysia through R&D Fund, 2011 – 2012. The author like to thanks the team at PusatPembinaanKampungPah, Jelevu andRumahSembelihSenawang, Seremban for their allowing the usage of facilities and technical assistance during the experimental period.

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# Characterization of the interaction of white spot syndrome virus (WSSV) protein with shrimp prophenoloxidase activating enzyme

Jantiwan Sutthangkul<sup>1\*</sup>, Piti Amparyup<sup>1,2</sup>, Walaiporn Charoensapsri<sup>1</sup>, Saengchan Senapin<sup>2</sup>, Anchalee Tassanakajon<sup>1</sup>

<sup>1</sup> Department of Biochemistry, Faculty of Science, Chulalongkorn University, Phayathai Road, Bangkok, Thailand

<sup>2</sup> National Center for Genetic Engineering and Biotechnology, National Science and Technology Development Agency, Paholyothin Road, Pathumthani, Thailand

\*Presenter, e-mail: jantiwan.s@hotmail.com

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## Abstract

Melanization activated by the prophenoloxidase (proPO) system, plays an important role in the invertebrate immune system. Previous studies have shown that the proPO system of shrimp *P. monodon* might be important to defense white spot syndrome virus (WSSV) infection and we found that WSSV is likely blocked the shrimp PO activation via inhibition of proteinase in the proPO cascade. Using the yeast two-hybrid technique, we identified the protein WSSV453 from WSSV that interacts with *PmPPAE2*, a proPO-activating enzyme, of shrimp *P. monodon*. WSSV453 is uncharacterized protein with no other predicted domains and consists of 306 bp encoding a predicted 101 amino acid residues with a calculated molecular mass and pI of 11.921 kDa and 9.95, respectively. The WSSV453 protein was successfully expressed in *E.coli* cell. Using co-immunoprecipitation, the result revealed that WSSV453 interacted with *PmPPAE2* *in vitro*. *In vivo* gene silencing of WSSV453 increased hemolymph PO activity in WSSV-infected shrimp. The results suggested that the inhibition of proPO system by WSSV might occur via the proteinase inhibition activity of WSSV453. However, further studies are required to elucidate the exact mechanism of WSSV453 in inhibition of shrimp proPO system.

## Keyword

Prophenoloxidase, Melanization, white spot syndrome virus, shrimp, *Penaeus monodon*

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## Acknowledgements

This work is supported by research grants from (i) Thailand Research Fund (ii) Thailand National Center for Genetic Engineering and Biotechnology (BIOTEC) (iii) the National Research University Project of CHE and the Ratchadaphiseksomphot Endowment Fund (FW643A) (iv) the Royal Golden Jubilee Ph.D. program, co-funding by Thailand Research Fund and Chulalongkorn University

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# Visualization and Characterization of Peptides and Lipids by Imaging Mass Spectrometry

Piyachat Chansela<sup>1\*</sup>, Naoko Goto-Inoue<sup>2</sup>, Nobuhiro Zaima<sup>2</sup>, Takahiro Hayasaka<sup>2</sup>, Tanapan Siangcham<sup>1</sup>, Mitsutoshi Setou<sup>2</sup>, and Prasert Sobhon<sup>1</sup>

<sup>1</sup>Department of Anatomy, Faculty of Science, Mahidol University, Bangkok, Thailand

<sup>2</sup>Department of Cell Biology and Anatomy, Hamamatsu University School of Medicine, Hamamatsu, Shizuoka Japan

\*Presenter, e-mail:piyachatnet@gmail.com

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## Abstract

This study aims to characterize and visualize neuropeptides and lipid compositions in *Penaeus monodon* shrimp. *P. monodon* using LC-MS/MS and imaging mass spectrometry. The common neuropeptides found in the CNS of the shrimps are composed of twenty-nine neuropeptides, including members of FMRFamide, SIFamides, crustacean hyperglycaemic hormone, orcokinin-related peptides, tachykinin-related peptides, and allatostatin-A. These neuropeptides were specifically distributed in the neuronal clusters and neuropils of the eyestalk, brain and thoracic ganglion. Tachykinin-related peptide is a novel neuropeptide firstly identified in this shrimp. In addition to neuropeptides, lipids are also important molecules in stimulating the ovary maturation, oocyte differentiation, and embryonic development in shrimp. In this study, the compositions of major lipids, i.e. phosphatidylcholines (PCs), triacylglycerols (TAGs), and fatty acids (FAs), in the ovaries, during ovarian maturation were investigated. Thin-layer chromatographic analysis showed that the total PC and TAG signal intensities increased during ovarian maturation. Further, by using GC-MS to analyze fatty acid (FA) compositions, we found that (1) FAs 14:0, 16:1, 18:1, 18:2, 20:1, and 22:6 proportionally increased as ovarian development progressed to more mature stages; (2) FAs 16:0, 18:0, 20:4, and 20:5 proportionally decreased; and (3) FAs 15:0, 17:0, and 20:2 remained unchanged. By using imaging mass spectrometry, we found that PC 16:0/16:1 and TAG 18:1/18:2/22:6 were detected in oocytes stages 1 and 2. PCs 16:1/20:4, 16:0/22:6, 18:3/22:6, 18:1/22:6, 20:5/22:6, and 22:6/22:6 and TAGs 16:0/16:1/18:3, 16:0/18:1/18:3, 16:0/18:1/18:1, and 16:0/18:2/22:6 were present in all stages of oocytes. In contrast, the PC- and TAG-associated FAs 20:4, 20:5, and 22:6 showed high signal intensities in stage 3 and 4 oocytes. These FAs may act as nutrition sources as well as signaling molecules for developing oocytes and the hatching process. Knowledge of neuropeptides and lipid compositions could be helpful for the improvement of shrimp reproduction, as well as for formulation of feed for female broodstocks to promote their fecundity and larval production.

**Keyword:** imaging mass spectrometry, neuropeptide, lipid, shrimp ovary

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## Acknowledgements

This work was supported by a grant from the Project for Higher Education Research Promotion and National Research University Development, Office of the Higher Education Commission (OHEC); a Distinguished Research Professor Grant (co-funded by the Thailand Research Fund, Mahidol University and OHEC) to P. Sobhon; a OHEC-Ph.D. scholarship to P.Chansela.; the Program for Promotion of Basic and Applied Researches for Innovations in Bio-oriented Industry (BRAIN) to N.Zaima.; and a SENTAN grant from the Japan Science and Technology Agency to M. Setou.

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# Administration of $\beta$ -glucan (*Saccharomyces cerevisiae*) by oral feeding increases survival, growth and immune responses in *Oreochromis* spp. infected with *Aeromonashydrophila*

NurHidayahanum, H. \*, Hassan, M.D., and RuhilHayati, H.  
Aquatic Animal Health Unit,  
Faculty of Veterinary Medicine,  
University Putra Malaysia,  
43400 Serdang, Selangor, Malaysia  
\*Presenter, e-mail:nur\_hidayahanum86@yahoo.com

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## Abstract

The effects of feeding  $\beta$ -glucan on the survival and immune responses of *Oreochromis* spp. were investigated. Fish received 3% of (body weight of animal) commercial tilapia pellet diet containing  $\beta$ -glucan at the concentration of 25mg/kg twice a day until day 40<sup>th</sup> of experiment. Control fish were fed with normal commercial tilapia pellet diet without the test compound at the same schedule. Every 10 days of interval, the fish were weighed and their FCR were recorded. Blood samples were collected from each group on day 7<sup>th</sup>. Control and test fish were challenged by i.p injection of LD<sub>50</sub> concentration of *A. hydrophila* on day 41<sup>th</sup>. Daily mortality was recorded up to day 48<sup>th</sup>. Haemoglobin (Hb, g/L), packed cell volume (PCV, L/L), erythrocyte (RBCx10<sup>12</sup>/L), total leukocyte (x10<sup>9</sup>/L), mortality and relative percentage survival (RPS) were determined and calculated. Feeding with 25mg/kg of  $\beta$ -glucan significantly enhanced the RPS and growth of the fish. Test fish injected with the compound also showed a significant increase in the total leukocytes count and Hb level (P <0.05), while there was no significant difference for PCV and RBC amounts. Administration of  $\beta$ -glucan through oral feeding effectively stimulates the immune response, growth and offers protection against *A. hydrophila* infection in *Oreochromis* spp. The results indicate that  $\beta$ -glucan could play an important role in the prevention of diseases in fish culture.

**Keywords:** *Aeromonashydrophila*,  $\beta$ -glucan, Oral feeding and *Oreochromis* spp.

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## Acknowledgements

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## Stereo-inverting property of D-phenylglycine aminotransferase

JuntratipJomrit<sup>1,2</sup>Pijug Summpunn<sup>2</sup>, VithayaMeevootisom<sup>1</sup>, SuthepWiyakrutta<sup>1</sup>

<sup>1</sup>Department of Microbiology Faculty of Science, Mahidol University, Rama 6 Road, Bangkok 10400, Thailand

<sup>2</sup>Department of Biotechnology, Faculty of Science, Mahidol University, Rama 6 Road, Bangkok 10400, Thailand

\*Presenter, e-mail:mizuho\_2u@hotmail.com

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### Abstract

D-phenylglycine aminotransferase (D-PhgAT) of *Pseudomonas stutzeri* ST 201 is a pyridoxal-5'-phosphate (PLP) dependent enzyme which selectively catalyzes the reversible transamination of D-phenylglycine (D-Phg) or D-4-hydroxyphenylglycine (D-4-OHPhg) with 2-oxoglutarate as the exclusive amino acceptor yielding *L*-glutamate. Due to the “stereo-inverting” transamination activity of this enzyme, D-PhgAT is useful as a biocatalyst for the enzymatic synthesis of D-Phg and D-4-OHPhg, which are important side-chains for industrial production of many penicillin and cephalosporin antibiotics. However, very little is known about the catalytic mechanism underlying this special enzymatic property. It is thus the objective of this research to study how the D-PhgAT catalyzes the stereo-inverting transamination reaction. Two crucial properties of the enzyme were investigated. First, the purified D-PhgAT was prepared in the double PLP form and reduced with NaBH<sub>3</sub>CN. Biphasic kinetics of the reduction reaction was observed. This evidence suggested that the active sites of the two subunits of D-PhgAT might be asymmetric. Second, stereospecific property of D-PhgAT was investigated using the method developed in this study, which is a sensitive non-radioactive procedure for determining the stereospecificity of aminotransferases for the C-4' hydrogen transfer on the coenzyme. The method was satisfactorily verified with an aminotransferase of known stereospecificity, and was successfully applied to determine the stereospecific nature of a novel enzyme, D-phenylglycine aminotransferase. By using this method, D-PhgAT was found to be a *si*-face specific aminotransferase. All these findings are just a preliminary step towards the understanding of the stereo-inverting aminotransferase property of D-PhgAT.

**Keyword** Aminotransferase, Hydrogen transfer, LC-MS/MS, Non-radioactive, Pyridoxal phosphate, Stereospecificity

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### Acknowledgements

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## Topical treatments with blue-green algae aqueous extract promote healing of diabetic wound.

NurAimiSyarina Pauzi<sup>1\*</sup>, Sharida Fakurazi<sup>1,2</sup>, Arulselvan Palanisamy<sup>1</sup>

<sup>1</sup>Laboratory of Vaccines and Immunotherapeutics, Institute of Bioscience, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia.

<sup>2</sup>Department of Human Anatomy, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia.

\*Presenter, e-mail:aimisyarina@yahoo.com

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### Abstract

Blue-green algae or scientifically known as *Spirulina platensis*, is gaining more attention and becoming a health food worldwide due to its nutritional and medicinal properties. Their roles as antioxidant, antiviral, anticancer and antidiabetic have been well established. The aim of this study is to examine the efficacy of aqueous extract of *Spirulina platensis* on wound repair in streptozotocin–nicotinamide-induced diabetic rats. Open excision wounds were made on the back of rats 5 days after diabetes induction. Aqueous extract at a dosage of 100 and 200 mg/kg body weight was reconstituted in 100 µl of phosphate buffered saline and applied topically once every 2 days up to 14 days for the treated wounds. Animals in normal and diabetic control groups were left untreated. Wound areas were measured on day 0, 7 and 14 post-wounding. Wound size and percentage wound contraction were observed to heal much faster on diabetic wounds which received treatment of the extract. The findings demonstrate the beneficial effects of the topical application of blue-green-algae aqueous extract in the acceleration of diabetic wound healing in animal model.

**Keyword** *Spirulina platensis*, diabetes, wound healing, wound contraction

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### Acknowledgements

This work was supported by Research University Grant Scheme (RUGS) of Universiti Putra Malaysia.

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## Protective effect of *Moringaoleifera* supplement against lead-induced toxicity in fish

Sunisa Sirimongkolvorakul<sup>1\*</sup>, Tawewan Tansatit<sup>2</sup>, Narin Preyavichyapugdee<sup>3</sup>, Piya Kosai<sup>1</sup>,  
Wanee Jiraungkoorskul<sup>1</sup>

<sup>1</sup>Department of Pathobiology, Faculty of Science, Mahidol University, Bangkok 10400, Thailand.

<sup>2</sup>Faculty of Veterinary Medicine, Mahidol University, Salaya Campus, Nakhonpathom 73170, Thailand

<sup>3</sup>Faculty of Animal Sciences and Agricultural Technology, Silpakorn University, Petchaburi IT Campus, Petchaburi, 76120, Thailand.

\*Presenter, e-mail: sirikul\_sunii@hotmail.com

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### Abstract

Lead contamination can be found in soil, water, and food which can be taken up by various organisms. Currently, lead exposure through dietary sources is a major public health concern. There is a growing trend worldwide on using medicinal plant as an alternative treatment for various diseases. *Moringaoleifera*, the plant in Moringaceae family, has been used in traditional medicine in many parts of the world. In this study, we investigated the protective potency of *M.oleifera* -supplemented diets against lead toxicity to the fish *Puntiusaltus*. Here we show that the group of fish that were pre-treated with *M. oleifera*-supplemented diets before lead exposure show only mild alterations from lead toxicity to the gill filament when compared with the group that do not receive *M. oleifera*-supplemented diets. Interestingly, a number of acid mucopolysaccharide of mucous cells was observed in the group pre-treated with *M. oleifera*-supplemented diets, whereas the control group without *M. oleifera* supplement shows mainly neutral mucus cell types indicating that the protective efficiency of these plant could be due to the role of acid mucous cells. Moreover, pre-treatment with *M. oleifera* supplement also reduces liver and kidney damages due to lead exposure as well as decreases in an expression of proliferating cell nuclear antigen (PCNA), a marker of cellular proliferation. Overall, these results suggest that pre-treatment with *M. oleifera*-supplemented diet is able to protect the fish against damages from lead exposure.

**Keyword:** *Moringaoleifera*, lead, histology, fish, cell proliferation

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### Acknowledgements

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# GROSS MORPHOLOGY OF THE STOMACH (PROVENTRICULUS AND VENTRICULUS) OF THE EDIBLE BIRD’S-NEST SWIFTLET (*AERODRAMUS FUCIPHAGUS*) AND HOUSE SWIFT (*APUS NIPALENSIS*)

FHAISOL, M.A.<sup>1</sup>, INTAN-SHAMEHA, A.R.<sup>1\*</sup>, AZHAR, K.<sup>2</sup> and ZUKI, A.B.Z<sup>1,3</sup>

<sup>1</sup>Department of Veterinary Preclinical Sciences, Faculty of Veterinary Medicine,

<sup>2</sup>Centre for Extension, Entrepreneurship and Professional Advancement (APEEC),

<sup>3</sup>Institute of Biosciences, Universiti Putra Malaysia,

43400 UPM, Serdang, Selangor, Malaysia

\*Corresponding author: email: [intan@vet.upm.edu.my](mailto:intan@vet.upm.edu.my)

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## Abstract

This study was attempted to describe the gross anatomy of the stomach of Edible Bird’s-Nest Swiftlet (*Aerodramusfuciphagus*). In addition, the comparison was made with the House Swift (*Apusnipalensis*). These two aerial insectivorous birds from *Apodidae* family are feed on similar flying insects group. The stomach of seven *Aerodramusfuciphagus* and six *Apusnipalensis* were dissected, examined, the weight and length were measured. The stomach of these two species of the birds comprises of proventriculus or *pars glandularis*, a glandular stomach and ventriculus or *pars muscularis*, a muscular stomach. The mean weight of the stomach of *Aerodramusfuciphagus* and *Apusnipalensis* were 0.39±0.05 and 1.15±0.08 g, respectively, while the mean length of the stomach of *Aerodramusfuciphagus* and *Apusnipalensis* were 2.87±0.41 cm and 2.53±0.19 cm, respectively. The relative weight of *Aerodramusfuciphagus* stomach (4.82±0.43 g) was higher than the *Apusnipalensis* (4.30±0.36 g) stomach, but the difference was not significant at  $P<0.05$ . Interestingly, the relative length of stomach of *Aerodramusfuciphagus* (17.88±2.26 mm) was found to be significantly higher than the *Apusnipalensis* (13.66±0.35 mm) at  $P<0.05$ . In conclusion, although the *Aerodramusfuciphagus* is smaller than the *Apusnipalensis* and these two insectivorous birds are grouped in the same family and consume similar diet, the stomach of *Aerodramusfuciphagus* is bigger than the *Apusnipalensis* relative to body weight.

**Keywords:** Stomach; gross anatomy; insectivorous birds; *Aerodramusfuciphagus*; *Apusnipalensis*

# Effect of Iron Overload-Induced Furin Downregulation Accompany with A Reduction of Serum Hcpidin

Surasak Wichaiyo<sup>1\*</sup>, Paranee Yatmark<sup>1</sup>, Ronald Enrique Morales Vargas<sup>2</sup>, Saovaros Svasti<sup>3</sup>, Suthat Fucharoen<sup>3</sup>, Pimtip Sanvarinda<sup>1</sup>, Noppawan Phumala Morales<sup>1</sup>

<sup>1</sup> Department of Pharmacology, Faculty of Science, Mahidol University, Rama VI Road, Bangkok, Thailand

<sup>2</sup> Department of Medical Entomology, Faculty of Tropical Medicine, Mahidol University, Ratchawithi Road, Bangkok, Thailand

<sup>3</sup> Thalassemia Research Center, Institute of Molecular Biosciences, Mahidol University, Salaya Campus, Phutthamonthon 4 Road, Nakhonpathom, Thailand

\*Presenter, e-mail: surasak\_w@live.com

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## Abstract

Hepcidin is a peptide hormone mainly expressed in liver. It plays a key role in systemic iron homeostasis. The regulations of hepcidin synthesis occur in both transcriptional and post-translational levels. Iron overload activates, whereas anemia represses hepcidin gene expression. Due to the fact that hepcidin is initially synthesized as a pre-pro-hormone, it must undergo a maturation process to become an active hormone. This process can be accomplished by a family of enzyme called proprotein convertase including furin. Besides, transferrin receptor 2 was demonstrated as one regulator of furin expression. Among  $\beta$ -thalassemia, hepcidin insufficiency which contributes to iron overload has been observed. This study investigated the effect of iron overload on hepcidin gene expression and hepcidin protein maturation in C57BL/6 (wild-type) and  $\beta$ -thalassemic ( $\beta$ -knockout, BKO) mice. The results showed that iron overload in both groups increased hepcidin expression (2-fold of control) whereas transferrin receptor 2 and furin expression were decreased (0.3- and 0.5-fold of control, respectively). Noticeably, serum hepcidin concentration was decreased in iron overload conditions (0.6-fold of control). In conclusion, this study demonstrated that iron overload induced hepcidin gene expression but reduced hepcidin protein maturation (through transferrin receptor 2 and furin downregulation), eventually resulted in decreased active hepcidin production.

**Keyword** hepcidin, transferrin receptor 2, furin, iron overload,  $\beta$ -thalassemia

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## Acknowledgements

This project is supported by Research Grant from the Thailand Research Funds and the Commission on Higher Education (RMU5480001); the Office of the Higher Education Commission and Mahidol University under the National Research Universities Initiative and the Thalassemia Research Center Institute of Molecular Biosciences, Mahidol University.

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## Anxiolytic-like actions of antidepressant drugs and endurance swimming in stressed male rats

Sarawut Lapmanee<sup>1\*</sup>, Charoenphandhu J<sup>2</sup>, Krishnamra N<sup>1</sup>, Charoenphandhu N<sup>1,†</sup>

<sup>1</sup>. Department of Physiology, Faculty of Science, Mahidol University

<sup>2</sup>. Physiology Division, Preclinical Sciences, Faculty of Medicine, Thammasat University

\* Presenter, e-mail: lapmanee\_sarawut@hotmail.com

† Corresponding author, e-mail: naratt@narattsys.com

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### Abstract

Exercise training has long been considered a stressor that may lead to paradoxical changes in physical and mental health (e.g., cardiovascular benefit vs. emotional stress). The aims of this study were to evaluate the anxiolytic-like effect of endurance swimming (SW) on the anxiety-like behaviors in stressed rats, and to compare the anxiolytic efficacy between antidepressant drug treatments and SW. Male Wistar rats subjected to restraint stress (1 hour/day, 5 days/week) were trained to swim for 4 weeks with or without antidepressant drug treatments (i.e., 2 mg/kg diazepam; 10 mg/kg fluoxetine; 10 mg/kg reboxetine; or 10 mg/kg venlafaxine, p.o.). At the end of the treatments and/or SW, anxiety-like behaviors were determined by the elevated plus-maze (EPM) test, elevated T-maze (ETM) test, and open-field test (OFT). The results showed that the open arm activity in the EPM was higher in the SW, reboxetine-treated and venlafaxine-treated groups as compared to age-matched controls, while diazepam and fluoxetine were without effect. In the ETM, a reduction in the avoidance latency was observed only in SW and venlafaxine-treated groups. Neither SW nor drug treatments altered general locomotor activity as indicated by no change in the number of the total lines crossed in OFT. In conclusion, restraint stress could induce anxiety-like behaviors, which were not responsive to diazepam or fluoxetine, whereas reboxetine, venlafaxine and SW showed anxiolytic-like actions in the stressed male rats.

**Keyword:** anxiety, elevated plus-maze, elevated T-maze, open-field test, swimming

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# Regular Exercise ReversesSuppressions of Cardiac Contraction, SERCA Activity and $\alpha$ -MHC Expression In Orchidectomized Rat

PavaranaVutthasathien\*, JonggonneeWattanapermpool, TepmanasBupha-Intr  
Department of Physiology, Faculty of Science, Mahidol University, Bangkok 10400  
\*Presenter, e-mail: pawa\_46@hotmail.com

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## Abstract

A high incidence of heart disease in hypogonadal man indicates a crucial role of male sex hormones in cardiac function. Suppressions of both cardiac systolic and diastolic functions have been reported in orchidectomized (ORX) rat (1). We have recently reported decreases in SERCA activity and  $\alpha$ -MHC expression in ORX rat heart which could be reversed by testosterone supplementation (2). Unfortunately, the use of testosterone is precluded in some patients. We then tested whether regular exercise could prevent the contractile dysfunction in ORX rat. With the protocol approval by Experimental Animal Committee, Faculty of Science, Mahidol University, in accordance with guidelines of Guiding Principles for the Care and Use of Animals, adult male rats were divided into SHAM and ORX rats with/without regular exercise. One week after sham-operation or orchidectomy, exercised rats were subjected to a nine-week treadmill running program with moderate intensity. Results showed an induction of cardiac hypertrophy in both SHAM and ORX rats after regular exercise. Regular exercise not only prevented the suppressed maximum force contraction of cardiacmyofilament in ORX rat but further enhanced the cardiac contraction force in SHAM and ORX rats which may be resulted from exercise-induced myofilament  $Ca^{2+}$  hypersensitivity. The suppressed maximum activity but enhanced  $Ca^{2+}$  sensitivity of SERCA detected in the heart of sedentary ORX rat was also completely disappeared in exercised ORX rat. Moreover, the shift of  $\alpha$ -MHC toward  $\beta$ -MHC observed in the heart of ORX rat was abolished by regular exercise.

**Keywords** Regular exercise, Orchidectomy, Cardiac contraction, SERCA, Myosin heavy chain

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## Acknowledgements

This study was granted by Mahidol University.

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# Transcriptomic Analysis on Susceptibility of Different Inbred Chicken Lines towards Very Virulent Infectious Bursal Disease Virus Infection

Noor Farhanah Mohd Isa<sup>1\*</sup>, Mohd Hair Bejo<sup>1,2</sup>, Nurulfiza Mat Isa<sup>3</sup>, Aini Ideris<sup>1,2</sup>, Venugopal Nair<sup>4</sup>, Abdul Rahman Omar<sup>1,2</sup>

<sup>1</sup> Institute of Biosciences, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia

<sup>2</sup> Faculty of Veterinary Medicine, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia

<sup>3</sup> Faculty of Biotechnology and Biomolecular Sciences, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia

<sup>4</sup> The Pirbright Institute, Ash Road, Pirbright, Woking, GU24 0NF, UK

Email: farahisa88@gmail.com

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## Abstract

Infectious bursal disease virus (IBDV) is an economically important virus which affects the poultry industry worldwide. The virus is a causative agent for Gumboro disease which can cause high mortality rate in young chickens by infecting and destroying actively dividing IgM-bearing B lymphocytes in the bursa of Fabricius leading to immunosuppression. Previous studies have identified differential expression of immune-mediated genes related to inflammatory response in chickens with different genetic susceptibility to IBDV infections. However, the mechanisms of genetic resistance against IBD are not known. RNA sequencing through next-generation sequencing (NGS) technologies provide an excellent platform to study differentially expressed genes of known or unknown function to better define effective mechanism of host resistance. Therefore, this study is aimed at investigating susceptibility of different inbred chicken lines toward very virulent IBDV through transcriptomic analysis. This analysis allows for quantification of gene expression and identification of possible single nucleotide polymorphisms (SNPs), indels, and novel protein-coding sequence. RNA isolated from bursa of day 3 IBDV-infected and control chickens were used for Illumina sequencing. Bioinformatics analysis of this data will allow function annotation of differentially expressed genes, indicating possible roles in the response to infection. Gene of interest, virus detection and copy number variation between different lines will be validated using qPCR. Genes of interest that exhibit novel SNP and/or indels will be validated using siRNA experiments. This study is expected to provide information that able to decipher the genetic resistance of chickens towards IBDV infection.

**Keywords:** Infectious bursal disease virus, next-generation sequencing, transcriptome

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## Acknowledgments:

The bursal tissues were kindly provided by V. Nair. We would like to thank Codon Genomics for helpful discussion in bioinformatics analysis.

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# Overexpression of Urokinase plasminogen activator (uPA) contributes to cholangiocarcinoma

Parichut Thummarati<sup>1\*</sup>, Sitsom Wijitburapat<sup>1</sup>, Banchob Sripa<sup>2</sup>, Tuangporn Suthiphongchai<sup>1</sup>

<sup>1</sup> Department of biochemistry, Faculty of Science, Mahidoluniversity

<sup>2</sup> Department of pathology, Faculty of Medicine, Khonkean university

\*Presenter, e-mail: parichutt@gmail.com

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## Abstract

Cholangiocarcinoma (CCA) refers to a primary malignancy of the bile duct epithelial cell. This cancer is rare worldwide, but the highest incidence is found in Northeast Thailand, where it is associated with liver fluke, *Opisthorchis viverrini*, infection. Most patients present with an advanced stage with high infiltration of the cancer into surrounding tissues and metastasis, resulting in poor 5-year survival rate. Cancer progression is a complex process involving, among other others, proteolysis of extracellular matrix (ECM). Urokinase plasminogen activator (uPA) is a serine protease, which plays a role in degradation of ECM components during cancer cell invasion, and is a potential target for cancer chemotherapy, especially in preventing metastasis. In this study, immunohistochemical analysis was used to show positive staining of uPA in 75% (131/174) of CCA tissues and high uPA expression level significantly correlating with local invasion and distant metastasis (*p-value* of 0.005 and 0.048 respectively). Previous studies from our laboratory have shown that cholangiocarcinoma cell line, KKU-M213 express higher levels of uPA compared with immortalized cholangiocyte H69 cell line. Moreover, suppression of uPA by anti-uPA siRNA in KKU-M213 cells reduced *in vitro* invasiveness by 50 ± 4% compared to non-targeting siRNA control. The disruption of uPA expression by siRNA also suppressed KKU-M213 cell migration using an *in vitro* wound healing assay, but did not have any effect on cell proliferation (MTT assay).

**Keyword** Urokinase plasminogen activator, cholangiocarcinoma, metastasis

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## Acknowledgements

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# Antibiotic and plasmid profiles of *Aeromonashydrophila* isolated from clinically infected freshwater fishes (*Oreochromismossambicus*, *Puntiusgonionotus*, *Leptobarbushoevenii*, *Pangasiuspangasius*, *Anabas testudineus*, *Clariasgariepinus* and *Cichlasoma* sp.)

Ruhil Hayati Hamdan  
Faculty of Veterinary Medicine, Universiti Putra Malaysia  
Ruhil Hayati Hamdan, e-mail: ruhilhayati1982@gmail.com

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## Abstract:

*Aeromonashydrophila* is one of the most important aquatic pathogen affecting cultured and feral fishes worldwide. Disease infection resulted in million dollar loses to aquaculture. Antibiotic resistance is increasing among pathogenic bacteria due to the extensive and indiscriminate use of antibiotics and other chemotherapeutants in fish farms. The antibiotics and chemotherapeutants are used either to prevent or cure fish diseases. Both are employed as feed additives or dissolved directly into the water. In present study, it was found that *A. hydrophila* was sensitive to peptidyltransferase and most of the aminoglycoside group, while it was resistance to  $\beta$ -lactams group. Present study provided an early warning of antibiotic resistance in *A. hydrophila*. Significantly, the Multiple Antibiotic Resistance (MAR) Index was 0.45. The current results indicated that the *A. hydrophila* in these farmed fish might have been indiscriminately and continuously exposed to those antibiotics during their culturing stages. The genetic determinants of antibiotic resistance are located extrachromosomally and the ability to transfer the drug resistance was used to indicate the presence of R-Plasmids. Plasmids isolation was thus carried out from *A. hydrophila*. It was found that all of the *A. hydrophila* strains harboured plasmids. Constant monitoring should be done in order to obtain more information on antibiotic sensitivity of *A. hydrophila* and other known pathogenic aquatic bacteria species in order to avoid the development of antibiotic resistant superbug.

**Keywords:** *Aeromonashydrophila* , Antibiotic , Plasmid profiling , Freshwater fishes



# Characterization of fusion luciferase from *Vibrio campbellii*: A development toward reporter gene applications

Ruchanok Tinikul<sup>1\*</sup>, Kittisak Thotsaporn<sup>2</sup>, Wichit Thaveekarn<sup>1</sup>, Sarawut Jitrapakdee<sup>3</sup>, Pimchai Chaiyen<sup>1</sup>

<sup>1</sup>Department of Biochemistry and Center of Excellence in Protein Structure and Function, Faculty of Science, Mahidol University, Rama 6 Road, Bangkok 10400, Thailand

<sup>2</sup>Department of Biochemistry, Faculty of Dentistry, Chulalongkorn University, Henri-Dunant Road, Bangkok 10300, Thailand

<sup>3</sup>Department of Biochemistry, Faculty of Science, Mahidol University, Rama 6 Road, Bangkok 10400, Thailand

\*E-mail: ruchanokti@yahoo.com

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## Abstract

Bacterial luciferase from *Vibrio campbellii* is a thermostable enzyme with an *in vitro* thermal inactivation half-life of ~1020 min at 37°C. The enzyme also binds tightly to reduced FMN. In this study, a *V. campbellii* fusion luciferase construct in which the  $\alpha$  and  $\beta$  subunits are linked with a decapeptide was made and characterized. In general, the overall enzymatic properties of the two enzymes are similar. Expression of the enzymes in *E. coli* demonstrated that the *V. campbellii* fusion luciferase emits less light than the native luciferase, but still emits a much greater amount of light than native luciferase from *Vibrio harveyi* and *Photobacterium leiognathi* TH1. The intensity of light emitted by the *V. campbellii* fusion luciferase was more than 80-fold greater than that from the *V. harveyi* native luciferase when expressed at 37°C. Biochemical characterization has shown that the *V. campbellii* fusion luciferase also retains a high binding affinity for reduced flavin mononucleotide and high thermostability. The levels of bioluminescence emitted by the *V. campbellii* fusion luciferase expressed in HEK293T cells reached  $\sim 1 \times 10^6$  Relative Light Units/mg total protein. These findings suggest that the *V. campbellii* fusion luciferase is a promising candidate for further development as a luciferase-based reporter for eukaryotic systems.

**Keywords:** luciferase, oxygenase, bioluminescence, flavin, *Vibrio campbellii*

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## Polyphenolic compounds and potential antioxidant properties from a green microalgae, *Tetraselmis tetrahele* (Butcher, 1959)

NurulFarahinAbd. Wahab<sup>1\*</sup>, Fatimah Md. Yusoff<sup>1,2\*</sup>, Norio Nagao<sup>1</sup>, Mahiran Basri<sup>3</sup> and Mohamed Shariff Mohamed Din<sup>4</sup>

<sup>1</sup>Laboratory of Marine Biotechnology, Institute of Bioscience, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia

<sup>2</sup>Department of Aquaculture, Faculty of Agriculture, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia

<sup>3</sup>Department of Chemistry, Faculty of Science, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia

<sup>4</sup>Department of Veterinary Clinical Studies, Faculty of Veterinary Medicine, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia

\*\*Presenter's e-mail: nfarahin\_wahab@yahoo.com

### Abstract

*Tetraselmis tetrahele* is a marine four-flagellated prasinophyte and forms one of the important microalgae as feed in aquaculture due to its high nutritional and antioxidant contents. *Tetraselmis tetrahele* also contains bioactive compounds such as flavonoids and polyphenols, which makes it a suitable raw material for cosmeceutical product development. Due to its eurythermal and euryhaline characteristics, this indigenous microalga can be easily mass produced in large bioreactors. The antioxidant activity of indigenous microalgae, *Tetraselmis tetrahele* (UPMC-A0007) cultured in two different media (F2 and Conway) using 100L annular photo-bioreactor for 56 days was determined. During the culture period, the microalgal biomass was collected six times to check the total phenolic (TPC) and antioxidant contents. The antioxidant activities on *T. tetrahele*'s crude extract were determined by DPPH, FRAP and ABTS measurements. There was no significant difference ( $p > 0.05$ ) in the antioxidant property between the algae cultured in F2 and Conway media. However, two groups of cell size; small cell size (0.025-0.05g/cells) and big cell size (0.055-0.08g/cells) were observed only in F2 media. The group of small cell size showed 1.6 times higher total phenolic content ( $90.98 \pm 2.05$  mg GAE/g) than that of big cell size. The average TPC ( $32.08 \pm 3.81$  mg GAE/g) also was high compared to commercial microalgae; *Spirulina platensis* and *Chlorella vulgaris* with  $24.00 \pm 1.14$  mg GAE/g and  $20.61 \pm 1.40$  mg GAE/g respectively. These results suggest that *T. tetrahele* is a potential antioxidant source and the effective antioxidant production can be achieved by controlling the cell size in their culturing process.

**Keywords:** *Tetraselmis tetrahele* (UPMC-A0007), photobioreactor, antioxidant activity, F2 media, Conway media, indigenous

### Acknowledgements

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# Development of Bacterial Polyhydroxyalkanoate Nanoparticles for Photodynamic Therapy

Sasivimon Pramual<sup>1\*</sup>, Nungnit Wattanavichean<sup>1</sup>, Pitirat Pholpabu<sup>1</sup>, Apinya Assavanig<sup>1</sup>,  
Kriengsak Lirdprapamongkol<sup>3</sup>, M.R. Jisnuson Svasti<sup>2,3</sup>, Nuttawee Niamsiri<sup>1</sup>

<sup>1</sup> Department of Biotechnology, Faculty of Science, Mahidol University, Bangkok, Thailand

<sup>2</sup> Center of Excellence in Protein Structure and Function, Faculty of Science, Mahidol University, Bangkok, Thailand

<sup>3</sup> Laboratory of Biochemistry, Chulabhorn Research Institute, Bangkok, Thailand

\*Presenter's e-mail: hare\_007@hotmail.com

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## Abstract

Photodynamic therapy (PDT) is a clinical procedure that holds a great potential for treating cancers. This strategy provides a more selective mean to cause tumor destruction and gives the option of repeated treatments. PDT involves three components: a photosensitizer (PS), light source and oxygen. PS is exposed to an appropriate wavelength of light so as to generate cytotoxic singlet oxygen for killing cancer cells, while leaving the healthy cells undamaged. Although the hydrophobicity of PS is preferable for localization of drugs towards cancer tissues, however the clinical efficacy of PDT has been hampered by the difficulty in administering these hydrophobic PS intravenously. Hence, there is a great interest in developing novel biodegradable sub-200 nm nanoparticles as a delivery system to improve the solubility of the PS while still maintaining its activity. In this study, we successfully developed PS-loaded nanoparticles made from biodegradable and biocompatible polyesters polyhydroxyalkanoates (PHAs). Here, PHAs with the same range of MW but varied in their monomer compositions were used to prepared sub-200 nm nanoparticles by emulsification-diffusion methods with narrow size distributions. The formulations of PS-loaded PHA nanoparticles were subjected to various characterizations. The preliminary *in vitro* photocytotoxicity of these nanoparticles were evaluated on HT-29 human colon adenocarcinoma cell line. This study provides an interesting proof of concept for using PHA nanoparticles for PDT. Nanoencapsulation of p-THPP in PHAs enhanced its *in vitro* activity, thus allowing the use of lower drug dose.

**Keyword** Photodynamic therapy, Polyhydroxyalkanoates, Polymeric nanoparticles, Drug delivery

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## Acknowledgements

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## Ammonium uptake by two fresh water periphytic microalgae immobilized in alginate beads

Norulhuda Mohamed Ramli<sup>1,2,3\*</sup>, Fatimah Md Yusoff<sup>2</sup>, Marc Verdegem<sup>3</sup>, Mohamed Shariff Mohamed Din<sup>2</sup>, Johan Verreth<sup>3</sup>

<sup>1</sup> Department of Biological and Agricultural Engineering, Faculty of Engineering, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia

<sup>2</sup> Institute of Bioscience, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia

<sup>3</sup> Aquaculture and Fisheries Group, Wageningen University, P.O. Box 338, 6700 AH, Wageningen, The Netherlands

\*Presenter, e-mail: [huda@eng.upm.edu.my](mailto:huda@eng.upm.edu.my)

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### Abstract

Microalgae play a significant role in nutrient recycling in aquatic ecosystem. Many species of microalgae have been isolated, cultured, and studied in laboratory to explore their potential use in aquaculture. In this study, two microalgae *Spaerocystis* sp. and *Stigeoclonium* sp., were isolated from aquaculture tanks in Aquatic Animal Health hatchery, Universiti Putra Malaysia. This study tested the capability of the microalgae cultured normally and immobilized in sodium alginate for uptake of ammonium. Between *Spaerocystis* sp. and *Stigeoclonium* sp., no difference was found on ammonium uptake. However, it was found that there was significantly higher ( $P < 0.05$ ) ammonium uptake by microalgae immobilized in sodium alginate than microalgae in normal culture. This higher uptake of ammonium by the immobilized microalgal beads maybe due to ammonium assimilation by microalgae and adsorption on alginate beads.

**Keyword** immobilized microalgae, periphytic microalgae, *Spaerocystis* sp., *Stigeoclonium* s.p

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### Acknowledgements

The author would like to thank the Ministry of Higher Education, Malaysia for financial support of the study.

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**Abstract**

**Graduate Forum**

**Food Science and Agriculture**

**(FA Group)**

**Chairperson of the Food Science and Agriculture Session**

**13 December 2012**

10.45 – 12.00    Assoc.Prof. Dr. Ed Sarobol  
                         Assist.Prof.Dr. Sompid Samipak

13.00 – 16.35    Assoc.Prof. Dr. Ed Sarobol

**14 December 2012**

10.45 – 12.00    Dr. SasitornTongchitpakdee

13.00 – 16.35    Dr. KullanartTongchao  
                         Dr. Kriskamol Na-Jom

**Student presentation list: Food Science and Agriculture**  
**Meeting Room, 1<sup>st</sup> Floor, Stang Mongkolsuk Building, MUSC**

**Thursday 13<sup>th</sup> of December 2012**

<b>Time</b>	<b>Topic</b>	<b>Presenter</b>	<b>Institution</b>
10.45-11.10 <b>FA 1</b>	Development of Food Gel for Oral Cancer Patients with Chewing and Swallowing Difficulties	Ms Panitnart Kanjanatiwat	Institute of Nutrition, Mahidol University
11.10-11.35 <b>FA 2</b>	Antimicrobial Properties of <i>Musa spp.</i> By-products and its application in Food Model.	Mr. Tin Hoe Seng,	School of Food Science and Nutrition, Universiti Malaysia Sabah
11.35-12.00 <b>FA 3</b>	Evidence of different starch origins on menthone inclusion complexes	Miss Jeesuda Keatkrai	Kasetsart University
	<b>Lunch</b>		
13.00-13.25 <b>FA 4</b>	Effect of Gamma Irradiation on the Physicochemical and Morphological Properties of Corn Starch with Different Amylose Content	Mr. Chung Kok Heung	School of Food Science and Nutrition, Universiti Malaysia Sabah
13.25-13.50 <b>FA 5</b>	Effect of Drying on Association of Asiatic acid and Mungbean Protein Hydrolysate	Ms. La-ongdao Wongekalak	Kasetsart University
13.50-14.15 <b>FA 6</b>	Categorization of Thai fish sauce based on volatile compounds and aroma characteristics	Mr. Jetsada Wichaphon	Faculty of Science, Mahidol University
14.15-14.40 <b>FA 7</b>	Assessment of nutritional and mineral composition of different parts of <i>Schismatoglottis bauensis</i>	Ms. Sarega a/p Nadarajan	Institute of Bioscience Universiti Putra Malaysia,
14.40-15.10 <b>FA 8</b>	Effects of Ethephon and Cow Dung on Growth and Yield of Corn under Drought Condition	Bhop Burapatpong	Kasetsart University
15.10-15.15	<b>refreshment</b>		
15.20-15.45 <b>FA 9</b>	Usage of Pennywort ( <i>Centella asiatica</i> ) in Herbal Ice Cream	Ms. Nurul'azah Mohd. Yaakub	School of Food Science and Nutrition, Universiti Malaysia Sabah
15.45-16.10 <b>FA 10</b>	Improving production of purified Konjac Glucomannan from <i>Amorphophallus muelleri</i> by multistage drying	Miss Rarisara Impaprasert	Chulalongkorn University
16.10-16.35 <b>FA 11</b>	Nutritional quality of tropical black long-spined sea urchin, <i>Diadema setosum</i> gonad: A comparative analysis of male and female gonads	Mr. Nicholas Khong Mun Hoe	Institute of Bioscience, Universiti Putra Malaysia
16.35-17.00 <b>FA 12</b>	COMPOSITE BOARD MADE FROM MIXTURE OF OIL PALM ( <i>Elaeis guineensis</i> ) FROND AND PINEAPPLE ( <i>Ananas comosus</i> ) LEAF FIBER	Ms. Siti Marlia Mohd Don	Faculty of Earth Sciences, Universiti Malaysia Kelantan

## Friday 14<sup>th</sup> of December 2012

(Meeting Room, 1<sup>st</sup> Floor, Stang Mongkolsuk Building, MUSC)

Time	Topic	Presenter	Institution
10.45-11.10 <b>FA 13</b>	Effects of Sorbitan-based Surfactants on the Early-Stage Crystallization of Cocoa Butter	Mr. Pawitchaya Podchong	Silapakorn University
11.10-11.35 <b>FA 14</b>	Properties of High Strength, Durable and Economically viable Composites Lumber from cultivated Bamboo <i>Gigantochloa scortechinii</i> and Christmas grass <i>Themeda arguens</i> (L.) Hack	Ms. Amirah Mohd Fikri	Faculty of Earth Science, Universiti Malaysia Kelantan
11.35-12.00 <b>FA 15</b>	Study on the best growing variety of onion on the hilly land of Jeli, Kelantan, Malaysia	Ms. Nor Razanah Che Ibrahim	Faculty of Agro-Based Industry, Universiti Malaysia Kelantan
	<b>Lunch</b>		
13.00-13.25 <b>FA 16</b>	Plant growth promoting effects by co-inoculation of endophytic bacteria and actinomycetes isolated from sugarcane	Mr. Worarat Kruasuwan	Kasetsart University
13.25-13.50 <b>FA 17</b>	Review: composting of agricultural waste with fungal inoculants	Ms. Fadzilah Kalamahidan	School of Sustainable Agriculture, Universiti Malaysia Sabah
13.50-14.15 <b>FA 18</b>	Molecular structure of repetitive element in the water monitor lizard ( <i>Varanus salvator macromaculatus</i> , Platyntota, Squamata)	Ms. Nampech Chaiprasertsri	Kasetsart University
14.15-14.40 <b>FA 19</b>	Potential of condensed tannins from <i>Leucaena leucocephala</i> hybrid on methane mitigation in ruminants	Mr. Saminathan a/l Poothan Mookiah	Institute of Bioscience, Universiti Putra Malaysia
14.40-15.10 <b>FA 20</b>	Aflatoxin B <sub>1</sub> -degrading activity of <i>Bacillus</i> spp., isolated from fermented cereal products	Ms. Namon Watanakij	Thammasart University
15.10-15.15	<b>Refreshment</b>		
15.20-15.45 <b>FA 21</b>	Characterisation of MicroRNAs in pineapple and development of artificial miRNA strategies for gene silencing	Ms. Noor Hydayaty Md. Yusuf	Biotechnology Research Institute, Universiti Malaysia Sabah

# Development of Food Gel for Oral Cancer Patients with Chewing and Swallowing Difficulties

Panitnart Kanjanatiwat<sup>1\*</sup>, Visith Chavasit<sup>1</sup>, Dunyaporn Trachootham<sup>2</sup>, Nattapol Tangsuphoom<sup>1</sup>

<sup>1</sup> Food Cluster, Institute of Nutrition, Mahidol University, Salaya, Nakhon Pathom, Thailand

<sup>2</sup> Faculty of Dentistry, Thammasat University Rangsit Campus, Klong Luang, Pathum Thani, Thailand

\*Presenter, e-mail: papano\_w@hotmail.com

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## Abstract

Use of tube feeding can increase risk of infection and cause late dysphagia in long term. Shelf-stable food gels were developed with appropriate physical and nutritional qualities as well as acceptable sensory characteristics for patients with chewing and swallowing difficulties. Agar, gelatin, konjac and xanthan gum were used for preparing gels of different physical characteristics at pH values of >4.6 and <4.6, heating at 121.5 or 100°C for 5 min and homogenization. Fourteen medical doctors, dentists and nurses selected the gel of appropriate physical characteristics (gel strength, hardness and water holding capacity were 25.72±1.76 g, 257.81±16.46 g and 99.90±0.04%, respectively) for use as the prototype. Nutrient sources included maltodextrin and sucrose for carbohydrates, lactose-hydrolyzed milk and whey protein for protein, and milk fat and rice bran oil for fat. The food gels provided 1-1.1 kcal per 1 ml, of which 55-57%, 16-18% and 27.27% of energy were from carbohydrate, protein and fat, respectively. Two flavors of gel included tea (pH>4.6) and mango (pH<4.6). The gels were treated (UHT) for 4 s at 140°C and 100°C for tea and mango flavors, respectively. The gel hardness of tea- and mango-flavored food gels were 235.03±18.76 g and 363.99±9.47 g, respectively. Average sensory acceptability scores of tea and mango flavors were 3.87±0.57 and 3.14±1.08 on 5-point smiley scale using home-use test by 30 oral cancer patients, respectively. The patients could chew and swallow the gels without choking. The UHT food gels had a shelf life of 1 year at room temperature.

**Keyword:** Chewing Problem / Swallowing Problem / Gel / UHT / Malnutrition

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## Acknowledgements

This study is funded by the Dental Innovation Foundation under Royal Patronage. The authors would like to thank staffs and patients of Mahavajiralongkorn Cancer Center, Pathum Thani, Thailand for their contributions in sensory evaluation.

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## Antimicrobial Properties of *Musa* spp. By-Products and its Application in Food Model

Hoe Seng Tin<sup>1</sup>, Fook Yee Chye<sup>1</sup>, Mohd Ismail Abdullah<sup>1</sup> and Charles S. Vairappan<sup>2</sup>

<sup>1</sup>School of Food Science and Nutrition, Universiti Malaysia Sabah, UMS Road 88400 Kota Kinabalu, Sabah, MALAYSIA

<sup>2</sup>Institute for Tropical Biology and Conservation, Universiti Malaysia Sabah, UMS Road 88400 Kota Kinabalu, Sabah, MALAYSIA

\*Presenter, e-mail: mhstin@gmail.com

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### Abstract

This study aimed to investigate the antibacterial potential of banana by-products and the application of the selected bioactive fractions as bio-preservative using food model. Results showed the methanolic extract obtained from banana inflorescence (buds) of *Musa balbisiana* cv. Saba having the highest antibacterial activity against *Staphylococcus aureus* (SA), *Bacillus cereus* (BC), *Listeria monocytogenes* (LM) and *Vibrio parahaemolyticus* (VP). The extraction parameters were optimized using response surface methodology (extraction time: 6.0 h, extraction temperature: 35°C, methanol to water percentage: 94% v/v) for an enhanced inhibitory activity against the tested bacterial. Methanolic-water fraction (H<sub>2</sub>O Fr.) and SPE-fraction 3 (BWF-3) gave the most prominent antibacterial activity (MIC H<sub>2</sub>O Fr.: 8.0 mg/ml – 25.0 mg/ml, MIC BWF-3: 0.6 mg/ml – 2.5 mg/ml) against SA, BC, LM and VP. Epigallocatechin and its derivatives, tryptophan, and vanillic-glucoside were identified in BWF-3 fractionated from water partition using LC-ESI-MS/MS. Food model based on decontamination of carrot cubes using BWF-3 effectively suppressed the growth of LM for seven consecutive days in chilled (4°C) storage, which is comparable to sodium hypochlorite at the concentration of 100 ppm. Microscopic examination revealed an altered cell membrane to the *L. monocytogenes* that was exposed to the bioactive BWF-3. Additionally, survival of the pathogenic bacteria increased with the fortification of ferum (II) and (III) at concentration as low as 1mM but not for calcium, magnesium, manganese and glucose. In conclusion, bioactive fraction obtained from banana inflorescence could be potential used as natural decontaminating agent for minimally processed foods replacing the current industrial synthetic antibacterial agents.

**Keyword:** banana inflorescences, methanol extract, antimicrobial, food composition, LC-ESI-MS/MS

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### Acknowledgements

The author would like to thanks Ministry of Agriculture for species identification, Ministry of Science, Technology and Innovation for research grant under E-Science Fund and scholarship under National Science Fellowship.

# Evidence of Different Starch Origins on Menthone Inclusion Complexes

Jeesuda Keatkraj<sup>1,2\*</sup>, Wanee Jirapakkul<sup>1,2</sup>

<sup>1</sup>Department of Food Science and Technology, Faculty of Agro-Industry, Kasetsart University, Ngam Wong Wan Road, Bangkok 10900, Thailand.

<sup>2</sup>Center of Advanced Studies for Agriculture and Food, Institute for Advanced Studies, Kasetsart University, Bangkok 10900, Thailand (CASAF, NRU-KU, Thailand).

\*Presenter, e-mail: jeesuda@hotmail.com

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## Abstract

Amylose has been recognized to be responsible for inclusion complex. Three native starches (mungbean, rice and tapioca starch) were selected in order to determine the ability of different starches on menthone inclusion complexes. High performance size exclusion chromatography (HPSEC) showed that mungbean starch had highest amylose content, followed by rice starch and tapioca starch, respectively. After complexation, macroscopic and microscopic changes were observed for all starches. Mungbean complex gave the highest menthone entrapment. Typical V7 pattern of crystalline were identified by wide angle x-ray diffractometer (WAXD) for both mungbean and tapioca complexes, while rice complex was not well organized. According to differential scanning calorimetry (DSC) analysis, thermogram of mungbean and tapioca complexes revealed the thermoreversible event. From this study, the evidence of high ability to form an inclusion complex with menthone of mungbean starch could be used as the new molecular encapsulation materials for aroma compounds.

**Keyword** Starch, Inclusion complex, Menthone

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## Acknowledgements

A part of this research was funded by Center of Advanced Studies for Agriculture and Food, Institute for Advanced Studies, Kasetsart University, Bangkok 10900, Thailand (CASAF, NRU-KU, Thailand).

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# **Effect of Gamma Irradiation on the Physicochemical and Morphological Properties of Corn Starch with Different Amylose Content**

K. H. Chung\*<sup>1</sup>, Othman Z<sup>2</sup>, and J. S. Lee<sup>1</sup>

<sup>1</sup> School of Food Science and Nutrition, University Malaysia Sabah, Jalan UMS, 88400 Kota Kinabalu, Sabah, Malaysia.

<sup>2</sup> Malaysian Nuclear Agency, Ministry of Science, Technology and Innovation Malaysia, Bangi, 43000 Kajang, Selangor Darul Ehsan, Malaysia

K. H. Chung, e-mail: kh\_humphrey85@yahoo.com

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## **Abstract**

This study reported is part of the attempt to elucidate how amylose-to-amylopectin ratio in starch would affect the gamma irradiation. Corn starches with different amylose-to-amylopectin ratio (waxy, normal, Hylon V, and Hylon VII) were treated with five doses of gamma irradiation (1 kGy, 5 kGy, 10 kGy, 25 kGy, and 50 kGy). The effects of gamma irradiation on the apparent amylose content and thermal behaviour (both watery and dense suspension system) of starch samples were investigated. Results obtained showed that the reduction in apparent amylose content increased with the amylose-to-amylopectin ratio in the starches when underwent irradiation at 25 kGy and 50 kGy. DSC study indicated that starches with high amylose content (Hylon V and Hylon VII) showed thermograms with lower peak and broader gelatinization temperature range (TC - To), whereas samples with higher amylopectin content (normal and waxy) demonstrated sharper peak and narrower gelatinization temperature range. Starches under dense suspension displayed similar thermal behaviours as compared to the watery one ( $p > 0.05$ ). A significant decrease in the gelatinization temperature was observed for Hylon V, Hylon VII and waxy samples that irradiated with dose of 25 kGy and 50 kGy. Cracks on granule of high amylose content starches have also been observed under SEM. X-RD and RVA study has also been carried out to observe the degradation and crystallinity changes of irradiated starches. In conclusion, the amylose-to-amylopectin ratio in corn starches influenced the degradation induced by gamma irradiation and consequently altered their physicochemical and morphological properties.

**Keywords:** Gamma irradiation, corn starch, physicochemical properties, morphological properties

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# Effect of Drying on Association of Asiatic acid and Mungbean Protein Hydrolysate

La-ongdao Wongekalak<sup>1\*</sup>, Parichat Hongsprabhas<sup>1</sup>

<sup>1</sup>Department of Food Science and Technology, Faculty of Agro-Industry, Kasetsart University, Bangkok, Thailand

\*Presenter, e-mail: g5190017@ku.ac.th

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## Abstract

This study investigated the influences of carbohydrate excipients on the characteristics of reconstituted freeze-dried mungbean protein hydrolysate (MPH) co-dried with asiatic acid (AA) and the potential use of MPH as carrier for amphiphilic pentacyclic triterpene AA. MW profile of MPH throughout tryptic hydrolysis process was in the same range of below 10.7 kDa. Z-average size of MPH are around 100-400 nm throughout hydrolysis time.  $\zeta$ -potential of MPH significantly increased after hydrolysis ( $p < 0.05$ ) and it was high enough to inhibit the aggregation of peptides. ORAC<sub>FL</sub> and TEAC antioxidant capacity of mungbean proteins were significantly increase after hydrolysis ( $p < 0.05$ ). Presence of AA did not affect antioxidant capacity of MPH-AA mixture. High MW excipient like a maltodextrin significantly decreased ( $p < 0.05$ ) the aggregation of MPH and MPH-AA. Antioxidant capacity of fresh MPH was 0.67 and 0.46  $\mu\text{mol Trolox equivalent (TE)}/\text{mg protein}$  that measured by ORAC<sub>FL</sub> and TEAC assays respectively. Freeze-drying in lactose excipient reduced the antioxidant capacity of MPH to 0.48  $\mu\text{mol TE}/\text{mg protein}$  in ORAC<sub>FL</sub> assay and 0.47  $\mu\text{mol TE}/\text{mg protein}$  in TEAC assay ( $p < 0.05$ ). However, lactose-maltodextrin (1:1) and maltodextrin lowered the antioxidant capacity of MPH to less than 0.30  $\mu\text{mol TE}/\text{mg protein}$  in both ORAC<sub>FL</sub> and TEAC assays ( $p < 0.05$ ) although the high MW excipient decrease the aggregation of MPH. Overall, these results suggested that MPH had potential use as an antioxidative hydrolysate and as a carrier for AA. Nonetheless, roles of the high MW carbohydrate excipient on the reduction of antioxidant capacity of MPH requires for the investigation.

**Keyword** aggregation, protein, antioxidant capacity, asiatic acid, drying

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## Acknowledgements

The financial supports from the Royal Golden Jubilee Ph.D. Program and Kasetsart University Research are gratefully acknowledged.

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## Categorization of Thai fish sauce based on volatile compounds and aroma characteristics

Jetsada Wichaphon<sup>1\*</sup>, Wilatsana Posri<sup>2</sup>, Apinya Assavanig<sup>1</sup>, Chaufah Thongthai<sup>3</sup> & Sittiwat Lertsiri<sup>1</sup>

<sup>1</sup>Department of Biotechnology, Faculty of Science, Mahidol University, Bangkok, 65000, Thailand

<sup>2</sup>Department of Food Technology, Faculty of Technology, Khon Kaen University, Khon Kaen, 40002, Thailand

<sup>3</sup>Department of Microbiology, Faculty of Science, Mahidol University, Bangkok, 65000, Thailand

\*Presenter, e-mail: artakung@yahoo.co.uk

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### Abstract

Fish sauce is a clear reddish brown seasoning commonly used in most parts of Southeast Asia and East Asia. The unique aroma of fish sauce is the result of a complex blend of volatile compounds originated during the ripening process of fermentation. Profiling of odor-active compounds and sensory aroma was approached for categorization of 52 Thai commercial products (Nampla) instead of using conventional standards of total nitrogen content (TN).

Eleven odor-active compounds including trimethylamine, 2-butanol, *n*-propanol, dimethyl trisulfide, 1-octen-3-ol, acetic acid, methional, propanoic acid, 2-methylpropanoic acid, butanoic acid and 3-methylbutanoic acid were the compounds in common among all fish sauce samples. The highest odor-activity value (OAV) demonstrated that methional was the most contributed compound to the aroma of Thai fish sauce. Apart from the attributes of salty and anchovy-like odors which represented the aroma characteristics of Thai fish sauce; the sour odor distinctively discriminated the fish sauce samples. Moreover, the sour odor exhibited the relation to volatile organic acids. Fish sauces with low-TN exhibited high level of these attributes. On the other hand, methional together with 1-octen-3-ol, 2-butanol, *n*-propanol and trimethylamine contributed to the characteristics of high-TN fish sauces giving odor attributes of shrimp paste-like, anchovy-like, sweet and fishy odors.

**Keyword:** fish sauce, sensory aroma profiles, odor-active compounds, product categorization

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### Acknowledgements

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## Assessment of nutritional and mineral composition of different parts of *Schismatoglottisbauensis*

\*Nadarajan Sarega<sup>1,2</sup>, Shahid Iqbal<sup>1,3</sup>, Kim Wei Chan<sup>1</sup> and Maznah Ismail<sup>1,2</sup>

<sup>1</sup>Laboratory of Molecular Biomedicine, Institute of Bioscience, Universiti Putra Malaysia, UPM Serdang 43400, Selangor, Malaysia.

<sup>2</sup>Department of Nutrition and Dietetics, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia, UPM Serdang 43400, Selangor, Malaysia.

<sup>3</sup>Department of Chemistry, University of Sargodha, Sargodha-40100-Pakistan

\*Presenter, e-mail : NadarajanSarega, sarega5166@gmail.com

### Abstract

The study was carried out to assess nutritional and mineral composition of dried whole plant, leaf, stem, rhizome and root of *Schismatoglottisbauensis*. Proximate analysis was carried out by measuring total protein, fats, carbohydrate, ash and moisture contents following official methods of Association of Official Analytical Chemists. Macro- (Ca, Na, K) and micronutrients (Fe, Cu, Zn) were analyzed using atomic absorption spectrometry. Results revealed that dried whole plant showed highest crude fats and moisture content, whilst dried leaf exhibited the highest percentage of crude protein, and dried rhizome had the highest carbohydrate content. The calorific values for whole plant, leaf, stem, rhizome and root were 288.52, 309.19, 267.10, 303.71, and 295.37 kcal/ 100 g, respectively. Major minerals present in all the tested samples were potassium and calcium ranging from 2714 to 7213 mg/100 g and 216 to 1517 mg/100 g, respectively. Overall, the findings indicate this plant to be a good source of nutrient and minerals, which could be exploited as a valuable material for functional foods or nutraceuticals.

**Keywords:** Proximate, nutritional, mineral, *Schismatoglottisbauensis*, Keladi Jantung, plant.

### Acknowledgements

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# Effects of Ethephon and Cow Dung on Growth and Yield of Corn under Drought Condition

Bhop Burapatpong<sup>1\*</sup>, Ed Sarobol<sup>1\*\*</sup>, Surapol Chowchong<sup>2</sup> and Sutkhet Nakasathien<sup>1</sup>

<sup>1</sup>Department of Agronomy, Faculty of Agriculture, Kasetsart University, Bangkok 10900

<sup>2</sup> National Corn and Sorghum Research Center, Pakchong district, Nakhon Ratchasima province 30320

\*Presenter, email: bhopfung@hotmail.com \*\* Corresponding author, e-mail: agreed@ku.ac.th

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## Abstract

This research aimed at investigating the effects of cow dung with different ethephon rates on growth and yield of corn in the dry season. SW 4452 was grown in a split plot in RCBD with 4 replications. The main plots were cow dung rates ( $C_1$ = cow dung 0 ton/ rai and  $C_2$  = cow dung 1 ton/ rai). The sub plots were 3 rates of 3% ethephon (0, 1.5 and 3.0 l/ rai) under different water regimens in which stressed and non-stressed conditions. The results revealed that under both conditions, corn grain yields were not significantly different. The trend was that corn with cow dung yielded greater than without cow dung. Cow dung improved soil water holding capacity as observed from tensiometer reading values ( $C_1$  vs  $C_2$  = 55.34 vs 52.22 cbar under stressed and 25.83 vs 25.17 cbar under non-stressed conditions). Greater ethephon rates tended to reduce corn grain yields. Cow dung tended to increase plant height and LAI of corn under both conditions. Finally, greater ethephon rates shorten corn plant height and reduced LAI, thus, reducing crop water use. As a consequence, soil water was saved for corn use at later stages of growth, when stressed was subsided.

**Key Words:** Hybrid corn, cow dung, ethephon, water stress, yield

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## Acknowledgements

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## **Usage of Pennywort (*Centellaasiatica*) in Herbal Ice Cream**

Nurul'azahMohdYaakub, Sharifudin Md. Shaarani and Patricia Matanjun

<sup>1</sup> School of Food Science and Nutrition, Universiti Malaysia Sabah, Kota Kinabalu, Sabah, Malaysia.

\*Presenter, e-mail: fatihah@ums.edu.my

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### **Abstract**

The aim of this study was to determine its optimized formulations, some nutritional data, antioxidant and rheological properties of pennywort (*Centellaasiatica*) herbal ice cream. The optimization of ingredients in the formulations of pennywort (*Centellaasiatica*) herbal ice cream was achieved using central composite design (CCD) by response surface methodology (RSM) with Design-Expert 6.0.4. The antioxidant and rheological properties of ice cream were evaluated to determine the potential of using pennywort powder as a value added ingredient in ice cream. Three independent variables tested are pulverized pennywort powder (2 – 8 g/kg), non fat milk solid powder (9-13%), and sweetener (13-16%). The five responses for the dependent variables are the sensory evaluations on colour, aroma, pennywort taste, astringency and overall acceptance were investigated using 35 semi trained panelists. Contour plots showed the relationships between independent variables and the responses were developed. The corrected coefficient determination, R- squared values are more than 0.900. From of the contour plots, optimum condition for pennywort herbal ice cream were 4g/kg pennywort, 12.5% NFMS, 13% sweetener was established for ingredients of acceptable pennywort herbal ice cream. Nutritional data of the product was determined by proximate analysis. It was found that pennywort herbal ice cream (dry basis) consist of 62.65% moisture, 2.16% fat, 12.32% protein, 6.84% carbohydrate, 0.33% fibre, 0.01% ash. Viscosity, texture, overrun, melt down, pH, colour hue measurement are significantly different ( $P<0.005$ ) compared to control ice cream. The optimized pennywort herbal ice cream showed significantly higher content of total phenolic content and ( $P<0.005$ ) radical scavenging activity by using DPPH (2,2-Diphenyl-1-picrylhydrazyl) method compared to control. Therefore, it is concluded that pennywort herbal ice cream improved in terms of nutritional content, antioxidant and physical properties.

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## Improving production of purified konjac glucomannan from *Amorphophallus muelleri* by multistage drying

R. Impaprasert<sup>1\*</sup>, C. Borompichaichartkul<sup>1</sup>, G. Srzednicki<sup>2</sup>, J. Zhao and L. Yu<sup>3</sup>

<sup>1</sup>Department of Food Technology, Chulalongkorn University, Bangkok, Thailand

<sup>2</sup>Food Science & Technology, University of New South Wales, Sydney, New South Wales, Australia

<sup>3</sup>School of Agriculture, Kunming University, Kunming, Yunnan, P.R. China

\*Presenter e-mail: rarisara.impaprasert@gmail.com

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### Abstract

Konjac glucomannan can be obtained from corms of various species within *Amorphophallus* genus. The most popular species for use in food industry is Buk Nuea Sai (*Amorphophallus muelleri*), a native species in Thailand as well as *Amorphophallus bulbifer*, a native species in Yunnan province, P.R. China, which are characterised by high glucomannan content, high viscosity of its glucomannan solution and stronger resistance to diseases than other species. Fresh konjac corm consists of carbohydrates, especially glucomannan, insoluble starch, cellulose, proteins, lipids and some impurities such as calcium oxalate which should be eliminated for safe consumption. Production of konjac glucomannan involves both dry and wet extraction processes. After this stage, the purified konjac glucomannan is dried down to safe moisture content for storage. However, improper handling of the drying process can significantly reduce the quality of konjac glucomannan. The aim of this research is to develop a multistage drying process for producing high quality purified konjac glucomannan flour as characterized by high whiteness index value, viscosity and low sulphur dioxide residue and shorter drying time. After wet extraction process, the purified konjac glucomannan was dried using hot air at various temperatures in the range of 50–90 °C. As a result, a multistage drying process was developed following this concept. The results show that the multistage drying has significantly improved the whiteness index value but decreased the viscosity with the residual sulphur dioxide content of KGM flour and the drying time being reduced in comparison with the conventional hot air drying at constant drying temperature. A solution of KGM flour produced from fresh corms has higher viscosity than the solution of KGM flour from dried slices. However, the whiteness index of KGM flour shows no significant differences between treatments. In addition, the solution of KGM flour produced from *A. muelleri* has significantly higher viscosity than that of KGM flour produced from *A. bulbifer*. However, KGM flour from *A. bulbifer* has a very high whiteness index value.

**Keyword** purified konjac, glucomannan, extraction, multistage drying

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## Nutritional quality of tropical black long-spined urchin, *Diadema setosum* gonads: A comparative analysis between male and female gonads

Nicholas M.H. Khong\*, Fatimah Md. Yusoff, M. Aminur Rahman & Perumal Kuppan  
Laboratory of Marine Biotechnology, Institute of Bioscience, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor Darul Ehsan, Malaysia  
\*Presenter, e-mail: nmhkhong@gmail.com

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### Abstract

Sea urchin gonads or roes are luxurious culinary and medicinal ingredient of which quality is greatly influenced by their biochemical compositions. This study aimed to assess and compare nutritional compositions between roe of male and female black long-spined urchin (*Diadema setosum*) inhabiting a tropical coastal area of Malaysia. The proximate nutritional composition of both male and female roe exhibited an order of protein > carbohydrate > lipid, which is contradictory to that of temperate *D. setosum*. Major amino acids in *D. setosum* roe were glycine, glutamate, aspartate, leucine and lysine whereas dominant fatty acids were C14:0, C16:0, C16:1, C18:1 n-9; C20:4 n-6 and C20:5 n-3. The ratio of essential amino acids to non-essential amino acids; unsaturated fatty acids (UFA) to saturated fatty acids (SFA); as well as PUFA to saturated fatty acids of roe from either gender were found to be similar i.e. 0.6, 1.2 and 0.5 respectively. Prominent protein as well as AHA and EPA content suggest *D. setosum* roe as an interesting subject recommended for investigation as active ingredient in nutraceutical, functional food and pro-health formulations. This study is also the first to illustrate some variations between tropical and temperate species of *D. setosum*.

**Keyword** *Diadema setosum*; gonad; proximate analysis; amino acids composition; fatty acids composition.

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# **COMPOSITE BOARD MADE FROM MIXTURE OF OIL PALM (Elaeis guineensis) FROND AND PINEAPPLE (Ananas comosus) LEAF FIBER**

Marlia Mohd Don, Madihan Yusof, Amirah Mohd Fikri, Ahmad Syafiq Mohamed  
Fakulti Sains Bumi, Universiti Malaysia Kelantan, Kampus Jeli.  
Marlia Mohd Don , e-mail: sitimarliamd@gmail.com

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## **Abstract**

New type of composite board made from mixture of oil palm frond and pineapple leaf fiber was invented. The board was made by combining waste from oil palm and pineapple cultivation that existed locally.

Oil palm frond (OPF) and pineapple leaf fiber (PALF) are agricultural waste that frequently burned at the end of harvesting period. The routine, if been practiced continuously, can disturb natural ecosystem. Transforming the agricultural waste into applicable product have been seen as a positive way to prevent undesired situation. In the other hand, the technology developed can be applied as replacement to future timber.

The board-manufacturing process is adaptable to that industry scale. Skin-free oil palm frond and pineapple leaf were sliced and dried before been chipped into small particles. The particles then were blended with urea formaldehyde resin and formed into mats. The mat later was hot-pressed into desired shape and thickness.

Went through ISO Standard, performance of the composite board is comparable to that of rubber wood.

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## Effects of sorbitan-based surfactants on the early-stage crystallization of cocoa butter

Pawitchaya Podchong<sup>1\*</sup>, Sopark Sonwai<sup>1\*\*</sup>, Dérick Rousseau<sup>2</sup>

<sup>1</sup> Department of Food Technology, Faculty of Engineering and Industrial Technology, Silpakorn University, Nakornpathom, Thailand

<sup>2</sup> Department of Chemistry and Biology, Ryerson University, Toronto, Canada

\*Presenter, e-mail: p.podchong@gmail.com \*\* corresponding author, e-mail: ssonwai@gmail.com

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### Abstract

In food science, the crystallization of edible fats has been extensively investigated, probably due to its importance in everyday life. After all, fat crystallization plays a critical role in determining sensorial properties and stability of many food products including chocolates and confectionery coatings, dairy products such as butter and cream, vegetable spreads (e.g., margarine), and peanut butter. [1, 2] As known from industry work, chocolate bloom is caused by separation of cocoa butter, the main fatty constituent, from the brown nonfat phase. Cocoa butter (CB) is the most important natural confectionary fat with multiple polymorphs [3-4]. The addition of surface-active agents to fats to control its crystallization has been done for many years. The purpose of this research was to investigate the early-stage crystallization kinetics, microstructure and polymorphism of cocoa butter (CB) in the presence of 5 wt% sorbitan esters (trioleate, monooleate, tristearate, monostearate or monopalmitate) or canola oil. Microstructure was investigated via polarized light microscopy, crystallization kinetics with pulsed NMR and DSC and polymorphism with simultaneous SWAXS/DSC (Hecus S3-MicrocaliX). Sorbitan tristearate had the largest effect on CB early-stage crystallization, likely co-crystallizing with POS and SOS and accelerating its initial crystallization, but retarding its crystal growth and polymorphic transformations. This was presumably due to the molecular complementarity of the stearic acids present in the CB and surfactant. There was a lesser, though still notable, influence of both sorbitan monostearate and monopalmitate whereas sorbitan triooleate and monooleate as well as canola oil had little effect given their liquid state at all temperatures. The palmitic and stearic-based surfactants reduced CB crystal size with these same surfactants accelerating initial crystallization rate (or nucleation), but leading to lower equilibrium SFCs. DSC revealed that these surfactants primarily modified the crystallization of CB's high-melting fraction. Overall, it was shown that sorbitan esters can significantly impact cocoa butter crystallization, though this is highly-dependent on surfactant structure.

**Keyword:** cocoa butter, crystallization, sorbitan-based surfactants

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### Acknowledgements

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# Bio-Composites Lumber Properties of Lignocelluloses Resources from cultivated Bamboo (*Gigantochloa scortechinii*) and Wild Christmas Grass (*Themeda arguens* (L.) Hack)

Amirah Mohd Fikri<sup>1</sup>, Marlia Mohd Don<sup>1</sup>, Madihan Yusof<sup>1</sup>, Ahmad Syafiq Mohamed<sup>1</sup> and Mohd Sukhairi Mat Rasat<sup>1</sup>  
Faculty of Earth Science, Universiti Malaysia Kelantan (UMK), Malaysia  
Amirah Mohd Fikri, amirahfikri@yahoo.com

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## Abstract

Increasing in the public awareness in environmental friendly product has led to the demand of eco-friendly product. Consumer began to change from timber product to bio composite product. In this investigation, *Gigantochloa scortechinii* and Christmas grass were used to produce composite lumber. Bamboo of age 3 to 4 years old from the portion of middle of the culm and the spongy pith of the Christmas grass were used to produce the composite lumber. The materials from the two species were bonded together using Urea Formaldehyde and Phenol Formaldehyde to produce composite lumber in parallel arrangement. The composites were produced by varying the ratio composition of the two materials. The physical, mechanical strength and the chemical properties of the lumbers were evaluated. Five replicates of the composite lumbers were prepared for testing. The composite lumbers were tested in accordance with ASTM and ISO.

**Keyword** Composite lumber, physical and mechanical strength, chemical properties

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# Study on the Best Growing Variety of Onion on the Hilly Land of Jeli, Kelantan, Malaysia

Nor Razanah Che Ibrahim<sup>1\*</sup>, S.M. Rezaul Karim<sup>2</sup>

<sup>1</sup>Faculty of Agro Based Industry, Jeli Campus, University of Malaysia Kelantan, Kelantan, Malaysia

<sup>2</sup>Faculty of Agro Based Industry, Jeli Campus, University of Malaysia Kelantan, Kelantan, Malaysia

\*e-mail: razanah\_anah@yahoo.com

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## Abstract

Onion (*Allium cepa* L.) is one of the most important spice and vegetable in the daily diet of entire world not only among Malaysian citizens. Unfortunately little discover on this crop in Malaysia, thus it made almost 100% of this vegetable comes from foreign country. Therefore since hilly land of Jeli is cool climate, planting of 6 varieties of onion cultivar from Bangladeshi which is Ono:275, Ono:276, Ono:277, Ono:285, Ono:286 and Ono:287 were carried out at Batu 17, Jeli. The aim of this study is to determine the best variety that can be grown and suited for cultivation in high land regions on Malaysia. Germination test were done on all varieties shown that average rate of seed germination exceed 80%. Methods of transplanting were used by growing the seedling in the seed trays. Results indicated that parameters of plant height, number of leaves per plant, perimeter of the bulb and weight of the bulb were leads by Ono: 276.

**Keywords:** Onion, variety, hilly land.

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## Plant growth promoting effects by co-inoculation of endophytic bacteria and actinomycetes isolated from sugarcane

Worarat Kruasuwan\* and Arinthip Thamchaipenet#

Actinobacteria Research Unit, Department of Genetics, Faculty of Science, Kasetsart University, Bangkok 10900, Thailand.

\*Presenter email: bird\_00\_red@hotmail.com

#Corresponding author email: arinthip.t@hotmail.com

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### Abstract

Plant growth-promoting bacterial (PGPB) endophytes have ability to colonize inside plants and can stimulate plant growth. Several studies on the association between PGPB including actinomycetes and plants towards plant growth enhancement have been undertaken. However, co-inoculation of endophytic bacteria and actinomycetes has not yet been well examined. In this study, 63 isolates of endophytic actinomycetes and 52 isolates of endophytic bacteria were isolated from healthy roots of sugarcane plants. Based on 16S rRNA sequence analysis they belong to genera *Actinomadura*, *Microbispora*, *Streptomyces*, *Acentobacter*, *Bacillus*, *Enterobacter*, *Lysinibacillus*, *Micrococcus*, *Paenibacillus*, *Kluyvera*, and *Pentaoe*. They were tested for their plant growth-promoting (PGP) traits and effects on plant growth. Thirty-six isolates (57.14%) of endophytic actinomycetes produced siderophores, 30 isolates (47.62%) showed phosphate solubilization and 30 isolates (47.62%) produced IAA whereas 17 isolates (32.69%) of endophytic bacteria produced siderophores, 12 isolates (23.07%) exhibited phosphate solubilization and 20 isolates (38.46%) produced IAA. Based on their PGP traits, individual and co-inoculation of endophytic bacteria and actinomycetes, *Enterobacter* sp. EN-16, *Pentaoe* sp. EN-29, *Microbispora* sp. GKU 827 and *Streptomyces* sp. GKU 833 were tested for effects of plant growth on maize plants. Pot culture experiments revealed that maize plants with the co-inoculation between *Microbispora* sp. GKU 827, *Enterobacter* sp. EN-16 and *Pentaoe* sp. EN-29 gave the best enhancement of plant growth and significantly increased root and shoot biomass compared with individual inoculated and un-inoculated treatments. These results indicate high potential of these endophytes as active biofertilizer agents in the future.

Keyword plant growth promoting, co-inoculation, endophytes, sugarcane

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### Acknowledgments

We gratefully acknowledge the financial support received from the Thailand Research Fund through the Royal Golden Jubilee (RGJ) Ph. D. program and Mitr Phol Sugarcane Research Center.

# REVIEW: COMPOSTING OF AGRICULTURAL WASTE WITH FUNGAL INOCULANTS

Fadzilah Kalamahidan<sup>1</sup>

<sup>1</sup>School of Sustainable Agriculture, Universiti Malaysia Sabah (Sandakan Campus)

Mile 10 Jalan Sungai Batang, 90000 Sandakan, Sabah Malaysia

\*Corresponding author email: fadzilahkalamahidan@gmail.com

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## Abstract

This paper is an overview on composting of agricultural waste with fungal inoculation. Composting is a controlled biological decomposition process, which converts organic wastes into humus-like materials. It is a process involving microbial degradation of different organic materials under moist, self-heating and aerobic conditions; this process is characterized by a succession of various microbial populations. The biodegradation of biomass carried out by different groups of heterotrophic microorganisms, bacteria, fungi and actinomycetes. Enzymes are released in the process of decomposition. Degradation of agricultural waste influenced by several factors such as carbon-nitrogen ratio, soil pH, moisture and aeration, temperature, microorganisms involved and use of inoculants. The main objective for inoculation is to shorten the composting period and produce high quality compost. Several species of fungi have been isolated and cultured to be use as accelerating agent in composting process. White rot fungi such as *Pleurotussajorcaju*, *Phanerochaetechrysosporium* and *Trichodermaharzianum* have the ability to degrade lignocellulosic materials. Otherwhite rot fungi, *Coriolusversicolor*, *Phanerochaeteflavido-alba* and *Trichodermakoningii*were effectively involved in humification and lignin degradation of horticultural wastes and might be used as inocula in a pre-treatment process before composting in order to reduce the resistance of the substrate to biodegradation. In filamentous fungi, cellulolytic enzymes including endoglucanases, cellobiohydrolases (exoglucanases) and  $\beta$ -glucosidases work efficiently on cellulolytic residues in a synergistic manner. In addition to cellulolytic or hemicellulolytic activities, higher fungi (basidiomycetes) have unique oxidative systems which together with ligninolytic enzymes are responsible for lignocellulose degradation.

**Keyword** composting, fungi, enzyme, lignin, cellulose

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## Molecular structure of repetitive element in the water monitor lizard (*Varanus salvator macromaculatus*, Platynota, Squamata)

Nampech Chaiprasertsri<sup>1,2,3\*</sup>, Yoshinobu Uno<sup>4</sup>, Surin Peyachoknagul<sup>2,3</sup>, Ornjira Prakhongcheep<sup>1,2</sup>, Mami Shibusawa<sup>4</sup>, Sudarath Baicharoen<sup>5</sup>, Saranon Charernsuk<sup>5</sup>, Chizuko Nishida<sup>6</sup>, Yoichi Matsuda<sup>4</sup>, Akihiko Koga<sup>7</sup> and Kornorn Srikulnath<sup>1,2,3,4#</sup>

<sup>1</sup> Laboratory of Animal Cytogenetics & Comparative Genomics, Department of Genetics, Faculty of Science, Kasetsart University, 50 Ngam Wong Wan, Chatuchak, Bangkok 10900, Thailand

<sup>2</sup> Department of Genetics, Faculty of Science, Kasetsart University, Bangkok 10900, Thailand

<sup>3</sup> Center for Advanced Studies in Tropical Natural Resources, National Research University-Kasetsart University, Kasetsart University, Thailand (CASTNAR, NRU-KU, Thailand)

<sup>4</sup> Laboratory of Animal Genetics, Department of Applied Molecular Biosciences, Graduate School of Bioagricultural Sciences, Nagoya University, Nagoya 464-8601, Japan

<sup>5</sup> Research and Conservation Division, Zoological Park Organization of Thailand, Bangkok 10300 Thailand

<sup>6</sup> Department of Natural History Sciences, Faculty of Science, Hokkaido University, Sapporo 060-0810, Japan

<sup>7</sup> Primate Research Institute, Kyoto University, Inuyama City 484-8506, Japan

\*Presenter, e-mail: maymee2532@hotmail.com

#Corresponding author, email: kornorn.s@ku.ac.th, ksrikulnath@yahoo.com

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### Abstract

A novel family of repetitive element named VSAKU was isolated by a constructed genomic DNA library of the water monitor lizard (*Varanus salvator macromaculatus*, Platynota). The nucleotide sequence was 185 bp in length comprising 59.67% GC-rich, and that the repeats were organized in tandem arrayed in the genome, indicating that VSAKU could be categorized as satellite DNA (stDNA). Simultaneously, VSAKU was localized to the pericentromeric region of two pairs of macrochromosomes, and three pairs of microchromosomes. Remarkably, this stDNA was crosshybridized to genomic DNAs of several vertebrates. Weak signals were observed in crocodile, turtle, chicken, human and frogs; by contrast, faint or no signals were observed in all squamate reptiles, especially in *V. exanthematicus*, which is the relative species of *V. salvator macromaculatus*, suggesting that the stDNA might be taxon-specifically distributed in platynotan lizards and squamate reptiles. Additionally, the novel repetitive element might have still retained in several vertebrates with the low copy number, and uniquely amplified in the lineage of *V. salvator macromaculatus*.

**Keyword** Repetitive element; the water monitor lizard; Chromosome

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## Potential of condensed tannins from *Leucaena leucocephala* hybrid on methane mitigation in ruminants

M. Saminathan<sup>1</sup>, H.Y. Tan<sup>2</sup>, C.C. Sieo<sup>1,3</sup>, N. Abdullah<sup>1,3</sup>, C.M.L.V. Wong<sup>4</sup>, and Y.W. Ho<sup>1</sup>

<sup>1</sup>Institute of Bioscience, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia

<sup>2</sup>School of Arts and Science, Tunku Abdul Rahman College, 53300 Kuala Lumpur, Malaysia

<sup>3</sup>Faculty of Biotechnology and Biomolecular Sciences, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia

<sup>4</sup>Biotechnology Research Institute, Universiti Malaysia Sabah, 88999 Kota Kinabalu, Sabah, Malaysia

E-mail: saminathan\_82@yahoo.com

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### Abstract

Methane is the second most important greenhouse gas that contributes to global warming and climate change. It has a heat trapping potential 23 times that of carbon dioxide. Globally, ruminant livestock produce about 80 million metric tonnes of enteric methane annually, accounting to about 30% of global anthropogenic methane production. Methane produced during enteric fermentation also contributes to a loss of energy of up to 15% for the animal. Thus, mitigation of methane production by ruminants not only reduces greenhouse gas emission but also improves feed efficiency and reduces production cost. There has been considerable interest in use of plant extracts to mitigate enteric ruminal methane emissions. Condensed tannins are secondary plant metabolites that have been considered for mitigating methane production in ruminants, but they may also decrease digestibility of feed in ruminants. *Leucaena leucocephala* is a tree legume that has been used as a feed supplement for ruminants because of its high protein content. However, it also contains condensed tannins. The *L. leucocephala* hybrids in Malaysia have been found to have higher condensed tannin contents than the parent *L. leucocephala*. The effectiveness of condensed tannins from these *L. leucocephala* hybrids on reduction of methane has not been studied. Thus, this study was conducted to investigate the effects of pure condensed tannins, extracted from young leaves and shoots of *L. leucocephala* hybrid-Rendang on methane mitigation, rumen fermentation parameters such as pH, dry matter (DM) digestibility, nitrogen degradability and volatile fatty acids production, as well as populations of methanogens and protozoa. The “*in vitro* gas production test” was used in the investigation as it provides data on fermentation parameters of feed with a high correlation to its *in vivo* base. The results showed that the condensed tannin extract, at a low level of 30 mg/g DM could reduce methane production by 39% as compared to the control, without negatively affecting DM digestibility, nitrogen degradability, rumen pH and total volatile fatty acids production. Total populations of methanogens and protozoa were also reduced by about 55 and 38%, respectively. Populations of methanogens in the orders *Methanomicrobiales* and *Methanobacteriales* were reduced by 22 and 7%, respectively. The findings of the study indicated that condensed tannins at 30 mg/g DM has the potential to be used as a feed supplement to reduce methane production in ruminants, without adversely affecting rumen fermentation parameters.

**Keyword** Methane mitigation, ruminal methane production, condensed tannins, *Leucaena leucocephala* hybrid

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## Aflatoxin B<sub>1</sub>-degrading activity of *Bacillus* spp., isolated from fermented cereal products

Namon Watanakij<sup>1\*</sup>, Awanwee Petchkongkaew<sup>1</sup>, Esther Y. Aderibigbe<sup>2</sup> and Wonnop Visessanguan<sup>3</sup>

<sup>1</sup>Department of Food Science and Technology, Faculty of Science and Technology, Thammasat University (Rangsit Campus), Pathum Thani, 12120. Thailand.

<sup>2</sup>Department of Microbiology, University of Ado-Ekiti, P. M. B. 5363, Ado-Ekiti, Nigeria.

<sup>3</sup>National Center for Genetic Engineering and *Biotechnology* (BIOTEC), National Science and Technology Development Agency (NSTDA), Thailand Science Park, Pathum Thani, 12120. Thailand.

\*Presenter, e-mail: iamtaew@hotmail.com

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### Abstract

Aflatoxin B<sub>1</sub> is a naturally occurring mycotoxin that is produced as secondary metabolite by *Aspergillus* spp., especially *A. flavus* and *A. parasiticus*. This toxin is the most severe toxin due to its carcinogenic, mutagenic and teratogenic properties. Hence, methods for toxin detoxification/degradation have been received increasing interest from both scientific communities and industries. The biological method is an interested way and *Bacillus subtilis* is the one of bacteria that has an ability to degrade this toxin. In this study, 32 isolates of *Bacillus* spp. from various fermented cereal products were screened for aflatoxin B<sub>1</sub> degradation ability. Results indicated that all isolates exhibited the aflatoxin B<sub>1</sub>-degrading activity of which 10 isolates had highest activity were grouped by (GTG)<sub>5</sub>-PCR genomic fingerprint and the result showed that the isolates were divided into 9 groups. Furthermore, 9 isolates which are representative from each group, were tested for hemolytic activity. The result revealed that 8 isolates were β-hemolysis and only 1 isolate was α-hemolysis, which was *Bacillus* spp. IRU-1A. Hence, *Bacillus* spp. IRU-1A was identified by 16s rDNA sequencing and the result showed that this strain was *Bacillus subtilis* subsp. *inaquosorum*.

**Keywords** Aflatoxin B<sub>1</sub>, Aflatoxin B<sub>1</sub> degradation, *Bacillus subtilis*

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# Characterization of MicroRNAs in Pineapple and Development of Artificial MiRNA Strategies for Gene Silencing

Noor Hydayaty Md. Yusuf\*, Mariam Abd Latip<sup>1,2</sup>, Vijay Kumar<sup>3</sup>

<sup>1,3</sup> Biotechnology Research Institute, Universiti Malaysia Sabah, Jalan UMS, 88400 Kota Kinabalu, Sabah, Malaysia

<sup>2</sup> Centre of Postgraduate Study, Universiti Malaysia Sabah, Jalan UMS, 88400 Kota Kinabalu, Sabah, Malaysia

\*Presenter, e-mail: noor\_hydayaty@yahoo.com

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## Abstract

MicroRNAs (miRNAs) are a class of small, usually with 19 to 24 nt in length. It is found endogenously within the cell and does not code for any protein. However, it participates in regulating the level of mRNA transcript through cleavage or translational inhibition, creating an effect called gene silencing. MicroRNAs have been postulated to be involved in the regulation of the ripening processes in non-climacteric fruits. We have chosen to study miRNAs in pineapple as it is a model organism for tropical non-climacteric fruit species. Here we report a complete list of pineapple miRNA obtained from high-throughput small RNA sequencing and strategy for functional analysis of gene silencing through the use of artificial miRNAs (amiRNAs) technology. In this study, Solexa sequencing was used for the construction of sRNA libraries from pineapple fruit and leaves. A total of 15,754,599 reads produces from both libraries. Bioinformatics pipeline developed through the manipulation of comparative genomics strategy revealed that 579,179 reads were homologous to 153 miRNAs (from miRBase), comprising of 41 miRNA families. In order to decipher the gene regulation associated with pineapple development mediated by miRNA, the gene quantification approach, stem-loop RT-qPCR was utilized. A total of 34 miRNAs showed differential expression between pineapple different tissues and developmental stages. Manipulating this naturally occurring silencing pathway by miRNA, knockdown of other important agricultural genes in pineapple is currently in progress. The silencing of genes in pineapple through amiRNA will provide a gene silencing platform that can be exploited specifically on pineapple, and generally on other plants.

**Keyword** MicroRNA, Gene Silencing, Pineapple, Artificial microRNAs, High-throughput Sequencing

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